



New ways of financing transport infrastructure projects in Europe

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New ways of financing transport infrastructure projects in Europe

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Abstract

Meeting large infrastructure needs – including its proper maintenance and operation – is and will remain a major challenge for the European Union in the coming years requiring targeted innovative financing mechanisms. Technological and systems innovation such as Collaborative Internet, Big and Open Access Data, 5G or Galileo are contributing to a faster deployment of intelligent and collaborative transport systems which will foster the development of an integrated and smooth transport network across regions. This study assesses a range of mechanisms to finance transport infrastructure projects in cross-border regions, and analyses the strategic role that the European Groupings of Territorial Cohesion (EGTC) could play in the planning and implementation of cross-border investments. Special attention is given to the often neglected small-scale projects, whose investment is up to €1 million.

Building on an in-depth literature review, and supported by interviews with various regional cooperation structures and an experts' workshop, the study analyses the current situation regarding the availability of financing tools for new technologies that enhance transport infrastructure in cross-border regions. It also outlines sources of financial support that could meet investment needs and assesses technological challenges and trends in the field of Intelligent Transport Systems, with a focus on regional interoperability. The study ends with suggestions of policy options to facilitate and accelerate cross-border transport infrastructure projects.

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Table of contents

List of figures	4
List of boxes.....	4
List of maps in Annex.....	5
List of figures in Annex	5
List of tables in Annex	5
List of abbreviations.....	6
Executive Summary.....	8
1. Introduction.....	17
1.1. Contextualisation	17
1.2. Objectives and methodological approach	18
2. Small-Scale Transport Infrastructure in Cross-Border Regions	20
2.1. Introduction	20
2.2. Small-Scale Missing Links in the TEN-T Network.....	23
2.3. Obstacles to Cross-Border Collaboration Projects.....	24
2.4. Difficulties in Understanding Cross-Border Mobility	28
3. Role of the European Groupings of Territorial Cohesion (EGTC).....	32
4. Innovation and Technological Trends	38
4.1. Overview of Trends	39
4.2. Intelligent Transport Systems (ITS)	40
4.3. Seamless passenger information and payment systems	43
4.4. Emerging mobility concepts - Mobility as a Service (MaaS).....	44
4.5. Connected and automated mobility.....	46
4.6. European Electronic Toll Service (EETS)	49
4.7. Environmentally Friendly Vehicles (EFV).....	52
4.8. Dynamic pricing and demand management	53
4.9. New materials and construction methods	54
4.10. Harnessing the benefits of the new technologies in cross-border regions.....	54
5. Financing Transport Infrastructure in Cross-Border Regions.....	56
5.1. Introduction	56
5.2. Instruments for Financing Small-Scale Cross-Border Infrastructure (SSCBI) Projects	58
5.3. Financing Small-Scale Cross-Border Infrastructure Projects	70
6. Policy Options	79
References	89
Annexes	94

List of figures

Figure 1: Overview of the project development methodology	19
Figure 2: Relevance and frequency of obstacles ^[1]	25
Figure 3: European Grouping of Territorial Cooperation, 2017 ^[2]	33
Figure 4: EGTC fields of activity grouped according to CoR Commissions in 2016 ^[2]	33
Figure 5: Role of EGTC in infrastructure project life-cycle.....	35
Figure 6: Relevant technologies and innovation in cross-border regions	40
Figure 7: Comparing different traveller planners ^[46]	44
Figure 8: The benefits of automated driving for overall traffic.....	48
Figure 9: Contractual relations under the EETS Framework	50
Figure 10: Sources of Financing Instruments for SSCBI projects	57
Figure 11: Key features of the European Commission's proposal on EFSI (extension of duration; technical enhancements for the Fund and the EIAH)	64
Figure 12: Financing transport infrastructure, the case of the FinöV fund ^[84]	68
Figure 13: The business model canvas ^[86]	69
Figure 14: Relationships between ESIF and EU instruments ^[93]	75
Figure 15: Complementarity opportunities between ESIF and Horizon 2020 ^[92]	76
Figure 16: Stepwise approach to develop a joint H2020 and ESIF financing of a SSCBI project.....	77
Figure 17: Proposed Policy Actions to overcome Challenges and Barriers in SSCBI projects.....	82

List of boxes

Box 1: Recommendations from DG MOVE for successfully closing small-scale missing links	21
Box 2: Transfermuga project overview	21
Box 3: Overview of mobility challenges in Luxembourg	22
Box 4: Example of EEIG: Rail Freight Corridor (RFC)	27
Box 5: Stable association of local entities - Quattropole.....	34
Box 6: A transport service contracted by an EGTC	35
Box 7: Cross-Border Cooperation (CBC) between France and Luxembourg	36
Box 8: Centralised permitting for the railway line between Dresden and Prague along the river Elbe	36
Box 9: Common procurement implementation in the Brenner Base Tunnel	37
Box 10: ITS corridor Medtis deploying traffic improvement mobility services	42
Box 11: Multimodal travel information planner – the Bonvoyage Project	43
Box 12: Incorporating MaaS Concepts in Public Transport Offer – SocialCar Project.....	44
Box 13: MAASiFiE - Mobility As A Service For Linking Europe	46
Box 14: The EU C-Roads platform	47

Box 15: EETS-compliant services in a cross-border context – REETS Project	50
Box 16: Portuguese tolling: DSRC-based and ANPR	51
Box 17: Satelise, an App for toll payment	51
Box 18: Promoting EFV through enhanced refuelling stations	53
Box 19: Pau-Zaragoza cross-border railway section under the CEF call for small-scale cross-border projects.....	61
Box 20: The „Pendlerfonds‘ of Basel-Stadt.....	62
Box 21: European Investment Advisory Hub.....	65
Box 22: Lisbon's EIB Loan	66
Box 23: Progress on strengthening the project pipeline	71
Box 24: Progress on procurement, permitting and State aid consistency	71
Box 25: Example of broadening funding and financing	72
Box 26: Progress in treatment of PPP	73
Box 27: EFSI and ESIF in Nord Pas de Calais (France) ^[93]	78

List of maps in Annex

Map A- 1: Land and Maritime border regions ^[5]	94
Map A- 2: CBC programs.....	95
Map A- 3: Share of total employment (outbound) commuting across national borders by NUTS 2 regions, 2015 (% of total employment)	96
Map A- 4: Border regions indicating the level of cross-border commuting ^[32]	97

List of figures in Annex

Figure A- 1: Vehicle Automation Development Paths – ERTRAC ^[94]	98
Figure A- 2: Barriers and problems to the implementation of EU EETS ^[59]	98
Figure A- 3: Matrix and scoring for technology options ^[63]	99

List of tables in Annex

Table A- 1: Study Interviews	100
Table A- 2: Overview of options, instruments and applicable projects.....	101
Table A- 3: Possible involvement of EGTC at different stages of an investment	103
Table A- 4: Potential role of EGTC in ESIF investments	103
Table A- 5: Transport Innovation scenarios (passenger side)	105
Table A- 6: Transport Innovation scenarios (freight side)	106

Table A- 7: Selected ITS project co-funded by CEF involving cross-border regions	107
Table A- 8: C-ITS Services List.....	108
Table A- 9: SAE Levels of driving automation for on-road vehicles.....	109
Table A- 10: Main technologies in use for tolling	110
Table A- 11: ESIF budget for Thematic Objective 7 ^[14]	113
Table A- 12: Relevant legislation (EU vs national) at each key step in the authorisation framework for transport infrastructure projects ^[9]	114

List of abbreviations

ANPR	Automatic Number Plate Recognition
BEV	Battery Electric Vehicle
CBC	Cross-Border Cooperation
CBS report	Christophersen-Bodewig-Secchi Report
CEF	Connecting Europe Facility
CF	Cohesion Fund
C-ITS	Cooperative Intelligent Transport Service
CNC	Core Network Corridor
CoR	Committee of the Regions
COSME	Competitiveness of Enterprises and Small and Medium Sized Enterprises
DIK	Data, Information and Knowledge
DSRC	Dedicated Short-Range Communications
e-Toll	Electronic Tolling
EEIG	European Economic Interest Group
EETS	European Electronic Toll System
EFSI	European Fund for Strategic Investments
EFV	Environmentally Friendly Vehicles
EGTC	European Grouping of Territorial Cohesion
EIAH	European Investment Advisory Hub
EIB	European Investment Bank
EP	European Parliament
ERDF	European Regional Development Fund
ESIF	European Structural and Investment Funds
ETC	European Territorial Cooperation
EU	European Union
FI	Financial Instrument
GDP	Gross Domestic Product
GNSS	Global Navigation Satellite Systems

GSM	Global System for Mobile Communications
ICEV	Internal Combustion Engine Vehicles
ICT	Information and Communication Technologies
ITS	Intelligent Transport Systems
LFS	Labour Force Survey
LGTT	Loan Guarantee Instrument for Trans-European Transport Network Projects
LRA	Local and Regional Authorities
MA	Managing Authority
MaaS	Mobility as a Service
MS	Member State
NUTS	Nomenclature of Territorial Units for Statistics
OBU	On-Board Unit
PPP	Public Private Partnership
R&D	Research and Development
RFC	Rail Freight Corridor
RFID	Radio Frequency Identification
RIS3	Research and Innovation Strategies for Smart Specialisation
SMEs	Small and Medium Sized Enterprises
SPV	Special Purpose Vehicle
SSCBI	Small-Scale Cross-Border Infrastructure
TEN-T	Trans-European Transport Network
TMS	Traffic Management Services

Executive Summary

Cross-border regions are relevant to the integration of the European Union, but internal borders still act as discontinuity lines

Housing over a third of the European Union (EU) population, cross-border regions have significant social and economic dimensions, playing a pivotal role to the fulfilment of the founding principles of EU, notably territorial integration. Some initiatives have shown that cross-border connections carry a high European added value, supporting the functioning of the internal market, strengthening the economic, social and territorial cohesion of the EU, and stimulating regional development across borders^{[1]-[4]}. The study 'Collecting solid evidence to assess the needs to be addressed by INTERREG Cross-Border Cooperation (CBC) programmes' highlights that the potential of each border region is mainly determined by the competitiveness of cross-border public and private sector organisations, the market integration of activities and people, human and social capital, integrated services and the shared management of natural capital^[5]. Additionally, the study identifies three main types of 'challenged border zones':

- Densely populated areas with high commuter flows, which may need additional border crossings due to high demand, even when existing infrastructure is highly developed. In these cases, technological innovation and new integrated services, Intelligent Transport Systems (ITS) and Cooperative ITS deployment, including promotion of mobility as a service, might represent cost-effective, high added value solutions.
- EU13/EU15 and EU13/EU13 borders, mainly resulting from an investment backlog, scarcity of investment funds and low demand for years. Targeted analysis of missing links in these regions, backed by sustainable cross-border transport strategies and solid economic evaluation, should be the focus of attention for managing authorities looking to prioritise the necessary investments. For these regions, the development of cross-border transport and mobility plans might be a path to follow.
- Borders with geographical obstacles, such as rivers or mountains, often with low population density, where the investment requirements for new border infrastructure, notably tunnels and bridges, could be high. In these cases, solid economic assessment (a cost-benefit analysis), including evaluation of alternative solutions, should be envisaged to support decisions, especially because these connections might have regional or even local impact/added value.

Continuity across cross-border regions remains more of an ambition than a reality in many EU cross-border regions, owing to the presence of gaps – i.e., missing links – in the transport infrastructure. Indeed, nowadays, the internal borders still represent a barrier to the development of the regions and, the closer the border, the stronger the effect. They continue to hamper the mobility of people and goods, with a negative effect on the social, economic and sustainable development of both the affected regions and the EU. In a recent study, the European Commission listed more than 200 obstacles to cross-border projects in the EU.^[6] The study also identifies public transport and mobility as the third biggest problem in cross-border life, after the labour market and education, social security and healthcare.

At the EU level, missing connections are dealt with by specifically designed mechanisms, of which the Trans-European Transport (TEN-T) (and the associated Connecting Facility Europe (CEF)) is the flagship programme. Indeed, over the last few years, EU policies seem to have focused on financing large-scale TEN-T infrastructures. Conversely, small-scale missing links, which often require projects below €1 million, are routinely left untouched, to be dealt with on an ad-hoc basis depending on the interest of the respective Member State (MS). Several EU publications^{[6][7]} have identified these smaller projects, the best known of which is probably a study led by Michael Cramer (Greens, Germany). The analysis also reveals several categories of missing cross-border links, which can be typified as:

- a. *Transport network related*: lack of a specific infrastructure (e.g. no bridge, no tunnel, etc.).
- b. *Transport operations or services related*: inexistence or absence of accessibility (e.g. no transport services, or infrastructure in bad condition).
- c. *Transport technology related*: poor or lack of technological interoperability (e.g. no integrated journey planners).

The main reasons for the presence of missing links in cross-border regions are:

- *Data-related* – available data on cross-border mobility patterns remains scarce and scattered across different institutions and MS. Apart from some notable exceptions, building an adequate picture of the mobility patterns is not possible in many cross-border regions.
- *Political* – low political visibility of local and regional authorities (LRA) at the political decision centres, means additional challenges to voice their problems and to gather political support.
- *Policy-related* – EU policy, such as the TEN-T, is oriented towards the development of seamless international corridors spanning several MS. Cross-border connections are necessarily needed to fulfil this ambition. Yet, no particular attention has been dedicated to cross-border regions outside these corridors.
- *Limitations of LRA* – lack of knowledge or resources (e.g., human, technology or financial) of LRA to develop joint projects or jointly access funds, limit the exploitation of available financing mechanisms.
- *Differences in culture, language or working methods* – management of cross-border teams is inherently complex. Cultural elements and working methods often differ across MS and are not necessarily aligned. Additionally, communication is often difficult as people lack sufficient language skills.
- *Finance-related* – mirroring the EU policy vision, financing mechanisms and regulations were formulated and tailored according to the specificities of large-scale projects, leaving small-scale projects out.
- *Limited attractiveness of Small-Scale Cross-Border Investment (SSCBI) projects for private investors* – the reduced financial dimension of small-scale projects, coupled with a lack of information (precluding proper financial and economic analyses), limits the interest of private investors.
- *Technology-related* – current EU policy is supporting the provision of seamless technological services across cross-border regions. However, the focus is on cities and other densely populated regions. Tailored technologies are required to tackle the uniqueness of cross-border regions.

Cross-border initiatives are inherently complex, requiring the coordination of several political and technical agents with different objectives and strategies. Even when a project targets regional connectivity, it often depends on the participation of and approval by national bodies, including ministries, state enterprises and infrastructure managers, who may have other priorities or simply disregard SSCBI projects' importance. Also, coordination must be ensured along the various stages – planning, design and implementation – of project development. Considering that projects often take more than one legislature or administration mandate, political support is also subject to change. Other barriers may emerge during project development. Our review confirmed the findings from the above-mentioned study that legal and normative obstacles are especially relevant, followed by obstacles linked to culture and language. The presence of different administrative structures, procedures and technical standards represents another important barrier to cross-border initiatives.

Support by national governments seems to facilitate the decision-making process (note that regions are sometimes far away from national centres of power) and accelerate project implementation. Also, there is a recognition that several border regions suffer from an inefficient use of the resources they already have – mostly resulting from administrative barriers – rather than from a lack of resources. As such, in order to promote cohesion, border regions need to be better involved in the governance of resources.

Cross-border collaboration calls for more coordination in the definition of processes and tools for harmonised planning, development and implementation, including funding and financing of projects of common interest, notably in cases of infrastructure projects.

Bridging the gaps will thus require coordination across different instruments and initiatives. Technological innovation and research activities are key factors to foster the global competitiveness of the transport sector and fundamental to developing cost-effective and customised solutions. Relevant policies should go beyond the financing of infrastructure and consider other domains where differences amongst MS create the real barriers to true integration.

Overcoming these obstacles through specific policies should allow regions to realise their potential more effectively with significant impact on economic, social and territorial cohesion. The most important types of potential are related to competitiveness (product innovation and the development of industrial and cultural activities) and social and human capital (education, training and support for social cohesion).

However, the real dimension of cross-border flows is still largely unknown

Border regions are increasingly recognised as functional regions that can only exploit the potential for growth and employment if there is sufficient connectivity between the two sides of the border and with the European network. Accessibility to facilities, notably health, schools and jobs, is recognised as a critical issue. However, there is a lack of information on fundamentals such as cross-border flows of workers, trade and tourism, cross-border use of public services or technological border clusters. In only a few cross-border regions have local stakeholders succeeded in building cross-border observation systems (e.g. Lille Metropolis).

Evidence on daily commuting patterns along different borders is still insufficient. Overall, the statistical data on EU cross-border mobility patterns is limited and quite heterogeneous, with a few regions having detailed datasets, while many others only have very aggregated data or none at all.^[1] Moreover, there is no EU centralised repository of data. Instead, it is dispersed across institutions. At the EU level, available data on transport or mobility is essentially limited to the main international transport links (highways, railways or inland waterways).

The lack of reliable data on accessibility and the mobility patterns of workers, shoppers and tourists at cross-border level jeopardises the assessment of the current situation. Such data could be used in economic and financial assessments of cross-border transport needs to prioritise the necessary investments.

The pivotal role of the European Groupings of Territorial Cohesion (EGTC)

Numerous EGTC that have emerged across Europe are making use of their structures to plan and implement cross-border investments and services and to enhance the technological infrastructure of cross-regional transport, especially when the required investments are high or not part of the TEN-T network. In September 2017 there were a total of 66 active EGTC, one more than in 2016.^[2] Out of these, 38 signal transport as one of their respective fields of activity.^[2] Nevertheless, an analysis of their past and ongoing activities reveals that only 23 are effectively working in transport-related fields.

EGTC can contribute to the implementation of EU cohesion policy by either implementing joint action plans, acting as the Managing Authority (MA) or being the sole beneficiary of a programme. EGTC are valuable instruments to the successful development of small-scale cross-border projects, as they can actively intervene in every stage of a project life cycle, as follows:

- **Project Development & Planning Stages** – EGTC can work as a focal point for the collection and generation of relevant information about the project. They can be used to collect data that is often scattered across LRA. Also, they may keep the momentum going, avoiding energy from fading out as time goes by and other projects come along.

- Procurement and Implementation Stages - EGTC may work on behalf of LRA taking care of all tasks related to procurement, communication and negotiation with suppliers, management of activities, etc. In particular, EGTC can monitor the project implementation, contributing to the fulfilment of budget and deadlines.
- Operation & Management Stages – EGTC can monitor and control the quality of the services if services are provided by third parties, or be directly involved in the provision of the service otherwise.

The EGTC regulation already offers a tool for implementing and managing CBC projects under differing national rules and legal procedures.^[8] The role of EGTC in supporting and promoting European territorial cooperation is largely acknowledged, especially regarding the flexibility they offer as a platform for multilevel governance. One of the proposed measures from a study^[9] on permitting and facilitating the preparation of TEN-T projects was the creation of a single leading authority acting as a one-stop-shop for cross-border projects. EGTC could be that leading authority. This approach has two main characteristics: i) it involves the integration of permits and decisions into a single comprehensive decision, and ii) it involves the designation of a leading authority, at the national level, responsible for coordinating the permitting procedure.

EGTC are in a good position to exploit synergies and complementarities among financing options and instruments. EGTC can benefit from a variety of instruments and options,¹ other than the European Structural and Investment Funds (ESIF), such as the Research, Innovation & Competitiveness-related programmes, financing instruments, or even leverage private investment. Apart from being a partner or lead partner in an ETC project, EGTC also contribute to the implementation of ETC through a variety of other actions, such as capacity building, support to programmes or membership of monitoring committees. By way of example, the 2015 EGTC monitoring report^[10] highlighted the higher than expected number of EGTC using one or more of the new instruments. Nevertheless, the overall number of EGTC making use of these instruments is still limited.

Notwithstanding the advantages and potential of the EGTC, the analysis of the 2016 annual report mentioned above showed that the instrument is still under-used to manage EU cohesion policy funds. Only recently, the EGTC instrument has become more prominent to facilitate theme-specific CBC) and transnational and interregional forms of cooperation. Different reasons explain the limited use of EGTC in cross-border transport, such as: established structures (INTERREG programmes building on past experiences); insufficient economic, geographic, institutional and cultural commonalities, negative expectations concerning the benefits of an EGTC in large transnational or widely spread interregional cooperation; or the availability of other instruments in some parts of the EU.^[11] Compared to other instruments for territorial cooperation, the EGTC legal instrument is relatively new and not yet mature. It faces different challenges to its funding and operations.^[3]

Addressing emerging innovation trends at smaller scale is critical

It is widely recognised that the quality and efficiency of transport services have a direct impact on economic growth, competitiveness and quality of life. Together with the provision of quality infrastructure, it is acknowledged that innovation and research are key to a globally competitive transport sector. They are focused on future challenges, market drivers, and new technologies that will help address threats without curbing mobility. An innovative transport sector will be critical to sustaining the economic competitiveness of European countries. Regarding environmental challenges, national and international regulations focused on the reduction of the transport sector's carbon and pollutant emissions, are creating markets for green innovations such as electric vehicles. The increasing number of people living in urban and metropolitan areas (including densely populated cross-border

¹ Discussion of the new instruments is made in Section 6.

regions) constitutes a challenge for transport system organisation and mobility management innovation, but also creates opportunities.

As many innovation policy instruments and policies for framework conditions are managed by national governments, regional and local governments need to identify where national actions can help or hinder their efforts. Given that national funds often stop at the border, different strategies to finance joint cross-border actions are needed. Some recommendations to make cross-border instruments work include:^[12]

- Devote more efforts to strategy development and policy intelligence,
- Mainstream the cross-border element in national and regional innovation strategies and policy instruments, or at least align programme rules,
- Make greater use of opportunities created by the border,
- Publicise success stories of cross-border instruments.

In 2015, the TEN-T coordinators introduced a set of five issues papers^[13] aiming to bring wider views to TEN-T beyond infrastructure provision: enabling multimodality and efficient logistics; boosting ITS; boosting new technologies and innovation, and effectively integrating urban nodes; extending cooperation with third countries. Several of the papers – notably the one on 'Innovation and ITS' – detail specific challenges for cross-border regions. Amongst other issues, they underline a vision that TEN-T corridors can act as a readily available inter-regional and international cross-border test bed and platform to learn-by-doing across local and national boundaries.

As innovation plays an important role in EU transport policy, it is important to review technology and societal trends so as to understand how these may affect cross-border transport investments. While societal trends can influence and contribute to new technology (e.g. gaming, Vision Zero, user-centred design), technological developments are already raising important opportunities for cross-border investments. Key technological trends, which call for specific attention at cross-border regions, include Intelligent Transport Systems (ITS), Passenger Information and Payment Systems, Mobility as a Service, Connected and Automated Vehicles, European Electronic Toll System, (EETS), Environmentally Friendly Vehicles (EFV), Dynamic Pricing and Demand Management, and New Materials and Construction Methods.

In all these areas, there are important developments underway with implications for cross-border transport infrastructure investments, and critical organisational issues. If the overall implementation of the needed infrastructure for autonomous driving or electric charging happens to be concentrated along the key networks (e.g., TEN-T core network) there is a risk that cross-border links of local or regional dimension become less competitive, thus risking the increased isolation of communities on both sides of the border. It is thus worth reflecting on whether national action plans are paying enough attention to the specific needs of cross-border regions. Road charging schemes up for revision also need to pay attention to the impacts on cross-border regions.

Problems of financing cross-border transport infrastructure show a need to rethink current EU infrastructure investment and its governance

Reliable and efficient financing instruments are key to the successful deployment of any policy or strategy. At the EU level this is no exception and, over the last decades, a wide diversity of instruments have been created, the most well-known and popular for financing transport infrastructure projects of which are the European Structural and Investment Funds (ESIF), the Connecting Europe Facility (CEF), national and multilateral funds, research and innovation programmes, financial instruments (FI) and private investment.

Several funding programmes and instruments have been established within the EU strategy for smart, sustainable and inclusive growth, where cross-border projects may fit. The ESIF is the programme that supports EU sectorial policies: regional and cohesion policy, common agricultural policy, and common

fisheries policy and integrated maritime policy. Cross-border projects fall under the regional and cohesion policy. The relevant ESIF are the European Regional Development Fund (ERDF), Cohesion Fund (CF) and the European Social Fund. The CEF Transport, managed by the Innovation and Networks Executive Agency, is a key EU-wide co-funding instrument for realising the TEN-T policy.

The diversity enhances the possibility of finding suitable opportunities. Reality evidences the high difficulty of financing SSCBI projects. Indeed, the preferable instrument is the INTERREG (an instrument of the Regional and Cohesion Policy). It was and still is the only EU level instrument that provides substantial and multiannual funding for ETC. INTERREG is financed by the ERDF. This funding has allowed the realisation of numerous projects and strategic initiatives, which would in most cases not have been implemented otherwise, or at least not with the same timing, scope and depth. INTERREG has significantly widened and intensified political and administrative exchanges in many policy fields across Europe, stimulated the Europeanisation of public administrations at all levels and enhanced a practice of cooperative self-organisation between decentralised government levels from different countries. Nevertheless, a common remark is that relatively few resources are available for decentralised tools such as the INTERREG programme to bridge the small-scale gaps identified in cross-border regions, even though these programmes are well placed to consider the local needs of the cross-border regions in question.

EFSI aims to mobilise private finance for strategic investments and stimulate the funding of economically viable projects with higher risk. Synergies between EFSI and the operational programmes of the ESIF are promoted to ensure coherence between investment projects and development strategies in Europe's regions. Also, the European Investment Bank (EIB) supports investment through loans and financial instruments such as lending, a structured finance facility and a Loan Guarantee Instrument for Trans-European Transport Network Projects (LGTT). Fund investment from public or private sources, such as the Marguerite fund and the European Energy Efficiency Fund, are also possible. These 'standard' loans are usually targeted at projects with a volume of more than €50 million. All of these could be used to leverage more funds from different countries and sources, although in some cases the decision-making power remains at the national level.

The EU strategic political agendas offer additional opportunities for financing small-scale cross-border projects. Looking into the current top priorities of the European Commission for the period 2015-2019, several are relevant for these projects, such as the Jobs, Growth and Investment; Digital Single Market; Internal Market; or the Energy Union and Climate. Each strategy is used as a reference framework for activities at regional, national and EU levels, being supported by a generous programme and multiannual budget. By way of example, the EU framework programme for Research & Development is the Horizon 2020 or H2020. It runs from 2014 to 2020 with a budget of nearly €80 billion.

Private organisations are another possible source of funding those small-scale cross-border projects. Their interest depends on the identification of viable business models that can generate enough revenues to cover costs. However, there is a common belief, perceptible in many discourses or documents that such projects fail to generate viable business models. However, this is not necessarily correct, as some past examples evidence. It is then necessary to invest in the generation of viable business models. The identification of value generation opportunities in small-scale cross-border projects and the subsequent development of viable business models is not a trivial matter. Tailored initiatives, such as stakeholder engagement or focus groups, need to be conducted, which requires resources and know-how.

Notwithstanding the significant progress, barriers and challenges still hamper cross-border integration of transport infrastructure. The study brings forward seven policy options to help accelerating and consolidating investment in cross-border transport infrastructure projects, particularly in the small-scale ones.

Policy Option 1: Create an EU observatory on cross-border transport and mobility dynamics

Available data on cross-border dynamics is relatively scarce and unreliable^{[7], [14]}. The lack of reliable and comprehensive datasets at the EU level creates problems of different order. Foremost, it makes accurate diagnosis of the mobility patterns difficult. Also, it prevents the realisation of benchmarking exercises across regions and MS. Thirdly, the policy decision-making process is conducted without the appropriate ground data and information, which increases the margin of error of the decision. Finally, business and private investors are unable to run financial and business analytics, reducing their interest for cross-border investments.

A new EU Observatory on cross-border transport and mobility dynamics would overcome several data-collection limitations. It could provide the necessary data and real-world evidences to support policy decision making process. The data could be used in an economic and financial assessment of cross-border transport needs and respective investments. Setting common rules for data collection and collecting data on cross-border regions would greatly contribute to bridge missing links. Common rules would enable benchmark analyses between different regions. Additionally, public and private investors could start developing more transparent analyses, which would reduce risk and bias, and favour investment.

Policy Option 2: Raise the political visibility of small-scale cross-border projects in central governments

A recurrent complaint voiced by Local and Regional Authorities (LRA) located cross-border regions is that they are below the political radar of central governments. The geographical distance of these regions in relation to the capital city acts still as a relevant communication barrier, which not even the recent advancements in the Information and Communication Technologies (ICT) were able to overcome.

Still, there are signals that the situation has been improving. The so-called 'integrated territorial investment' could combine INTERREG and mainstream EU funds for cross-border transport projects, which entail political visibility within central government and decision-making bodies. These projects can be carried out by EGTC. Developing initiatives to raise the awareness and visibility of cross-border projects could be beneficial for their approval. The creation of dedicated offices (or contact points) in central institutions and governments would facilitate the communication with the LRA and contribute to raise visibility and presence in central governmental agenda. In addition, adoption of cross-border sustainable mobility plans, interoperable solutions and joint consultations should be a condition for cross-border investments.

Policy Option 3: Develop new project assessment and evaluation guidelines for small-scale cross-border projects

Customised project assessment and evaluation approaches should be developed considering the specificities of small scale cross-border projects. Such projects are hardly attractive to private investors and, even at political level, often play second fiddle to other more popular or visible projects.

Tailored project assessment and evaluation guidelines should be developed considering the specificities of such projects and the limited (human and technological) resources and timeframe of LRA. Also, projects' entire life cycles should be kept in mind, with a separate business plan for each phase (e.g. planning, design, procurement, construction, operation and maintenance). Segmenting a project like this would shed light onto which parts of the project could be attractive to private investors. Risks could be better shared between the public and private sectors, and the ex-ante conditionality of access to EU funds strengthened, for example by requiring a project to be linked to a national transport master plan to benefit from the ESIF.

Also, the guidelines should also include dedicated sections to business models, to raise the interest among private investors. As small scale cross-border projects rarely produce viable business models, development of innovative business models is deemed necessary.

Policy Option 4: New funding mechanism tailored to small-scale cross-border projects

For local and regional authorities, the smaller missing links across borders are as important as completing the TEN-T network and main transport corridors. Most EU funding goes to the latter however. Small-scale projects are often either too small or not bankable. The only dedicated source of funds for small-scale cross-border links is INTERREG, which presents just 3% of cohesion policy funds.

The creation of tailored financing mechanisms, with simplified rules and stable budgets, would help increase the rate of supported small scale cross-border projects. A possible way forward is to design a new fund specifically for projects with long implementation times, low returns and EU benefits, which would complement the CEF. Other alternatives lie ahead that could secure new financing for infrastructure projects. Examples include: i) promoting cross-financing (e.g. highway toll revenues funding railways), ii) extending the polluter pays principle to value positive externalities (e.g. recognising the environmental benefits of rail versus road), iii) developing banking laws that recognise infrastructure's special needs, or iv) promoting the participation of private investors (e.g., through PPP by taking them off balance sheet). Alternatively, complementarities between different mechanisms can be exploited (e.g., combining H2020 and ESFI financing instruments).

Policy Option 5: Strengthen INTERREG programme as the chief financing instrument for cross-border regions

INTERREG has gained wide popularity, over the last decades, as the primary source of financing for cross-border projects located outside the TEN-T corridors. Even so, it contains some limitations. By way of example, approval of expenses requires independent approval by each MS. Also, each LRA must comply with the respective national legislation in what concerns project approval. Consequently, the management of a cross-border project is quite cumbersome.

Improvements in INTERREG conditions could facilitate implementation and promote cross-border projects. A list of key domains of intervention and a brief description of proposed actions includes: i) legal framework and budget conditions (e.g., review and simplify EU legislation by creating a single regulation reflecting INTERREG-specific implementation provisions, or increase INTERREG funding allocation, particularly in what concerns technical assistance), ii) thematic Focus (e.g., focus on the specific the needs of cross-border regions, instead of defining general goals (or thematic menus), or define investment priorities to better address the various degree of integration), iii) harmonisation and simplification of regulations (e.g., define a set of common indicators tailored to the needs of INTERREG programme), and iv) management and control system (e.g., adjust INTERREG programme governance to better respond to thematic priorities, or clarify and adapt the rules of auditing to the specificities of INTERREG programme).

Policy Option 6: Adopt new legislation that could facilitate cross-border projects

The need to abide by dissimilar national regulations -especially the need for specific approvals by each MS along the various stages of a project- has been repeatedly pointed out as a key barrier. Variations among MS (e.g., legal requirements, timeframes or data and inputs) frequently result in cumbersome and lengthy project-related procedures. Even the adoption of a *border friendliness approach* in the transposition of EU laws does not guarantee a good fit on the border because of many other differences.

Therefore, MS could simplify their procurement and permitting procedures for cross-border projects by adopting special rules for cross-border projects similar to what happens with the EGTC or INTERREG programmes. In this context, cross-border projects would be subject to a single legislative framework and could be developed faster with lower risks and costs. An EGTC can take on the role of a cross-

border transport authority that could promote sustainable urban mobility plans at a cross-border level to help with their implementation, operation and maintenance.

Policy Option 7: Create instrument to finance technological solutions for tackling small-scale missing links

The financing mechanisms to help cross-border regions are available; the problem is accessing them. New, more risk-based financing schemes are not a preferred choice of most LRA, however. Also, cost-benefit analyses of small-scale projects are not yet widely practised, which makes it harder to prioritise and drive investments in them. Despite their privileged understanding of cross-border mobility barriers, the participation of cross-border regions in international fora or research projects remains limited and they risk lagging behind.

Several options are available. Cross-border regions could actively contribute to the design and development of future technologies, to ensure that cross-border barriers and gaps are considered and addressed in the final solutions. The call for proposals could i) address specific cross-border problems and specificities, ii) require the active participation of LRA or other organisations located in these, or iii) foresee the development of pilots or case studies in these areas. Alternatively, risk capital, notably venture capital, could be raised for support small scale projects. These are specialised instruments in financing innovative, and often disruptive, business ideas of Small and medium Sized Enterprises (SMEs) or start-up companies.

1. Introduction

1.1. Contextualisation

The European Parliament (EP) has maintained a deep interest in the financing of transport infrastructure new technologies, with a particular concern for cross-border regions. In a recent own-initiative report, 'Improving the connection and accessibility of the transport infrastructure in central and eastern Europe', the EP^[15]:

- i) stresses the need to enhance the connectivity and accessibility of transport infrastructure;
- ii) reiterates the Trans-European Transport Network (TEN-T) objectives of filling missing links, removing bottlenecks and ensuring seamless connections for long-distance and regional travel – especially in cross-border regions – for passengers and freight;
- iii) strongly advises making better use of existing policies and instruments for regional cooperation, such as European Territorial Cooperation (ETC), INTERREG and above all European Groupings of Territorial Cooperation (EGTC) to enhance cross-border transport.

In his 2014 address to the EP, European Commission President Jean-Claude Juncker identified ten political priorities for his mandate^[16]. Several of these are directly or indirectly related to transport infrastructure and the uptake of new technologies in this area. For example, the goals of smarter investment, and boosting innovation and competitiveness are part of the first priority (jobs, growth and investment) and underpin the instruments that finance transport infrastructure in the European Union (EU). Another key area for the transport sector is the political priority related to climate change and energy. Both areas have been central to the EU transport and mobility policies since the European Commission publication of the 2011 White Paper 'Roadmap to a single European Transport Area - Towards a competitive and resource efficient transport system'^[17]. It was recently reinforced with the adoption of 'A European strategy for low-emission mobility'^[18]. In both cases, investment in new technologies and infrastructure is a key element of the shift towards a decarbonised transport system.

It should come as no surprise that the Commission's main transport investment mechanism, the Connecting Europe Facility (CEF), is concentrating on the introduction of new transport technologies, with a particular focus on cross-border projects. However, the focus on financing large-scale TEN-T projects stands in sharp contrast to the relatively few resources channelled to addressing smaller-scale (i.e. projects with a budget of below €1 million) infrastructure problems in Europe's border regions. This situation can cause problems, as the development of border regions strongly relies on the availability of infrastructure to facilitate the movement of people and goods across and on both sides of the border. The lack of funds can lead to the persistence or emergence of missing links, which hampers the realisation of the full economic potential of the EU border regions.

Europe faces a serious test in meeting its looming infrastructure needs, including for proper maintenance and operation, and eventually actions to increase resilience to climate change. That said, a wide range of financing options for transport infrastructure is currently available at the EU level:

- European Structural and Investment Funds (ESIF),
- European Fund for Strategic Investments (EFSI),
- Horizon 2020,
- European Investment Bank (EIB),
- CEF, including related financial instruments.

Ideally, all these shall be used to complement Member States' (MS) own resources. An action plan² on making the best use of these new financial schemes with twelve concrete recommendations grouped into four blocks was published by the European Commission in 2015^[19]. The report, known as

² The action plan is discussed in Section 5.

Christophersen-Bodewig-Secchi Report (CBS Report), was an initiative of TEN-T European Coordinators Carlo Secchi (Atlantic Corridor) and Kurt Bodewig (Baltic Adriatic Corridor), and former European Commission Vice-President Henning Christopherson. A progress report^[20] is under preparation and it will be published by the end of 2017 or beginning of 2018.

1.2. Objectives and methodological approach

This study aims to inform decision-makers about possible policy options to enhance the financing of cross-border transport infrastructure projects, with a particular focus on those deploying Intelligent Transport Systems (ITS). The objectives of the study are the following:

1. Review the current situation in the EU and its Member States with regard to the availability of financing tools for new technologies that enhance transport infrastructure in cross-border regions;
2. Outline/Identify sources of financial support in relation to investment needs;
3. Analyse technological challenges and trends in the field of ITS, with a focus on regional interoperability;
4. Provide and assess policy options to improve Europe's governance and capabilities of financing new technologies that enhance transport infrastructure in cross-border regions. Focus on the strategic role that EGTC could play in the planning and implementation of cross-border investments.

Figure 1 provides a schematic presentation of the methodological approach. A literature review and desk research of the different funding programmes was complemented by interviews with various stakeholders and organisations. Interviews with several EGTC reinforced the analysis with more qualitative information and case study highlights. This was accompanied by interviews with policymakers, including from different units at the European Commission (e.g. DG MOVE, DG REGIO) and the Committee of the Regions (CoR). The reference section offers a detailed overview of the reviewed documents and sources of information. The interviews were targeted to elicit policymakers' views on the analysis and to validate the findings. The list of interviewees is presented in Table A- 1³.

The preliminary conclusions were presented and discussed at a workshop on June 6, 2017⁴. This was an opportunity to discuss possible approaches to improve the financing of new technologies that could enhance transport infrastructure in border areas.

The workshop was structured in three parts:

- *Part I* began with a presentation of the preliminary findings of the STOA study on 'New ways of financing transport infrastructure projects in Europe' followed by presentations by the Commission and CoR, and an overview of the role of EGTC in cross-border investments.
- *Part II* was an informed debate on the changes that are needed to enhance the role of cross-border financing, with stakeholders being invited to share their own experiences.
- *Part III* was a wider debate in which the various speakers were available to answer questions and react to comments from the audience.

The list of speakers included:

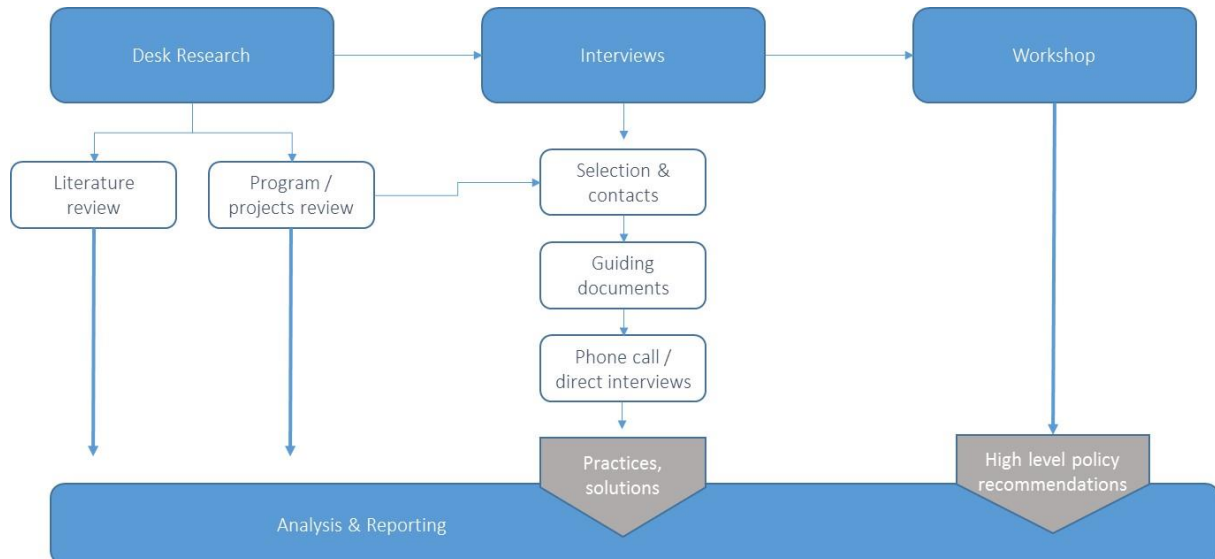
- Claudia Schmidt (EPP, Austria), Chair of the Workshop
- Daniela Carvalho, TIS
- Carlo Secchi, European Commission, DG MOVE
- Pavel Branda, Committee of the Regions
- Dirk Peters, European Commission, DG REGIO

³ The tables with caption like Table A-x, in which x is a number, are available in Annex.

⁴ Further information about the Workshop can be found here: <https://goo.gl/WwZHCT>.

- Marie-Pierre Mésplede, Eurorégion Nouvelle-Aquitaine-Euskadi-Navarre
- José Maria Costa, Eixo Atlantico (PT-ES)
- Krzysztof Zarna, Central European Transport Corridor EGTC.

Figure 1: Overview of the project development methodology



The remaining of this document is organised as follows. Section 2 addresses the problems and challenges of bridging the missing links in cross-border transport infrastructure. Section 3 discusses the pivotal role of EGTC to facilitate bridging the missing links. Section 4 enumerates relevant technological and innovation trends, and how cross-border regions could advance and avoid being left behind. ITS, automated and connected mobility, tolling and the European Electronic Toll Service (EETS), and clean vehicles and infrastructure deployment are some of the trends addressed in more detail. Section 5 explores instruments and opportunities to financing cross-border transport projects, emphasis is given on the small-scale projects. Finally, Section 6 draws the main conclusions of the study and proposes a series of policy options.

2. Small-Scale Transport Infrastructure in Cross-Border Regions

KEY FINDINGS

- The current focus on financing large-scale TEN-T infrastructure projects stands in sharp contrast to the relatively few resources channelled to addressing smaller-scale infrastructure problems in EU border regions. This lack of funding is potentially behind the persistence or emergence of missing links, which hampers the realisation of the full economic potential of the regions that span diverse borders.
- Border regions are increasingly recognised as functional regions that can only exploit the potential for growth and employment if there is sufficient connectivity between both sides and with the European network. Accessibility to facilities such as health and jobs is recognised as a critical issue.
- Previous research suggests that legal and normative obstacles are very significant impediments to cross-border collaboration, as are cultural and language barriers. In 2015, the Luxembourg Presidency of the Council identified possible measures and tools to overcome these obstacles, in particular those concerning the legal framework.
- Well over a third (37.5%) of the EU population lives in border areas. Establishing a viable connection between regions can contribute to boosting economic and social well-being. But evidence on daily commuting patterns along the different borders is still lacking
- This absence of reliable data on the accessibility and mobility patterns of workers, shoppers and/or tourists at cross-border level jeopardises any assessment of the current situation. Such data could be used as supporting evidence for economic and financial assessments of cross-border transport needs and respective investments.
- Solving missing cross-border links requires an integrated approach. Special attention must be paid to barrier-free and interoperable cross-border ticketing and information systems, favouring inter-modality.
- Innovative thinking is needed to solve mobility challenges in border regions. Mobility management strategies and assessment of accessibility and mobility from a broad perspective (physical, spatial, temporal and financial) needs to be more broadly applied.
- Synergies with economic activities (leisure, work, tourism, etc.) should be envisaged as market driven.
- Cross-border infrastructure and services should be supported in cross-border sustainable mobility plans.

2.1. Introduction

Cross-border transport projects are vital, both for building an efficient and sustainable transport system which enables the free movement of goods and passengers and for ensuring the effectiveness of the single market. Such projects will help affirm the various freedoms of EU citizens and ultimately drive job creation and growth.

The issue of Small-Scale Cross-Border Infrastructure (SSCBI) missing links was raised by Michael Cramer (Greens, Germany) in an initiative to map out a list of abandoned cross-border railway sections. The resulting brochure *Die Lücke muss weg*, containing a selected list of projects, builds on the study, promoted by the CoR, which provides an analysis of the potential of closing small-scale missing links in border regions^[12]. The aim was to show that besides expensive investment in corridors, considerable effect could be achieved with small projects of less than €1 million. That study focused on passenger transport and analysed three types of border regions with different infrastructure challenges. In response to Cramer's initiative, the DG Move proceeded with an analysis of a selection of discontinued local connections. The results are summarised in a publication^[21]. Key findings include: five projects are located on the TEN-T Comprehensive Network, meaning that the other 93 are not part of it; 83 projects are between MS and nine represent links to non-EU/neighbouring countries; five projects refer to

freight lines, 18 accommodate services for passengers and 51 combine passengers and freight (purpose is unknown for the remaining 23). The recommendations made in the DG MOVE study are summarised in Box 1.

Box 1: Recommendations from DG MOVE for successfully closing small-scale missing links

I. Devote efforts to the governance aspect of cross-border (railway) projects:

1. Set up a suitable governance structure for cross-border projects,
2. Involve citizens in the process of reopening a cross-border line at an early stage,
3. Allow for synergies among stakeholders,
4. Enable the creation of alliances/synergies between different actions.

II. Focus on making available the studies dedicated to the cross-border analysis:

5. Carry-out cost-benefit analyses and prioritise the projects.

III. Surmount the technical aspects:

6. Address interoperability issues.

IV. Focus on the financial viability of the projects

7. Determine their financial streams.

V. Simplify the cross-border (legislative) frameworks:

8. Establish a simplified/readily available cross-border procurement procedure,
9. Establish a cross-border legal framework.

These recommendations underline the idea that solving missing cross-border links requires an integrated approach. Special attention must be paid to barrier-free cross-border ticketing and information, favouring intermodality. To this end, it is essential to involve and coordinate the various companies operating these links, especially the state-owned, and the respective states and Local and Regional Authorities (LRA). Box 2 and Box 3 below present case studies on these types of activities.

Box 2: Transfermuga project overview

Transfermuga showcases a successful project (co-financed by INTERREG) on coordinated planning and deployment of macro-regional local transport services in the cross-border regions of Euskadi (Spain) and Aquitaine (France). Nearly 70% of the cross-border flows here are over very short distances, 25% over medium distances and 5% long distance. The vast majority of the travel (85%) is by car, with a very low occupancy rate. Shopping is identified as the main motivation.

The project highlights a very interesting multidimensional analysis: governance, planning, information flows, and policies such as park and ride, tariffs and clearing, and cycling. There is coordination at various levels: improved parking policies and cycle lanes, new cross-border coach services, joint passes for public transport that include cross-border services and exchange zones, cross-border information, and synchronised rail services between Irun (Spain) and Hendaye (France). In addition, a smartphone app (and a portal) for multimodal, cross-border planning is being developed, complementing the one already operational for railways. This Euroregion is also involved in paving the way for the continuity of track gauges between railway networks for the development of new services.

The Transfermuga project started in 2013, two years after the birth of the EGTC Euroregion Aquitaine-Euskadi. The EGTC was extended to Navarra in 2017 and now counts with some 8.7 million people spread across 100 000 km².

Box 3: Overview of mobility challenges in Luxembourg

More than 160 000 commuters enter Luxembourg daily (doubling the city's population) from France, Belgium and Germany – a recent study says that 6 out of 10 jobs in Luxembourg are cross-border. The need to establish cooperation agreements among border regions to solve transport-related issues was thus identified very early on, and led to a series of bilateral agreements.

Several cross-border sustainable mobility plans (i.e. one with each neighbouring border region) identify the main added value projects and services, and their financing options. In general, the plans set out investments and priorities for the next 5-10 years and as far as possible, associated financing schemes.

Public transport (road/rail) is subject to a public service contract with all procurement and contracting done by the Luxembourg government. The Alzette Belval EGTC and the border regions help define the critical routes in each locality.

For cross-border public transport, a key issue that has been raised is cross-border ticketing.

Luxembourg has developed a cross-border strategy for Cooperative-ITS⁵ (C-ITS), which will allow road users and traffic managers to share information and coordinate their actions. Intermodal planning including real-time re-routing and Mobility as a Service (MaaS) are part of its cross-border strategy. It plans to use INTERREG co-funding to help operationalise it.

The abovementioned and other studies^{[19], [22], [7], [1], [21], [23]} shed light over the main aspects currently facing SSCBI missing links:

- Missing links in border regions are part of a broader issue, namely the lack of financial resources for developing local and regional infrastructure. Innovative thinking is needed to solve mobility challenges in border regions.
- Bridging missing links involves building infrastructure but also facilitating services such as new links for public transport and for the transport of goods. It may involve reopening existing lines in some cases, while in others flexible transport service solutions might be envisaged. Market demand has a significant bearing on the feasibility of these new links.
- The traditional 'predict and provide' model is not enough. Mobility management strategies and assessment of accessibility and mobility from a broad perspective (physical, spatial, temporal and financial) need to be more broadly applied.
- Synergies with economic activities (leisure, work, tourism, etc.) should be envisaged as market driven.
- Cross-border infrastructure and services should be supported in cross-border sustainable mobility plans, with strong consultation and awareness activities based on the EU's guidance^[24]. The development of these cross-border plans might be evaluated as a necessary pre-condition to access EU funding.
- Financial engineering activities, including cooperation with financiers, should take a more important role in the planning stages.
- Deployment of interoperable ITS and C-ITS in border regions should be a priority, particularly in those densely populated regions such as the metropolitan areas. Multimodal travel and traffic information can help achieve better modal integration and better manage demand and network capacity. Traffic management measures can help reduce congestion. Multimodal smart ticketing integrated with information services could be used to provide statistical data on passengers' trips

⁵ Cooperative Intelligent Transport Systems (C-ITS) use technologies that allow road vehicles to communicate with other vehicles, with traffic signals and roadside infrastructure as well as with other road users. The systems are also known as vehicle-to-vehicle communications, or vehicle-to-infrastructure communications. The C-ITS Platform agreed on a list of 'Day 1 services' which, because of their expected societal benefits and the maturity of technology, are expected to and should be available in the short term. Furthermore, also agreed on a list of 'Day 1.5 services', considered as mature and highly desired by the market, though, for which specifications or standards might not be completely ready.

to transport operators (duly respecting privacy and anonymity requirements) to optimise networks' use and public transport operations.

2.2. Small-Scale Missing Links in the TEN-T Network

Schade et al assessed the wider economic impacts of non-completion of the TEN-T network, i.e. if planned investments were ceased by 2015^[25]. They calculated costs of about €3 000 billion of accumulated Gross Domestic Product (GDP) if the planned investment of €623 billion into the core TEN-T network was not made. Moreover, a sensitivity scenario where only the major cross-border projects were not implemented showed that these projects give rise to a very high economic multiplier. This clearly demonstrates their significant European added value. These results only cover part of the story however, as the links between European border regions go well beyond the 'core' connections addressed by the TEN-T network.

In fact, the TEN-T guidelines introduced the concept of a dual layer structure, consisting of a comprehensive network and a core network based on a common and transparent methodology^[26]. The core network has been defined on the basis of an objective planning methodology^[27]. Moreover, those links, which are not included in neither layer, are seen as feeder networks into the TEN-T network, i.e. a complementary set of transport connections to provide access to the backbone of the EU transport system. Regulation No 1315/2013, together with the dual layer structure, establishes the concept of Core Network Corridors (CNC). Under its Article 42.1, the CNC are "an instrument to facilitate the coordinated implementation of the core network [...] contributing to cohesion through improved territorial cooperation" and "shall be focused on a) modal integration, b) interoperability and c) a coordinated development of infrastructure, in particular cross-border sections and bottlenecks". Within the core network, nine corridors have been defined. CNC should be intermodal and cross at least three Member States. If possible, they should connect to a maritime port.

The CNC should help to develop the core network in such a way so as to address bottlenecks, enhance cross-border connections and improve efficiency and sustainability. They should also address wider transport policy objectives and facilitate interoperability, modal integration and multimodal operations^[28]. The CNC will be implemented by 2030 according to corridor work plans supported by related corridor studies. For this purpose, corridor work plans and studies identify the major missing links and bottlenecks affecting connectivity along each CNC and propose a set of measures to help address these. One of the key objectives of the policy is to deliver compliance of transport infrastructure for all modes with the technical requirements set out in Regulation No 1315/2013 by 2030. Given this commitment, it is not surprising that available funding, notably through CEF is particularly targeted at actions to address missing links and bottlenecks in the CNC. Moreover, while Annex I of the CEF Regulation^[29] identifies the priority projects in each of the nine corridors as well as horizontal priorities, each corridor work plan includes a project list describing the investment foreseen at corridor level. This exercise will contribute to establishing a clear pool of relevant and mature projects, in terms of technical maturity, institutional readiness and financial assessment.

The new CNC concept offers opportunities for stakeholders to contribute to the objectives of the new policy through Corridor Forum meetings and working group meetings called by the respective Coordinators (Article 45). Up to now, most of the CNC had promoted dedicated working group meetings on cross-border issues and regions, with the involvement of cross-border regional promoters. Territorial cooperation structures such as EGTC (e.g. Rhine Alpine corridor EGTC, Saxony-Prague EGTC), macro Strategies (e.g. Danube, peripheral maritime regions) or thematic groups (e.g. Cylog for logistics) often participate in corridor activities, either as Forum stakeholders or as active participants in the ad hoc working group meetings convened by each of the CNC.

Following the initiative of Michael Cramer (Greens, Germany), member of the EP and former Chair of the Committee of Transport and Tourism, to map a list of abandoned cross-border railway sections,^[12]

the issue of missing smaller cross-border transport infrastructure links moved up the political agenda. Important on a regional scale, but outside the core or comprehensive networks, EU resources for such links are more limited and centred mainly in the INTERREG program. The CoR joined Cramer's initiative and commissioned a study analysing small missing transport links in border regions, mainly oriented towards passenger flows^[7]. The aim was to show that besides large-scale investment in corridors, considerable results can be achieved with small-scale projects (i.e., estimated at less than €1 million).

During autumn 2015, the Regional Policy Directorate of the European Commission (DG REGIO) launched a 'Cross-border Review', addressing obstacles to Cross-Border Cooperation (CBC). It is structured around three pillars: a study, a public consultation and several workshops with stakeholders^[22]. At the intergovernmental level, the Luxembourg Presidency of the Council of the EU had placed its cross-border work in the fields of Territorial Cohesion and Urban Policy, under the umbrella theme of making the objective of territorial cohesion, as well as the Territorial Agenda 2020, more operational. A working group on innovative solutions to cross-border obstacles was created as a follow-up to the Luxembourg Presidency's work and a proposal for a new legal tool has been issued^[30]. A consultation process is ongoing with the different European institutions.

All in all, these initiatives demonstrate that there is widespread recognition that cross-border connections carry a high European added value, support the functioning of the internal market, strengthen the economic, social and territorial cohesion of the EU and stimulate regional developments across borders. The main lessons of the cross-border review are that administrative and legal obstacles are the most significant issue; second is language and cultural differences; and third is accessibility. Obstacles are often systemic (several categories of obstacles are mixed). The more integrated the border area is, the more the obstacles become visible.

2.3. Obstacles to Cross-Border Collaboration Projects

The study 'Collecting solid evidence to assess the needs to be addressed by INTERREG CBC programmes'^[5] undertaken for DG REGIO in the context of the Cross-border review, identified 62 border regions, of which 45 are land and 17 are maritime, covering all EU Member States, Norway, Switzerland, Liechtenstein and Andorra (Map A- 1⁶). Potentials and obstacles were mapped out for the border regions through a set of indicators and a database developed for the study includes 25 harmonised indicators aggregated at the border region level and available for the 2013 NUTS3⁷.

The study also identified clusters of border regions based on economic performance (GDP per capita and GDP growth), demographic features (density, population size, population growth) and EU membership. Border regions are highly differentiated in terms of their needs, implying that each requires a different mix of policy approaches. Some may require intervention to improve the efficiency of resource use through specific measures on governance, i.e. on 'soft' elements, reinforcing integration and cooperation between communities. Alternatively, border regions may require new investments to increase the available, but insufficient, resources to develop their potential and promote economic, social and territorial cohesion. Some border regions may need both types of intervention. Different needs have been assessed in terms of suitability (Does it fit with CBC programmes?), affordability (How much does it cost?) and relevance (How important is it to reach the objective of economic, social and territorial cohesion?)

The study concludes that the potential of each border region is mainly linked to the competitiveness of cross-border public and private organisations, market integration of activities and people, human and social capital, the availability of integrated services and the shared management of natural capital. Affordability ranks from low for investment in new infrastructure (e.g. physical obstacles) to high for

⁶ The maps with caption in the style Map A-x, in which x is a number, are available in Annex.

⁷ Nomenclature of Territorial Units for Statistics.

intangible assets (e.g. cultural obstacles or human and social capital). Most needs can be addressed through standard CBC policy instruments.

Based on the data collected, the researchers concluded that legal and normative obstacles are highly relevant, as are cultural and language barriers. Overcoming these obstacles through specific policies should allow regions to realise their potential more effectively with significant impact on economic, social and territorial cohesion. Interventions addressing physical obstacles and socio-economic disparities are normally less relevant.

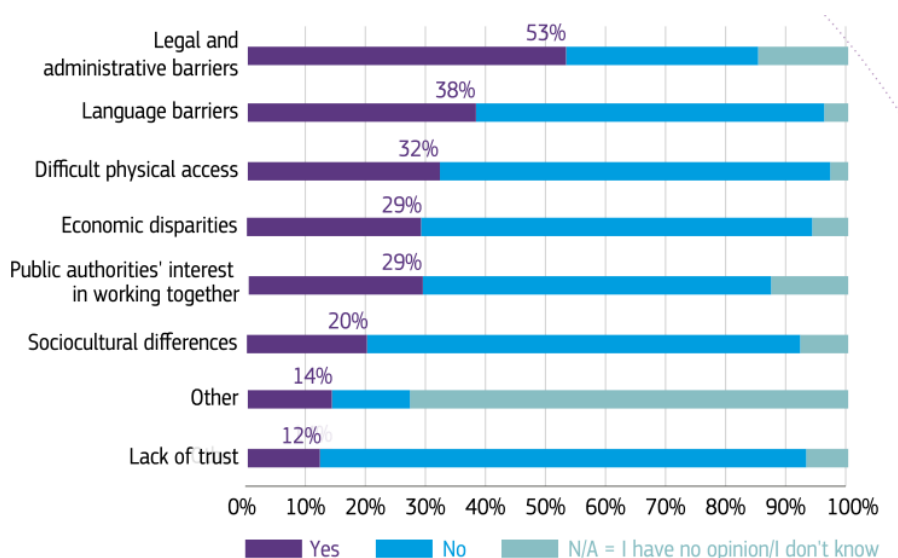
The most important potentials are related to competitiveness (for product innovation and the development of industrial and cultural activities) and social and human capital (education, training and support for social cohesion). Addressing other types of potential is less relevant for socio-economic and territorial cohesion.

The research team also recommends prioritising a set of indicators that directly relate to accessibility and connectivity at border regions. These indicators are:

- i) the number and types of roads crossing the border,
- ii) traffic bottlenecks in public transport along the border,
- iii) the number of searches for job offers across the border,
- iv) the location of urban services,
- v) the number of cross-border agreements between institutions.

Similar findings were obtained in an online public consultation undertaken by DG REGIO on overcoming obstacles in border regions. Most of the 623 respondents flagged differences in legal and administrative aspects as the top barrier, followed by language differences (Figure 2)^[1].

Figure 2: Relevance and frequency of obstacles^[1]



The results of an analysis by DG MOVE are also aligned, showing that apart from traditional financing issues, there are many other barriers for implementing cross-border rail projects^[21]. These can include:

- administrative and legal hurdles, such as different permission, concession and procurement rules in Member States,
- political barriers, such as unaligned political priorities or opposition from local communities to building a line,
- technical barriers, in terms of different standards applicable to rail lines and rolling stock, and variations in safety certification rules,

- operational barriers, such as different languages, infrastructure charging approaches, and issues around ticket sales and access to service facilities.

There is a recognition that several border regions suffer from an inefficient use of the resources they already have, rather than from a lack of resources. As such, to promote cohesion, border regions require more intervention in the governance of resources than new investment to increase them. In this regard, CBC programmes can stimulate intervention on governance to unlock some of the potential for industrial and cultural activities, as well as growth potential related to human and social capital. In some territories, the shared management of natural resources as well as integrated services in urban cross-border regions has started to be promoted. Positive case studies for health, water management, education, tourism and transport can be found in various European regions.

Support for the development of 'cross-border metropolitan regions' is seen in the priorities of the EU's territorial cohesion policy and Territorial Agenda 2020. These aim to initiate CBC initiatives by blending resources and know-how, and achieving a common, coherent political, economic and administrative direction.

The challenges presented in different border regions are diverse. Previous studies on cross-border collaboration emphasised that technical, political, financial and procedural obstacles may affect the implementation of cross-border initiatives and concluded that this calls for more coordination in the definition of common processes and tools for the harmonised planning, development and implementation – including funding and financing – of projects of common interest, notably in cases of infrastructure.

Cross-border initiatives are considered projects of common interest with the highest European added value; as such they should be planned, designed and implemented conjointly. Projects do not just require the commitment of regional and national governments; they also require the direct involvement of infrastructure managers to align on standards and make sure processes and procedures are implemented in harmony. This goes beyond project preparation and implementation; it extends to the operational stage. See Map A- 2 with an overview of 2014-2020 cross-border programs.

The review undertaken in the study on the potential of closing missing links^[12] also showed that many regional authorities depend on national bodies and state enterprises for the implementation of infrastructure projects, even when they are targeting regional connectivity. Overall, that study distinguishes three main types of 'challenged' border zones.

- Densely populated areas with high commuter flows: They may need additional border crossings due to high demand, even when existing infrastructure is highly developed. In these cases, the innovation potential for new, integrated services, ITS and C-ITS deployment, including promotion of MaaS concepts may represent less costly and high added value solutions.
- EU13/EU15 and EU13/EU13 borders, mainly resulting from an investment backlog, scarcity of investment funds and low demand for years. Targeted analysis of the missing links in these regions, backed by sustainable cross-border transport strategies and solid economic evaluations should be the focus of attention for Managing Authorities (MA) in these regions so that they can map and prioritise the necessary investments. For those regions, the development of cross-border transport and mobility plans might be a lucrative step forward.
- Borders with geographical obstacles like rivers or mountains, often with low population density, where investment requirements for new border infrastructure, notably tunnels and bridges, may be high. In these cases, solid economic feasibility analysis (cost-benefit) including evaluation of alternative solutions should be envisaged to support a decision, especially because these connections might have regional or even local impacts and added value.

Moreover, the regional operational programs under ESIF require the approval of the State, with the major investment priorities being projects contributing to the completion of the TEN-T network. While

this is a necessary condition of the policy option backed by Member States when they contributed to the TEN-T methodology and definition of the classification and alignment of the corridors, it creates the risk of not capturing important cross-border dynamics contributing to growth and cohesion. It should be noted however, that this is also a consequence of the lack of evidence of the local impact of those dynamics and of the economic benefits and added value of small-scale projects.

The review conducted of the various recent studies on CBC structures, largely supported by ETC programmes, notably INTERREG, shows that much progress has been made. The possibility of establishing adequate institutional structures at the EU level such as, for example, the EGTC for the public sector and the European Economic Interest Group (EEIG) for the private sector means that other solutions are available to support projects, in parallel to the European programmes. A good example of a EEIGs is the Rail Freight Corridors (RFC), which are examined in more detail in Box 4. A similar interest grouping is not available for passengers.

Box 4: Example of EEIG: Rail Freight Corridor (RFC)

The RFC are governance structures dedicated to cross-border rail freight. They involve ministries, infrastructure managers, railway undertakings and terminals. They can lead to harmonisation or help identify the need for such harmonisation within a corridor, between corridors or at European level. Experience has shown that harmonisation at the RFC level has in certain cases fostered the convergence and evolution of national rules and procedures.

RFC are ruled by Regulation (EU) No 913/2010. They are mostly established as European Economic Interest Groupings (EEIGs) and are a good example of cross-border functioning at the corridor level, with the direct involvement of rail infrastructure managers. Although aligned in large part with the Core Network Corridors, the RFC also cover the wider, comprehensive network and even sections that do not belong to the TEN-T network. They respond to concrete operational and market-driven demands. So-called Corridor Information Documents set out implementation plans and identify the investments needed to address missing links, bottlenecks and interoperability (gauge, electrification, traction, etc.).

The studies are consistent in suggesting that many obstacles can be solved within existing legal frameworks through cross-border arrangements between actors. Some obstacles could be solved through the unilateral recognition of certain rules and provisions (including technical standards and norms) of one country by another country, for example. Nevertheless, in many cases, these arrangements suffer from a lack of legal certainty and they are thus not viable in the long term. Other obstacles might require either changes in national legislation or in the EU legal framework, or harmonisation efforts at the EU level.

The Luxembourg Presidency presented a first suggestion of new tools to allow Member States affected by a specific cross-border project to agree on a legal framework, based on the existing laws of these Member States and applicable only to this specific project^[30]. One of them consists of putting in place a legal tool based on a European regulation. This tool would enable local authorities that are faced with a legal obstacle regarding a cross-border project to propose to their respective governments a legal framework that is specific to the functioning of the project concerned. For example, in the case of the extension of a tramline on the other side of a border (e.g. the Strasbourg-Kehl tram) the standards of one of the countries could be applied on both sides. In short, governments could recognise the application of normative provisions from the law of a neighbouring country in order to facilitate the functioning of a specific cross-border project. This new form of mutual recognition would help with the implementation of cross-border projects and thereby benefit border populations^[23]. The suggestions put forward by the working group are now under discussion with the European Commission.

A study launched by the Commission on permitting and facilitating the preparation of TEN-T core network projects identifies barriers in the regulatory and administrative processes that impact the effective and efficient planning, and implementation of TEN-T core network projects. It delivers

recommendations on how to address these barriers, including proposed policy options.^[20] These will be considered for an eventual European Commission proposal for a legislative instrument on streamlining measures for swifter implementation of TEN-T projects as referred to in the European strategy for low-emission mobility^[31].

The five main areas discussed in the study cover:

1. Organisation of the permitting procedure,
2. Building public acceptance,
3. Environmental assessment,
4. Public procurement,
5. State aid.

The proposed policy options (Table A- 2) address problems encountered at all stages of the authorisation framework for TEN-T projects – from strategic planning to decisions on development consent and procurement procedures – with relevance beyond the TEN-T network.

2.4. Difficulties in Understanding Cross-Border Mobility

Overall, the statistical data and information on EU cross-border mobility patterns is limited and quite heterogeneous, with a few regions having detailed datasets, while many others only have very aggregated data or none at all^[1]. Moreover, there is no EU centralised repository of data, instead it is dispersed across institutions. We may arrange the sources of data in three broad categories: Eurostat and national statistics offices, cross-border related associations and regional observatories, and studies and reports.

The relevant Eurostat databases to understand cross-border transport (people and freight) flows are the transport statistics database⁸ and the Labour Force Survey⁹ (LFS). The transport statistics database covers six modes of transport (i.e., road, rail, inland waterways, air, sea and pipeline) and include three measurement types: transport of people, transport of goods and traffic. Unfortunately, the database only contains aggregated data at MS level, which is of no relevancy to characterise cross-border dynamics. The LFS database covers residents in private households (excluding conscripts) according to labour status, as follows: employment, unemployment and inactivity. Cross-border commuting flows can be derived from employed people living (i.e., have permanent residence) in one MS and working, at least once a week, in another. Data is available at NUT 2 level (some regions excluded – Map A- 3) as of 2012.

The latest available statistics reveal that, in 2016, there were around two million cross-border commuters EU wide. In absolute terms, the highest number of cross-border commuters originated from France (454 thousand), Germany (285 thousand) and Poland (180 thousand). Unsurprisingly, the relative importance of cross-border commuting was generally highest in regions that share a border with a neighbouring country. A cluster of regions with relatively high shares of cross-border outbound commuters runs from the Nord - Pas-de-Calais (northern France), through the Benelux countries into Rheinland-Pfalz (Germany); another covers much of Slovakia and Hungary and then runs into Slovenia and Croatia. The share of cross-border outbound commuting was also quite high in: three regions on the western edge of Poland (Opolskie, Lubuskie and Zachodniopomorskie); two regions in the west of the Czech Republic (Jihozápad and Severozápad); the southern Swedish region of Sydsverige (which is linked to the Danish capital city region of Hovedstaden by the Øresund bridge); the Nord-Est region of Romania (which shares a border with both Moldova and Ukraine); the north-eastern Bulgarian region of Severoiztochen (which shares a border with Romania), and; Estonia (which shares a border with

⁸ More information available at <http://ec.europa.eu/eurostat/web/transport/overview> (accessed on 16 November 2017).

⁹ More information available at <http://ec.europa.eu/eurostat/web/lfs> (accessed on 16 November 2017).

Latvia and Russia, and where more than half the cross-border commuters went to work in Finland). Cross-border outbound commuters accounted for more than one quarter of people in the south-eastern Belgian region of the Province Luxembourg (which borders France and Luxembourg) who were employed. The second highest share of cross-border commuting was recorded in the north-eastern French region of Lorraine (which borders Belgium, Germany and Luxembourg). The third highest share of cross-border outbound commuters was recorded in the western Austrian region of Vorarlberg (which borders Germany, Lichtenstein and Switzerland). Luxembourg is a particular and interesting case. A significant percentage (above 40%) of its workforce commutes from Belgium, Germany and France, in a total of 181 thousand cross-border inbound commuters (in 2015). Also, there is a strong asymmetry for cross-border commuting, there was a high degree of asymmetry for cross-border commuting patterns into and out of Luxembourg (in 2015, the ratio was of 31:1). Owing to the relevance of cross-border dynamics, Luxembourg has a very detailed dataset of its cross-border dynamics.

The LFS database provides valuable information about territorial cross-border dynamics, particularly the available time series, but it is of limited help to characterise mobility of workers, shoppers or tourists at cross-border level (e.g., daily trips, timings, or origin or destination regions). Such data, if it were available, could be used as supporting evidence for economic and financial assessments of cross-border transport needs and respective investments.

The national statistics office of every MS also collects cross-border data. Yet, there are high heterogeneity among national databases (e.g., measurement types, periodicity, level of aggregation or organisation format), due to differences in MS national legislations (which determines the collection of different data) or the still low harmonisation between MS offices in relation to transport-related data collection. The outcome is a patchwork of national databased of difficulty (if not impossible) harmonisation and, hence, of limited use. Even so, data about cross-border traffic on main transport links (e.g., highways, railways or inland waterways is commonly available). The point is that this traffic can have origin and destination outside the cross-border regions.

The survey conducted by the European Association of Border Regions^[32] in 2011 is probably one of the most complete overviews of the cross-border daily commute at the EU level. The study points out that outbound cross-border commuters accounted for more than one quarter (27.3 %) of all employed people in the south-eastern Belgian region of the Province Luxembourg (which borders France and Luxembourg). The second highest share (12.2%) of cross-border commuting was recorded in the north-eastern French region of Lorraine¹⁰ (which borders Belgium, Germany and Luxembourg). These were the only regions in the EU where more than 10% of the regional workforce commuted across the border daily. The third highest share (9.9%) of outbound cross-border commuters was recorded in the western Austrian region of Vorarlberg (which borders Germany, Lichtenstein and Switzerland). In addition, in the interview performed with the state of Luxembourg, it was stated that more than 160,000 commuters enter the city daily to work, generously contributing to the economic growth of the country. The Map A- 4 from the above-mentioned study highlights the main differences in terms of total population and population density in the different border regions. Denser regions are likely to correspond to urban and metropolitan regions often established as euro metropolis or euro districts. Indeed, an important element of the cross-border problem-solving capacity is the presence of a permanent CBC structure.

Several MS and other European countries have signed bilateral or multilateral agreements establishing regional cross-border observatories, examples include the Spanish-French Observatory of Traffic in the Pyrenees, the South East Europe Transport Observatory (members: Albania, Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia, Montenegro and Serbia). Again, similar challenges to those abovementioned for the MS national statistics office are also find here. Moreover, datasets are not always publically available and, sometimes, have incomplete data series. The point is

¹⁰ Now part of the Grand Est region.

that observatories often run on limited budget and with limited resources, which naturally makes difficulty the continuous and comprehensive gathering of information.

A final category of data on EU cross-border mobility are reports and studies. Routinely, EU, national and regional institutions commission studies to support decision making on the most diverse topics, including cross-border mobility. Additionally, this topic is also the object of interest of scholars, researchers or even consultants. The data and the findings are commonly made available either in public reports or in academic publications. Some examples are listed below:

- 'Benchmarking study of cross-border Transport development in Helsinki- Tallinn vs. Öresund Region - Final Report'^[33],
- 'People, borders, trajectories: an approach to cross-border mobility and immobility in and to the European Union'^[12],
- 'Commuting flows across bordering regions: A note'^[34],
- 'Scientific Report on the Mobility of Cross-Border Workers within the EU-27/EEA/EFTA Countries – Final Report'^[35],
- 'Cross-border mobility: Galicia-North of Portugal'^[36].

Understandably, these studies tend to have a clear regional focus, reflecting the local interests of the client or scholar. Also, the published data is commonly limited and often object to a previous analytical treatment (i.e., it is not the raw data). Hence, the added value of these reports lies essentially on the findings about the mobility patterns in the cross-border region. This is the case of the study entitled 'Commuting flows across bordering regions: A note'^[34] that focussed on the cross-border dynamics in Luxembourg. The study analysed the bilateral commuting flows across between this and the neighbouring countries. The results suggested that aggregate cross-border commuting increases as the asymmetries in income per capita and the unemployment rate increase. Commuting time or distance and language differences between the bordering regions impede cross-border commuting.

Summing up, despite the cross-border regions housing around 37% of EU population and being pivotal in the EU integration, little is still known about the local or regional mobility dynamics. Available data on transport or mobility is essentially limited to the main international transport links (highways, railways or inland waterways). As such, data on cross-border mobility is often derived from other datasets (e.g., employment). Moreover, the level of detail is quite heterogeneous (in terms of measurements) and asymmetrical (in geographical terms). Finally, it is currently dispersed in many different institutions, while the lack of standardisation reduced the scope for comparison.

A different approach to data collection and analysis in cross-border regions would greatly improve the knowledge about the respective mobility patterns. Although the specification of data requirements requires a different study, some general comments can be elaborated. We may broadly organise transport and mobility related data in two categories. A first category is related with the traffic patterns. This is pretty much about characterising the movement of vehicles (i.e., cars, BUS, trains, trucks, etc.) in the territory. Relevant data includes the origins and destinations, routing, timings or vehicle's occupancy. The traditional way to collect this kind of data is through surveys. But this is timing consuming and rather expensive. Alternative, economic solutions, such as sensors, radars, cameras or, even, mobile phones are being increasingly used to autonomously and automatically collect data. A second category refers to the behaviouristic properties of the agents – i.e., people and decision makers (e.g., companies, politicians) – that determine their mobility choices. Essentially, what factors influence a person choosing between taking a bus or riding a bike. Examples of data include social, demographical and economic characteristics (e.g., age, gender, income, household composition, job, ownership of vehicles, etc.). Commonly, this data is obtained through surveys or other similar methods.

The data of the first category allows for the characterisation of the mobility patterns in the cross-border regions; while an understanding about the underlying decision factors, requires data from the second

category. Gathering data of the second category is of higher complexity, difficulty and cost. Yet, depending on the case, data of the first category may be enough.

On the other hand, taking into consideration the current state of development of the transport demand models, exhaustive datasets may not be required. Instead, representative samples may be sufficient, depending on the case. As such, in function of the available budget and resources, the data gathering process can be adapted.

3. Role of the European Groupings of Territorial Cohesion (EGTC)

KEY FINDINGS

- Numerous EGTC have emerged all over Europe, making use of their structures to plan and implement cross-border investments and services to enhance the technological infrastructure of cross-regional transport.
- In September 2017 there were a total of 66 active EGTC, one more than in 2016^[2]. Out of these, 38 signal transport as one of their respective fields of activity^[2]. Nevertheless, an analysis in the web pages of their past and on-going activities reveals that only 23 are effectively working on transport-related fields.
- Compared to other instruments for territorial cooperation, the EGTC legal instrument is relatively new and not yet mature. Different challenges occur in the founding and running of an EGTC.
- EGTC also contribute to the implementation of ETC through a variety of other actions, such as capacity building, support to programmes or membership of monitoring committees. Many more EGTC intend to become involved in ETC before the end of the 2014-20 programming period.
- EGTC are valuable instruments to the successful development of a SSCBI project, as they can actively intervene in every stage of a SSCBI project life cycle.
- The role of EGTC in supporting and promoting European territorial cooperation is largely acknowledged, especially in terms of the flexibility they offer as a platform for multilevel governance.
- EGTC could be the single leading authority acting as a one-stop-shop for cross-border projects. This approach has two main aspects: i) it involves the integration of permits and decisions into a single comprehensive decision; and ii) it involves the designation of a leading authority, at national level, responsible for coordinating the permitting procedure.
- Different reasons explain the limited use of EGTC in cross-border transport: established structures, insufficient economic, geographic, institutional and cultural commonalities, negative expectations concerning the benefits of an EGTC in large transnational or widely spread interregional cooperation, and the availability of other instruments in some parts of the EU^[11]. Just few INTERREG programmes are directly managed by an EGTC. The most well-known is the cross-border programme of the Greater Region (Luxembourg, Belgium, France and Germany).
- EGTC can make use of a variety of financing instruments, other than the ESIF (i.e., INTERREG). As such, EGTC are in a good position to exploit synergies and complementarities among financing options and instruments.

Numerous EGTC (Figure 3) that have emerged across Europe are making use of their structures to plan and implement cross-border investments and services, to enhance the technological infrastructure of cross-regional transport, especially when the required investments are high or not part of the TEN-T network. The EGTC concept was established in 2006 through Regulation (EC) No 1082/2006. In September 2017 there were a total of 66 active EGTC, one more than in 2016^[2]. Out of these, 38 signal transport as one of their respective fields of activity^[2]. Nevertheless, an analysis in the web pages of their past and on-going activities reveals that only 23 are effectively working on transport-related fields. The scope of their actions is varied, including:

- Railway Services (including urban and long-distance trains) e.g. Lille-Kortrijk-Tournai, Eurodistrict PAMINA or the Interregional Alliance for the Rhine-Alpine Corridor;
- Road maintenance e.g. EspacioPortalet;
- Integrated ticketing e.g. Eurométropole Lille-Kortrijk-Tournai, Eurodistrict Strasbourg Ortenau or Aquitaine-Euskadi;
- Transport services e.g. Eurodistrict Strasbourg Ortenau or Tatry Ltd;
- Infrastructure development (including new roadways, walkways or bike lanes) e.g. Euro-Go, Czech Republic-Saxony, Ister-Granum, Pons Danubii or Mura Region;

- Corridor-oriented structures e.g. Rhine Alpine Corridor or Central European Transport Corridor;
- Freight transport and logistics e.g. CETC-Central European Transport Corridor or TRITIA;
- Intelligent Transport Systems (ITS) e.g. Espacio Portalet, SaarMoselle or Tattry Ltd.

Figure 3: European Grouping of Territorial Cooperation, 2017^[2]

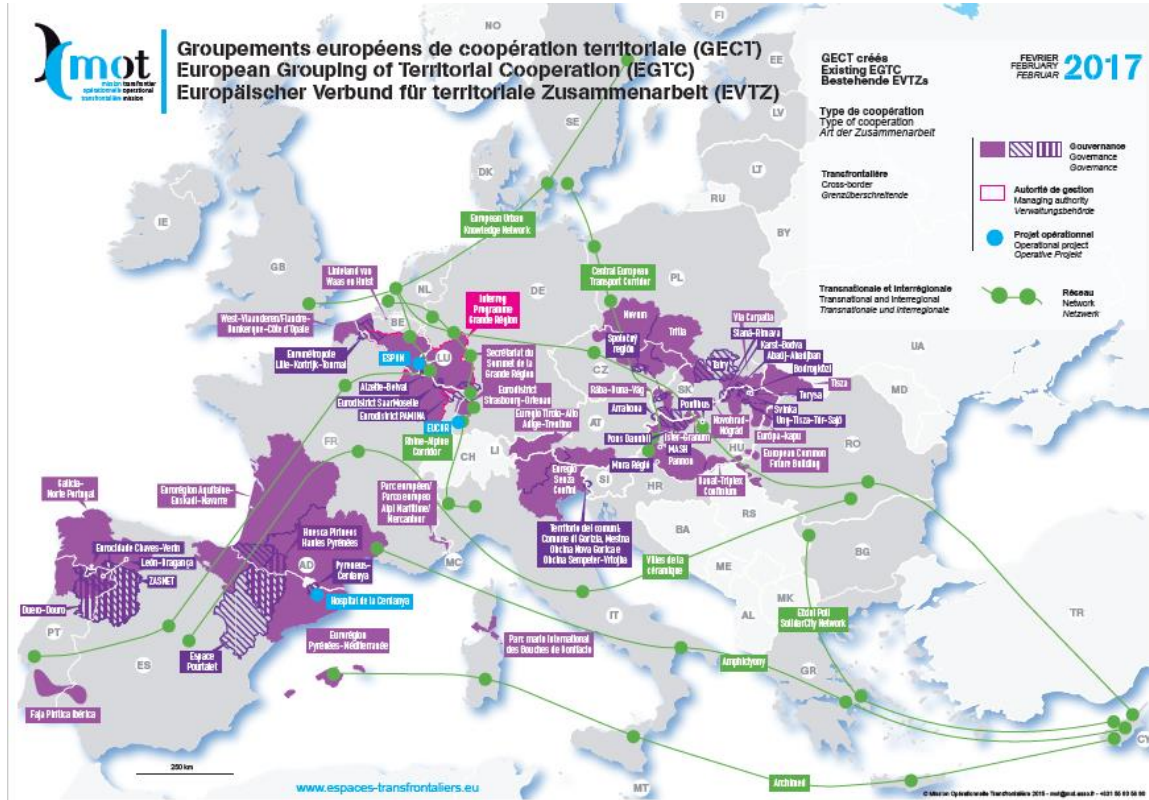
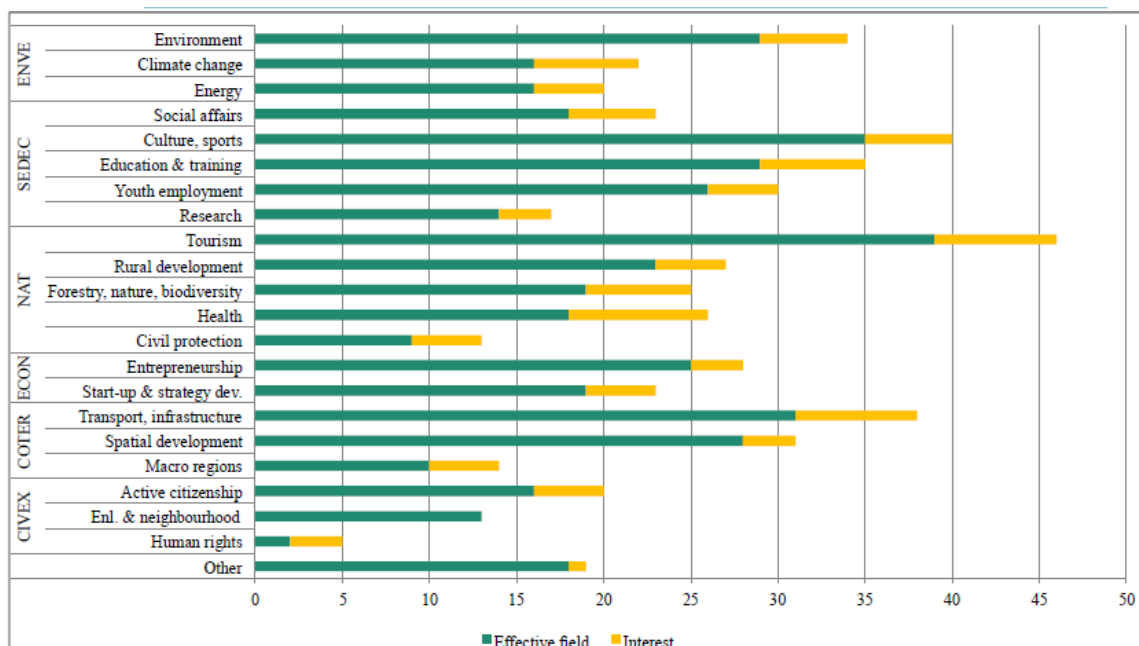


Figure 4: EGTC fields of activity grouped according to CoR Commissions in 2016^[2]



The diversity of EGTC fields of activity demonstrates their vitality (Figure 4)^[10]. It also means however, that transport is just one more sector competing with other economic areas for attention.

EGTC can contribute to the implementation of EU cohesion policy by implementing joint action plans, or acting as the MA or sole beneficiary of a programme. The analysis of the 2016 annual report mentioned above showed that the instrument is still little used to manage EU cohesion policy funds, however, most of the EGTC aim to conduct CBC projects and deal with several themes relevant for cross-border regions. Different reasons explain the limited use of EGTC in cross-border transport: established structures (INTERREG programmes building on past experiences); insufficient economic, geographic, institutional or cultural commonalities; negative expectations concerning the benefits of an EGTC in large transnational or widely spread interregional cooperation; or the availability of other instruments in some parts of the EU^[11]. Just few INTERREG programmes are directly managed by an EGTC. The most well-known is the cross-border programme of the Greater Region (Luxembourg, Belgium, France and Germany – Box 5). Compared to other instruments for territorial cooperation, the EGTC legal instrument is relatively new and not yet mature. It faces different challenges to its founding and running^[3].

Box 5: Stable association of local entities - Quattropole

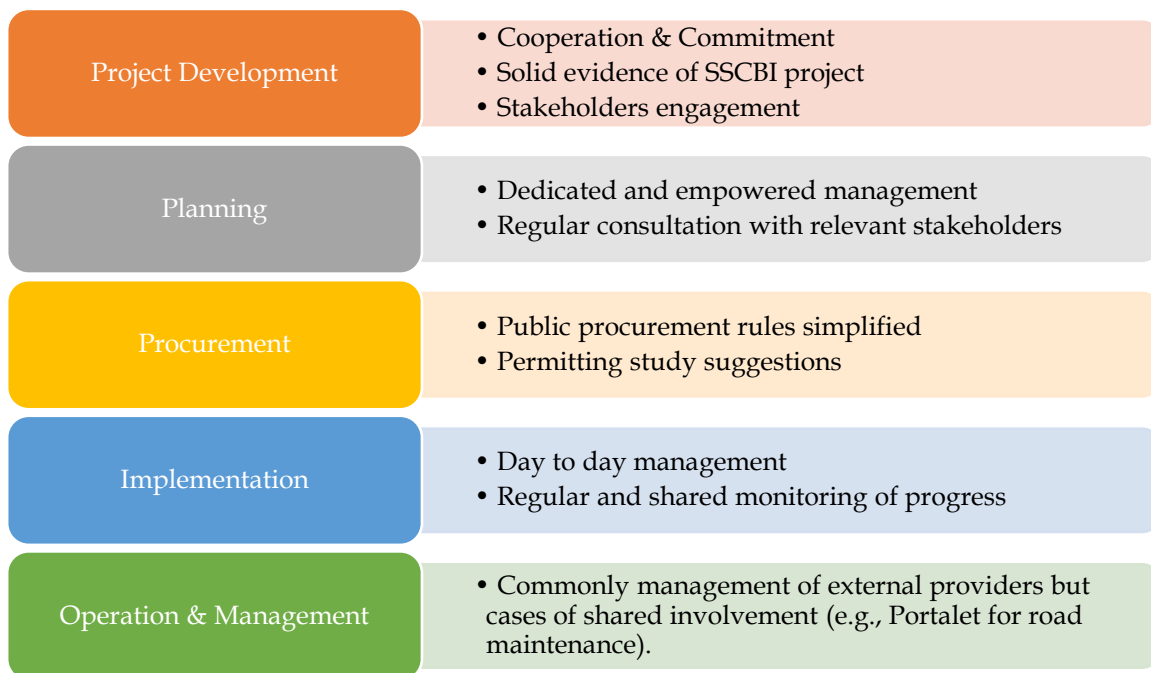
Quattropole is a cross-border network of four cities – Luxembourg, Metz, Saarbruecken and Trier – located in three neighbouring member states (Luxembourg, France and Germany). The association, set up more than 10 years ago, does not have the status of Euroregion and is not currently structured in an EGTC but Quattropole aims at exploiting synergies between the four poles with the creation of a virtual metropolis (a polycentric structure with different specialisations). Its specific goals include enhancing the attractiveness of its respective members through an integrated offer of heritage/services, as well as facilitating mutual accessibility, with the priority given to public transport.

In one action promoted by the cities, the four regions involved (Saar, Luxembourg, Lorraine – now merged in the Grand Est – and Renan-Palatinat) agreed to jointly define, advertise and commercialise tourist passes valid for public transport. Rail, road and combinations of them were covered. (NB: such a formula does not imply service integration or complex ex-post tariff clearing/technological deployment, although Quattropole is looking into further action on service integration.)

Only recently the EGTC instrument is becoming more prominent to facilitate theme-specific CBC and transnational and interregional forms of cooperation. Examples of cooperation on transport were found in the Strasbourg (France) and Ortenau (Germany) EGTC, Rhine Alpine Corridor EGTC, Saxony (Germany) and Czech Republic EGTC, Aquitaine (France) and Euskadi (Spain) EGTC and Space Portalet EGTC. The latter was established with the main objective of managing a road.

EGTC are valuable instruments to the successful development of a SSCBI project, as they can actively intervene in every stage of a SSCBI project life cycle (Figure 5). EGTC can work as focal point for the collection and generation of relevant information about the project. They can be used to collect data that often is scattered across the various regions. In addition, they may keep the momentum, avoiding energy from fading out as time goes by and other projects come along. An EGTC may work on behalf of LRA taking care of all tasks related with procurement, communication and negotiation with suppliers, management of activities, etc. In particular, EGTC can monitor the project implementation, contributing to the fulfilment of budget and deadlines. During the operations and management of the infrastructure, the EGTC can monitor and control the quality of the services if services are provided by third parties, or being directly involved in the provision of the service otherwise. The Metis team^[37] reinforced that investments with a genuine cross-border dimension are often challenging ventures: there are many different stages in which an EGTC could be involved (Table A- 3).

An interesting case can be found at the border between Hungary and Croatia, where the border region is trying to create an EGTC for the rehabilitation of an old train line (to be transformed into a bus line) that will connect the city of Pecs with a Croatian airport.

Figure 5: Role of EGTC in infrastructure project life-cycle

Most of the EGTC benefit from ETC instruments for their establishment and supporting activities. Despite this, the presence of different administrative structures, procedures and technical standards still represents an important barrier to cross-border structures, as evidenced by different studies. National government backing seems to facilitate decision-making (border regions are sometimes very far from national power centres) and accelerate project implementation.

The EGTC regulation already offers a tool for implementing and managing CBC projects under differing national rules and legal procedures^[8]. The role of EGTC in supporting and promoting European territorial cooperation is largely acknowledged, especially in terms of the flexibility they offer as a platform for multilevel governance. One of the measures proposed^[20] has been the creation of a single leading authority acting as a one-stop-shop for cross-border projects. EGTC could take on this central role (see Box 6 below on a case where the EGTC acted as a public authority on a cross-border service).

Box 6: A transport service contracted by an EGTC

The Eurodistrict Strasbourg (France) – Ortenau (Germany) is doing all it can to implement ETC programmes. Development of common transport projects is a natural component of CBC, although transport remains a competency of each regional transport authority. In 2015, a cross-border transport plan was developed and supported by the Eurodistrict. From that plan, a set of different needs and projects was identified. These projects have been evaluated and prioritised by the Eurodistrict and an expert group involving authorities, operators, etc. The plan had identified the cross-border connection Erstein (France) – Lahr (Germany) as a priority, but there was no interest to exploit the line. The solution found by the EGTC was to create a specialised regular service to an industrial area. This service was contracted directly by the EGTC, acting as a transport authority. The line has been in operation since 1 April 2017. The idea is to have it in operation for two years under this regime and after this, to evaluate the possibility of establishing the line as a regular transport service. The EGTC hopes to develop into a cross-border transport authority and looks to be endowed by the regional partners with that competency.

This approach has two main aspects: on the one hand, it involves the integration of permits and decisions into a single comprehensive decision. This decision is either taken directly by a single authority or coordinated closely among different authorities with competence for specific parts of the procedure. A second aspect involves the designation of a leading authority, at national level, responsible

for coordinating the permitting procedure. There is considerable experience with different approaches to consolidating the permitting procedure for transport infrastructure projects across the EU, summarised in Box 7.

Box 7: Cross-Border Cooperation (CBC) between France and Luxembourg

An interview with the Transport Ministry of Luxembourg highlights an example of the construction of a border road in France. The two countries and regions jointly planned the project, but all the coordination of permitting, procurement, etc. was directly assumed by the French region. Against invoices issued by France, the state of Luxembourg co-financed the road's construction. The decision to co-finance the project was taken after the conclusion that such an investment was critical for cross-border mobility and that the state of Luxembourg would be the main beneficiary of the road's construction.

Practice has shown that centralised permitting can avoid the duplication of procedures, assessments and reviews that can occur when processes are carried out by or under the authority of different institutions. It can considerably reduce the burden on project promoters, who have the ease of communicating with a single contact point for all procedures. It has also been found that the centralised approach allows competent authorities to build up their level of expertise and knowledge, ensuring more consistency in the treatment of projects. This of course requires that appropriate resources are allocated to the leading authority or one-stop-shop. An example is provided in Box 8.

Box 8: Centralised permitting for the railway line between Dresden and Prague along the river Elbe

The new railway line through the Ore Mountains will reduce travel time for passengers between Dresden (Germany) and Prague (Czech Republic) from currently more than two hours to less than one hour, increase capacity for freight transport, reduce noise and traffic pollution in the Elbe Valley and provide a flood-safe connection to the Czech Republic. The founding of an EGTC for this important cross-border project affirms its commitment to the new railway line. The cross-border railway line between Dresden and Prague along the river Elbe is one of the most serious bottlenecks in the European core network corridor Orient/East-Med. To promote this important infrastructure project, the Czech Republic and the Free State of Saxony, as well as the regions Ústecký kraj and Landkreis Sächsische Schweiz-Osterzgebirge, have agreed to establish the EGTC. In less than one year all partners coordinated their responsibilities and prepared the required documents. The main task of the EGTC is to support the meeting of all regulatory and technical requirements, initiate the project and coordinate public relations.

One of the novelties introduced in a recent reform of EU public procurement legislation concerns the rules on 'procurement involving contracting authorities from different MS (see Article 39 of Directive 2014/24/EU and Article 57 of Directive 2014/25/EU). These rules address joint contracting by authorities from different MS and bring clarity on the applicable national laws (paragraph 5 of both provisions). According to the new rules, the contracting entities can agree to apply the national procurement rules of the MS where the joint entity has its registered office or the national provisions of the MS where the joint entity is carrying out its activities. In addition, they can choose to apply this agreement for an undetermined period, when fixed in the constitutive act of the joint entity, or limit its application to a certain period of time, certain types of contracts or to one or more individual contract awards. Box 9 provides additional information on the case of the Brenner Base Tunnel, linking Austria and Italy.

Besides participation in and management of projects, the amended EGTC Regulation also allows for the provision of services of general interest as a task that could be accomplished by EGTC. A good example of this is found in the Eurodistrict Strasbourg-Ortenau, an EGTC which provides a special regular bus service for cross-border employees that has been up and running since April 2017^[23]. A similar solution was adopted in other cases where there was no interest for commercial exploitation nor contractual

capacities to create a regular public transport service (e.g. a dedicated coach service linking Bragança in the northeast of Portugal to a main railway station in Spain 30 km away).

Box 9: Common procurement implementation in the Brenner Base Tunnel

Austria and Italy signed a Shareholder Agreement in 2011 defining the procurement rules governing the project, i.e. tendering according to the law applicable to the company's headquarters, which are in Italy. Following the adoption of the new EU Procurement Directives, the agreement was amended in 2015. It now states that the law applicable is the one of the country where the works are to be carried out and that for works to be carried out in both countries as part of the same contract, the law applicable is the one applicable to the company's headquarters. In addition, the option to formulate the contract documentation in English was included in the agreement.

The cross-border context also generates important externalities, which make investments here less attractive and appropriate for mainstream financial instruments. There are many small-scale projects that are not immediately bankable. Such complex projects require specific expertise that goes beyond the usual technical, legal and financing issues. Nevertheless, support from the EIB through the European Investment Advisory Hub (EIAH) is increasing and it is becoming a powerful tool in the definition of financial instruments and blending options – as a first evaluation of the EFSI package has demonstrated^[38].

EGTC can benefit from a variety of instruments and options¹¹, other than the ESIF (Table A- 4), such as the Research, Innovation & Competitiveness-related programmes, financing instruments, or even leverage private investment. Apart from being a partner or lead partner in an ETC project, EGTC also contribute to the implementation of ETC through a variety of other actions, such as capacity building, support to programmes or membership of monitoring committees. By way of example, the 2015 EGTC monitoring report^[10] highlighted the higher than expected number of EGTC using one or more of the new instruments. Nevertheless, the overall number of EGTC making use of these instruments is still limited.

The EU macro-regional strategies correspond to integrated frameworks endorsed by the European Council – which may be supported by the ESIF among others – to address common challenges faced by a defined geographical area. In this framework, the countries involved benefit from strengthened cooperation and greater economic, social and territorial cohesion. Four EU macro-regional strategies, covering several policies areas, have been adopted so far:

- the EU Strategy for the Baltic Sea Region (2009),
- the EU Strategy for the Danube Region (2010),
- the EU Strategy for the Adriatic and Ionian Region (2014),
- the EU Strategy for the Alpine Region (2015).

Border regions are increasingly recognised as functional regions that can only exploit the potential for growth and employment if there is sufficient connectivity between both sides of the border and with the European network. Accessibility to facilities, notably employment and health, is recognised as a critical issue. However, for that there is a need to collect evidence and data to support decision making: information on flows of cross-border workers, trade and tourism, cross-border use of public services, cross-border clusters, etc. is fundamental. This evidence is generally lacking. Data on cross-border flows is rarely collected or published. In only a few cross-border regions have local stakeholders succeeded in building cross-border observation systems (e.g. Lille Metropolis).

¹¹ Discussion of the new instruments is made in Section 5.

4. Innovation and Technological Trends

KEY FINDINGS

- As with transport services and infrastructure, cross-border regions also act as barriers to cross-border interoperability, preventing the continuous utilisation of a given technology, such as road tolls, rail signalling or communications.
- Public and political recognition of the importance of cross-border regions for the technological integration of the EU is on the rise, largely due to the emergence of the connected and automated mobility paradigms and the need for truly pan-EU travel planning and information providers.
- Cross-border regions can be valuable laboratories to test new concepts and solutions. In this context, cross-border institutions – notably the EGTC – are strategically positioned to shape the future development of technology.
- Technological advancement and the advent of Information and Communication Technologies (ICT) facilitate the provision of innovative services relating to different modes of transport and traffic management, and enable users to be better informed and make safer, more coordinated and smarter use of transport networks. ITS can play an effective role in bridging many of the barriers in cross-border regions, particularly concerning the provision of mobility services.
- Integrated and seamless multimodal travel information is fundamental to promote mobility across regions and borders. Besides EU-funded projects, big digital players such as Google and CISCO are also active in this field and several tools have already been rolled out. What seems critical is the need for viable business models, aimed at incentivising the transport operators to provide their data and allow real-time rebooking and re-ticketing. An emerging challenge in this regard is data ownership and privacy.
- If implementation of the necessary infrastructure for autonomous driving happens to be concentrated along the key networks (e.g. the TEN-T core network) there is a risk that cross-border links of local or regional dimension become less competitive, leading to the increased isolation of communities on both sides of the border. Cross-border regions should play a role in the testing and introduction of automated vehicles.
- Currently a patchwork of different and non-interoperable solutions for tolling coexist in Europe. Cross-border regions should actively collaborate on the implementation of the EETS. A recent study points out that a key factor for the success of the EETS is precisely the existence of regional networks of partners that embrace it.
- CEF funding (for innovation) is strongly contributing to address the chicken and egg dilemma for the deployment of alternative fuels by supporting infrastructure deployment for these fuels along the main transport corridors, thereby unlocking the potential for clean vehicles. Again, it is critical to ensure that border regions not directly located along a CNC are not cut off from infrastructure availability.
- Cross-border regions should work together on the promotion of Environmentally Friendly Vehicles (EFV) through the joint deployment of suitable refuelling infrastructure, including electric recharging or refuelling stations.
- To avoid a fragmented approach to deployment and, hence, to be better able to take advantage of network effects and the single market, national, regional and cross-border business cases for the deployment of technological advances should be further developed. The role of incentives and other methods to foster deployment should also be further examined by the relevant authorities. Cross-border regions and EGTC could take on a greater role as test cases. The support for sustainable (long term) interconnections and the development of business cases that spread benefits across the border should be enforced.

4.1. Overview of Trends

The transport sector is the backbone of EU integration. The quality of transport services and infrastructure has a direct impact on economic growth, competitiveness and quality of life. It is widely acknowledged that innovations and research activities are key factors for fostering the global competitiveness of the transport sector. Innovation and related research agendas target future challenges, market drivers and technologies that will help address threats (e.g. to the environment) without curbing mobility. An innovative transport sector will be critical to sustain the economic competitiveness of the European countries. National and international regulations such as those to reduce the transport sector's carbon footprint and other air pollutant emissions have created potential markets for green innovations, such as the EFV. The increasing number of people living in urban and metropolitan areas (including densely populated cross-border regions) constitutes a challenge for transport system organisation and mobility management innovations, but also creates opportunities for new and innovative technologies as it helps them generate enough demand to be economically viable.

The research conducted in 2014 in the FUTRE project assessed the future prospects for the evolution of and innovation in transport and its impact on the competitiveness of Europe^[39]. The project identified the main issues from the passenger perspective, such as: globalisation, growth in passenger transport, urbanisation, a change in factors influencing modal choice, or openness to innovation. On the freight side, the main issues included: freight volumes in relation to the global economy, the openness of global international trade markets, consumption behaviour in relation to ethical values, a switch from 'ownership' to 'sharing', innovative technologies for logistics or new technologies for energy saving and environmental awareness. For each challenge, three scenarios were evaluated: unlimited, passivity and collapse, and responsible growth (Table A- 5 and Table A- 6).

Other FP7 projects like Market-Up^[40] or GHG-TransPoRD^[41] highlighted the importance of reliable policy frameworks on the innovation culture in the transport industry. Innovation processes from first idea to successful market entry are long-term processes operating under high uncertainty. The framework conditions for innovations – such as demographic structure, energy resources and mobility patterns – are continuously changing.

As with transport services and infrastructure, cross-border regions also act as barriers to cross-border interoperability, preventing the continuous utilisation of a given technology, such as road tolls, rail signalling or communications. But the problem is not limited to the transport sector: until recently roaming charges on mobile communications were real barriers to the integration of EU transport, as they artificially increased the costs of mobility on international trips, notably in cross-border regions where people frequently commute.

Public and political recognition of the importance of cross-border regions for the technological integration of the EU is on the rise, largely due to the emergence of the connected and automated mobility paradigms, and the need for truly pan-EU travel planning and information providers. Examples are provided in the sections that follow. Cross-border regions can be valuable laboratories to test new concepts and solutions. In this context, cross-border institutions – notably the EGTC – are strategically positioned to shape the future development of technology. They know the mobility problems of people and freight. Additionally, they have a close relationship with the people and companies directly affected by the technological barriers hence they can promote dialogue, deployment or dissemination. Some recommendations to make cross-border instruments work include^[4]:

- Devote more efforts to strategy development and policy intelligence,
- Mainstream the cross-border element in national and regional innovation strategies and policy instruments, or at least align programme rules,
- Make greater use of opportunities created by the border,
- Publicise success stories of cross-border instruments.

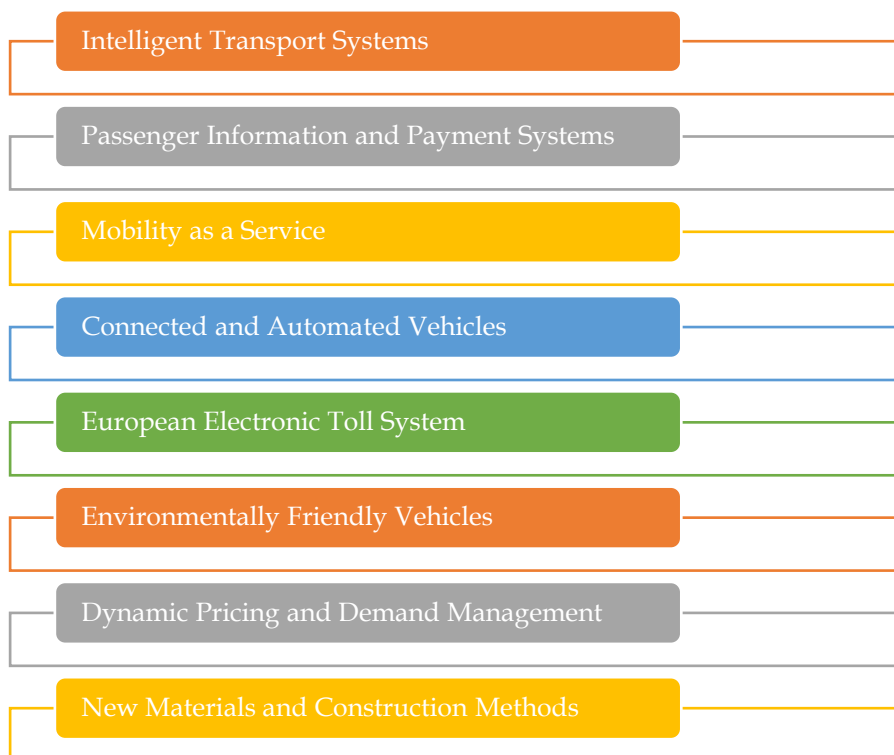
In 2015, the TEN-T Coordinators introduced a set of five issues papers aiming to bring wider views to TEN-T beyond infrastructure provision^[13]:

1. enabling multimodality and efficient logistics,
2. boosting ITS,
3. boosting new technologies and innovation,
4. effectively integrating urban nodes,
5. extending cooperation with third countries.

Several of the papers and notably the ones on innovation and ITS are of particular interest for cross-border projects. Amongst other aspects, they underline a vision that TEN-T corridors can act as a readily available inter-regional and international cross-border test bed and platform to learn-by-doing across local and national boundaries.

As innovation plays such an important role in EU transport policy, it is important to review technological and societal trends, as well as the various technical and regulatory barriers in order to understand how these may affect cross-border transport investments. While social trends can influence and contribute to new technology (e.g. gaming, Vision Zero, user-centred design), deployments are already taking place, which raise important opportunities for cross-border investments. Figure 6 presents seven key trends, which are briefly discussed below.

Figure 6: Relevant technologies and innovation in cross-border regions



4.2. Intelligent Transport Systems (ITS)

The advent of ICT such as mobile communications, machine-to-machine communications and even machine-to-human communications, has been very beneficial to the transport sector and led to the emergence of the concept of ITS. Since 2008, when the European Commission published an action plan to foster the deployment of ITS, it has ranked highly on the agenda of European transport policymakers.

The main aim of ITS is to increase reliability and efficiency (cost-efficiency, efficiency of use, energy efficiency), as well as to reduce congestion and accidents. ITS provide innovative services relating to different modes of transport and traffic management, and enable users to be better informed and make safer, more coordinated and smarter use of transport networks. ITS integrate telecommunications, electronics and information technologies with transport engineering to plan, design, operate, maintain and manage transport systems.

Nowadays, transport-related companies rank amongst the most technological of companies (e.g. some transport companies have their own dedicated satellite as is the case of UPS) and all of them operate state-of-the-art information and communication systems. Technological advancement has resulted in decreasing production costs, while increasing computational power has meant that any company could turn to increasingly sophisticated technology. In parallel, we have witnessed a progressive miniaturisation of technology. The consequence has been the emergence of handheld devices with mounting capabilities. Nowadays, anyone can use a small device to conduct complex tasks remotely. Again, the impact on the transport sector has been significant due to the fragmentation of the business (many people, many packages and many vehicles in multiple locations).

One of the most common uses of ICT is in the provision of route guidance – that is, journey planners. A set of technological advancements has converged to enable the production of inexpensive and small-sized equipment. Firstly, the access for civil use to Global Positioning Systems (constellation of satellites) has enabled the calculation in real time, remotely and with sufficient accuracy, of the geographical coordinates of an object anywhere on the globe. Secondly, the growing capabilities of computers have supported the development of fast and reliable pathfinder algorithms. Thirdly, growing storage capacity has allowed the storage of maps and route information. Nowadays, journey planners are valuable tools for urban logistics activities. They allow drivers to find optimal routes. Real traffic conditions can be taken into account, guiding drivers to the fastest way. The advantages are multi-fold: more efficient and better services, lower levels of fuel consumption, and reduced emissions and costs. Advancement in ICT has resulted in an increased capacity to monitor, retrieve and transmit information, often in real time, which coupled with an ever-greater availability of storage space, has led to the storing of a growing amount of up-to-date data. This is the trend towards 'Big Data'. Big Data is a growing reality for many of the largest logistics and freight transport companies, which are responsible for handling and transporting thousands of individual packages across regions and continents. Big Data is also an issue for public authorities, which are nowadays able to retrieve traffic information at the city or metropolitan level. They can track and trace freight in real time. The amount of information is ever growing. The analysis of this information can provide valuable insights into the patterns and behaviours of urban logistics activities and hence, actions to improve them.

The importance of ITS is widely recognised at regional, national and EU level in several political and legal texts. The ITS Directive is being used to establish interoperable and seamless ITS services while leaving MS the freedom to decide which systems to invest in^[42]. Priorities include: i) traffic and travel information, ii) the eCall emergency system, and iii) intelligent truck parking. In particular, specifications for functional, technical, organisational or services provisions have been adopted on: i) the provision of EU-wide real-time traffic information services and ii) multimodal travel information services. Another initiative is the Platform for the Deployment of Cooperative Intelligent Transport Systems in the EU (C-ITS platform). C-ITS allow data exchange through wireless technologies so that vehicles can connect with each other, with the road infrastructure and with other road users. The importance of C-ITS in the EU strategy for cooperative, connected and automated driving has been recently reconfirmed by both the CoR^[43] and the EP^[44]. Of importance, the CoR recognised the need of deploying C-ITS outside the TEN-T and urged the European Commission to pursue specific actions.

Research projects have been funded on the most diverse ITS areas. Table A- 7 offers some examples of CEF co-funded projects.

ITS can play an effective role in bridging many of the barriers in cross-border regions, particularly concerning the provision of mobility services (Box 10). ITS support urban policy goals in areas such as travel information, traffic and demand management, smart ticketing and urban logistics. Innovative transport solutions can help meet citizens' ever-growing needs with new mobility services such as car and bike sharing schemes, or smart ticketing solutions. ITS are key enablers for public policy and support the design of urban mobility. They offer tailor-made measures adapted to a wide variety of urban mobility scenarios. ITS can provide very concrete solutions for traffic and travel operations and management, reducing congestion and its negative externalities. Multifunctional ITS can be used for different purposes under different conditions, for all transport modes and mobility services, and for both passengers and freight. Traffic and travel information is a key element of ITS deployment. It can provide the European traveller with door-to-door information for well-informed travel decisions (pre-trip) as well as information during the journey (on-trip), notably continuity across borders. In particular, the following components of the EU ITS Action Plan can play an important role in cross-border transport infrastructure and services:

- Multimodal travel and traffic information can help achieve better modal integration and better manage demand and network capacity, with benefits for end-users (i.e. better services) and operators (i.e. optimisation of performance and better cost efficiency).
- Traffic management measures can help reduce congestion.
- Multimodal smart ticketing integrated with information services could be used to provide statistical data on passengers' trips to transport operators (duly respecting privacy and anonymity requirements) to optimise network usage and public transport operations.
- C-ITS services to be deployed in an interoperable way across Europe (Table A- 8).

Several of the innovation trends discussed in this section are examples of applied ITS. Cross-border regions, albeit knowledgeable about the problems, limitations and potential solutions, have limited scope to steer the technological development of the latter. Instead, they must seek a bigger voice in the discussion forums and participate in the research projects. In an age of co-modality, when the car is getting smarter, and the types and sources of data larger, new economic models with ITS as a core element are combining different transport modes and services emerge with ITS as a core element. ITS can fulfil an important role in economic development and innovation.

Box 10: ITS corridor Medtis deploying traffic improvement mobility services

The Medtis project is implementing Traffic Management Services and supporting Traveller Information towards European travellers along the TEN-T Mediterranean corridor. In a context of growing situation, increasing demand for light vehicle and freight mobility on regional scale and long distance, ITS Traffic Management Services (TMS) support road operators to cope with critical situations. These situations can be recurrent (daily traffic congestions on Core Urban Nodes) or seasonal (winter/summer holiday). The deployment of ITS TMS services and supporting technologies provide road operators with the relevant tool to optimise the use of the TEN-T network infrastructure when saturation or events are occurring.

Interoperable Traveller Information Services have been implemented, according to different ITS standards, for all the road stretches involved in the project. By way of example, travel time information is exchanged between different countries and between different road operators.

In one of the stretches where Travel Time Services continuity was deployed - cross-border section between France (Escota) and Italy (Motorway A10 Ventimiglia - Savona - Autostrada dei Fiori, the satisfaction levels measured for travel information services are rather high (60% to 80%). Other interesting results concern the perception of travel time. Travel time appears to be useful for drivers not only in case of congestion (and route choices), but also seems to be useful for "normal" conditions, enabling users to record these and perform a proper assessment of non-recurrent conditions, to anticipate pauses and plan their destination (including modal change).

4.3. Seamless passenger information and payment systems

Integrated and seamless multimodal travel information is fundamental to promote mobility across regions and borders. EU traveller information remains a patchwork of autonomous and independent systems, however. A person moving between regions – regardless of whether these are in the same MS or across different MS – is confronted with different types of information (in terms of language, content or level of detail) and even the graphical information changes (e.g., maps, signalling, etc.). In cross-border regions, this is particularly worrisome given the intensity of travel and the geographical proximity of the regions. In this sense, technological solutions can mitigate travellers' discomfort by providing them with a uniform and standard human-machine interface provided via handheld devices such as smartphones or tablets. The underlying idea is to offer travellers a seamless experience, regardless of the country or region. The expectation is that the interface should be similar to the one in the traveller's home region.

Box 11: Multimodal travel information planner – the Bonvoyage Project

The EU co-funded research project Bonvoyage is preparing a multimodal door-to-door travel platform, including a mobile app, for both passengers and goods¹². The platform will integrate travel information from heterogeneous databases (e.g. on road, railway and urban transport systems), real-time empirical data (e.g. traffic and weather forecasts), and user profiles and feedback.

Key aspects of the platform include: i) consideration of multiple modes of transport, ii) user-centric, through extensive personalisation options (e.g. colours, contents, language, etc.), iii) tariff and ticketing integration, to offer the most cost efficient alternatives, iv) interoperable with other platforms for data exchange, v) multi-channel communication capabilities (actual use depends on the handheld device), including wireless, mobile network (including 5G), sensors, etc., and vi) new security communication approaches and protocols.

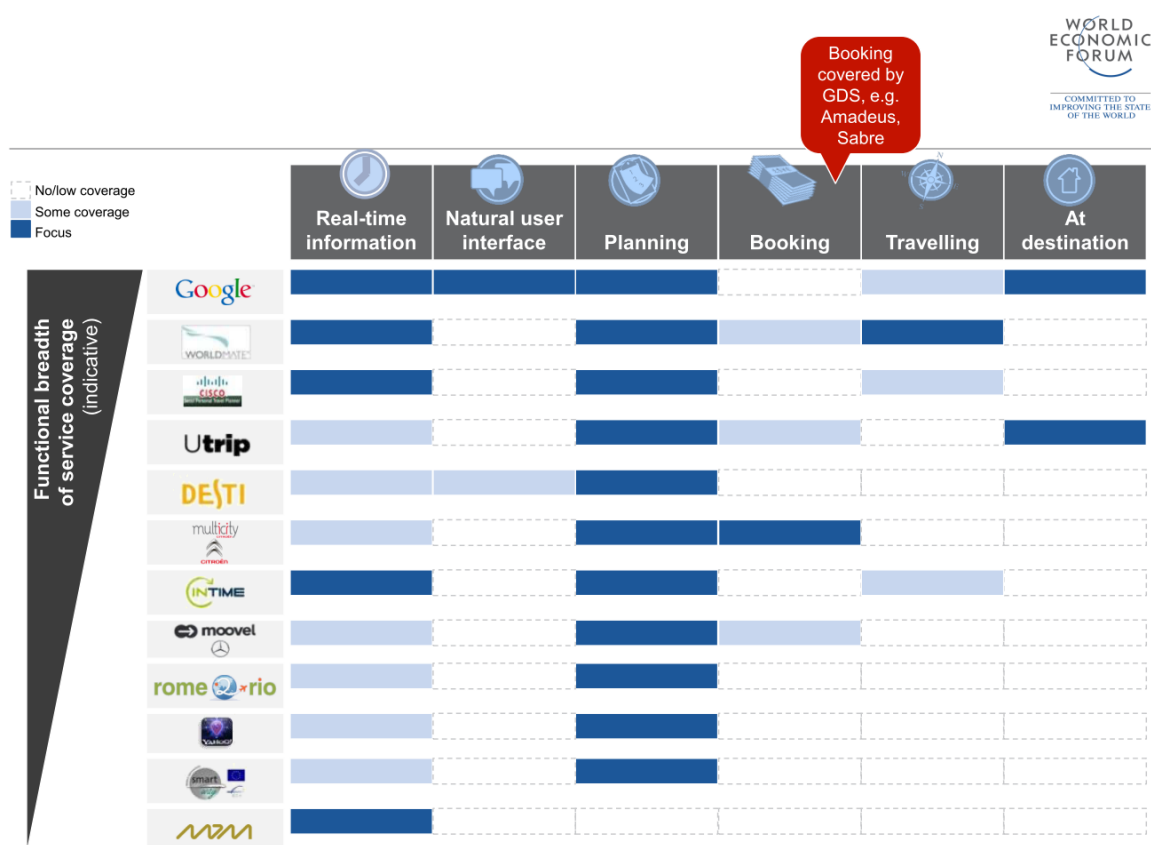
Yet, the Bonvoyage project consortium is not alone. Many other organisations, including big digital players, such as Google and CISCO, are also actively working in this field and several tools have already been rolled out. However, they exhibit different shortcomings (Figure 7) as diverse and significant challenges persist. For example, few transport operators are willing to provide information, particularly in real time, on scheduling or traffic. Another challenge is related to the costs of running such platforms. If certain companies, like Google, have well defined business models, other travel planners struggle to find revenue streams. There is the need for viable business models, aimed at incentivising transport operators to provide their data and allow real-time rebooking and re-ticketing. An emerging challenge in this regard is data ownership and privacy.

The recent call for Programme Support Action¹³ under the CEF transport pillar for the implementation of data exchange for digital maps for Union-wide multimodal travel, engaging a minimum of twelve MS, is a good example of the efforts being made towards wide and interoperable deployment of ITS across Europe, notably through the requirements to make road, traffic and transport services data used for digital maps accurate and available to digital map producers and service providers through national access points.

This is expected to contribute to the delivery of European transport policy objectives and the realisation of a robust and resource-efficient European transport system. Relevant EU legislation and standards include the ITS Directive (Directive 2010/40/EU) and its delegated regulations, plus the standardisation request for ITS in urban areas as foreseen in the TEN-T Regulation^[45].

¹² More information available at <http://bonvoyage2020.eu/> (accessed on 16 November 2017).

¹³ More information available at: https://ec.europa.eu/transport/facts-fundings/grants/2017-b4-psa-its_en (accessed on 16 November 2017).

Figure 7: Comparing different traveller planners^[46]

4.4. Emerging mobility concepts - Mobility as a Service (MaaS)

MaaS describes a shift away from personally-owned modes of transport towards mobility solutions that are consumed as a service. This is enabled by combining services from public and private transport providers through a unified gateway that creates and manages the trip, which users can pay for with a single account (Box 12). The central concept behind MaaS is to offer both people and goods mobility solutions based on travel needs.

Box 12: Incorporating MaaS Concepts in Public Transport Offer – SocialCar Project

The EU co-funded research project SocialCar aims to simplify travel in urban and peri-urban regions by incorporating MaaS into public transport planning¹⁴. The objective is to develop truly seamless door-to-door mobility systems.

The project will consider an array of complementary mobility services such as carpooling, car sharing, bike sharing, taxi and other on-demand services. In similar fashion to the Bonvoyage project (Box 11), it will also produce a travel planner incorporating all of them and including planning, booking and ticketing (payment).

In cross-border regions, low population densities can result in limited offers (in terms of coverage or frequency) of public transport services. Carpooling can be of particular interest to complement public transport offers, particularly for the first and last mile.

This shift is fuelled by various innovative new mobility services on offer, such as car sharing, ride sharing, bike sharing and e-hailing, as well as on-demand "pop-up" bus services. On the other hand, the trend anticipates self-driving cars, which put in question the economic benefit of owning a car over using on-demand car services, which are widely expected to become much more affordable when cars

¹⁴ More information available at <http://socialcar-project.eu> (accessed on 16 November 2017).

can drive autonomously. MaaS is further enabled by improvements in the integration of multiple modes of transport into seamless chains, with bookings and payments managed collectively for all legs of the trip. Between the multiple modes, trips and payments, data is gathered and used to help journeys become more efficient. MaaS may cause a decline in car ownership, which would reduce overall pollutant emissions. Simultaneously it could significantly increase the efficiency and use of public transport. Ultimately, a more efficient network coupled with new technology such as autonomous vehicles will significantly reduce the cost of public transport.

In the government space, the same data allows for informed decision-making when considering improvements to regional transport systems. Public transport scheduling and spending of public money can be justified by obtaining and analysing data on modern urban mobility trends. The creation of a suitable open data infrastructure will play a major role in enabling MaaS solutions.

Shared-use mobility describes a wide variety of new technology-enabled services and tools that give instant access to services and travel information while complementing traditional transport modes like fixed-route transit. Through the shared economy, people have access to a much wider array of travel options. Indeed, models of shared-use mobility such as car sharing, bike sharing, ride sharing, and on-demand transit have gained prominence in recent years.

While many of these concepts emerged years ago, (e.g. bike sharing first emerged in the 1960s in Amsterdam), their growth is enabled by communications technology that eases reservations, vehicle tracking and payments. The figures may still make up a small share of the overall market, but new options continue to emerge and car ownership, especially in large cities, is becoming less of a necessity.

Taxi-like services are increasingly offering ride sharing functions that involve the sharing of one vehicle by multiple riders. UberPOOL and Lyft Line, for example, let drivers carrying one passenger add additional passengers riding a similar route. These services are known as 'ride-splitting,' since passengers can divide up the cost of the trip. Several variations on the theme of shared use of road vehicles exist and are growing: shared vehicle with no driver (car sharing), shared trip in vehicle with driver (flexible taxi-like services with ridesharing), shared trip in private vehicle (carpooling).

Another technological development that has already had significant impacts on the transport sector is the smartphone and its applications for taxi and transit services. Smartphones are enabling new business models through new interactions with customers. The new services use smartphone apps to let riders arrange rides in real time with drivers who provide a ride in exchange for payment. These services have sometimes been called 'ride sourcing' rather than 'ride sharing' since they are not designed to reduce vehicle trips. They have directly challenged existing regulations and practices that have long shaped the taxi industry, raising questions about appropriate regulatory and public policy responses.

Some services have gone further, creating smartphone-enabled public transport services. They use mobile apps to optimise pick-ups, drop-offs and routing based on demand, at a cost typically higher than a public transit fare but lower than a taxi. Using a network of shuttles, they allow a level of flexibility less available in more traditional public transit systems. Ride sourcing is viewed as part of a suite of transport options that serve a previously unmet demand for fast, flexible and convenient mobility in urban areas.

The full benefits of MaaS can only be obtained if cross-border regions have homogeneous regulations. This is seldom the case, however. Indeed, as regulations are often local or national, there are strong regional disparities, further actions are required (Box 13). An instructive case is Uber or Cabify, in which each MS has a different approach, ranging from full market access to no access at all. Such regulatory disparities prevent the seamless use of these services in cross-border regions. In this sense, cross-border regions can be interesting laboratory cases on the development of joint and homogenous regulations to promote MaaS concepts.

Box 13: MAASiFiE - Mobility As A Service For Linking Europe

The main goal of MAASiFiE, funded by the Conference of European Directors of Roads Transnational Road Research Programme on Mobility and ITS with pilot cases in Finland, Austria and Sweden, is to identify and analyse MaaS models and create a 2025 Roadmap for MaaS in Europe¹⁵. This requires a common understanding of MaaS among both public and private stakeholders. Its recommendations illustrate the relevance of standardisation, notably:

- applying road transport standards relevant for C-ITS, automation – DATEX II;
- data content specifications applied to road and public transport, and related data standards – DATEX II (RT), NETEX/Transmodel, SIRI;
- digital networks/routing applications – common digital network graph (links and nodes for routing) and exchanging information (e.g. based on INSPIRE).

Moreover, it is acknowledged that more pilots and services, for benchmarking of best practices and understanding of contextual factors is necessary.

4.5. Connected and automated mobility

Autonomous and connected vehicle features are enabled by sensors, cameras and radars, and allow vehicles to wirelessly exchange data with their surroundings. These features let vehicles communicate with each other (referred to as vehicle-to-vehicle or V2V communications) and with roadway infrastructure such as traffic signals and toll booths (referred to as vehicle-to-infrastructure or V2I communications).

On 30 November 2016 the European Commission adopted a European strategy on C-ITS, a milestone towards cooperative, connected and automated mobility^[47]. The Commission will continue working on the regulatory environment, resource efficiency and standardisation to facilitate the market introduction of increasingly efficient cooperative, connected and automated mobility. Progress is also being made in fora such as the C-ITS Platform, C-Roads, Gear 2030 and the Round Table on Connected and Automated Driving. As recently as the end of 2016, the EU and the European Economic Area States signed up to cross-border experiments on cooperative, connected and automated mobility via the European Alliance of Telecoms and Automotive. The aim is to develop intelligent cross-border testing of technological connectivity for road transport in real traffic conditions^[48]. The collaboration is ambitious. It includes working together on research, testing and large-scale demonstrations on cross-border road sections, itineraries or corridors in several key areas: safety, data access, data quality, liability, connectivity and digital technologies. An ambitious part of the initiative is the introduction of the fifth generation (5G) of wireless communication systems. 5G will ensure high speed and enough capacity for millions of devices, including cars, to interact at the same time. The large-scale test that the Alliance is preparing will be consistent with the European strategy on C-ITS. The first steps are being taken.

Even before the publication of the European strategy on C-ITS, in 2013, the Netherlands, Germany and Austria signed a memorandum of understanding on C-ITS corridor joint deployment. The project involves highway operators from the three member states and partners from the automotive industry. The pilot case is a corridor extending from Rotterdam (Netherlands) via Frankfurt (Germany) to Vienna (Austria). The parties agreed upon the introduction of two cooperative systems: roadworks warning and improved traffic management by vehicle data. The project was divided in two phases: phase 1, 2014-2017, related with the definition of system specifications and testing; and phase 2, 2017onwards, related with the deployment of cooperative system and monitoring of results. On 8 February 2017, Germany and France signed an agreement to develop joint cross-border experiments of connected and automated vehicles. They will build a cross-border corridor between Lorraine (France) and Saarland

¹⁵ More information available at <http://www.vtt.fi/sites/maasifie/results>, assessed 20 July 2017.

(Germany) to test, in real world conditions, connected and automated driving. The purpose is to develop solutions to ensure the continuity of automated services across borders.

However, the increase in vehicle automation has important legal implications for the attribution of liability and compatibility with existing legislation, particularly as more advanced C-ITS services begin to be deployed. Moreover, massive quantities of detailed information (about individuals, activities, travel and locations) through a variety of channels will be generated. This increases the exposure and possibility of inappropriate use of information, which raises significant concerns on data privacy, protection and security. Policy developments will be required to address data collection and security issues relating to autonomous and connected vehicles.

Although much progress has been made on the security and certification of C-ITS, there remains a significant body of work to be done including developing a single common standardised EU trust model and certificate policy and international cooperation on interoperability. International coordination between the various parties is key to the deployment of C-ITS services and essential to: increase the efficiency and learning capacity of researchers and market players, reduce the knowledge divide among European regions and increase the competitiveness of the European transport sector as a whole. Initiatives such as the C-ITS Platform and C-Roads platform (Box 14) will be vital in helping to ensure this cooperation.

Box 14: The EU C-Roads platform

Through the C-Roads Platform, authorities and road operators join forces to harmonise the deployment activities of C-ITS across Europe. The goal is to achieve the deployment of interoperable cross-border C-ITS services for road users. Working groups provide decision-making support to a steering committee to ensure proper decisions towards interoperable deployments.

The technical aspects working group deals with all technical standardisation and interfacing issues in order to be able to provide a common standard repository in the shape of a web service, incorporating interface description to data and services within the pilot sites. This includes dedicated monitoring of standards and alignment with respective pilot requirements, as well as approaches to deal with security issues within the EU C-ITS trust model. Solutions to be elaborated by the C-Roads Platform include:

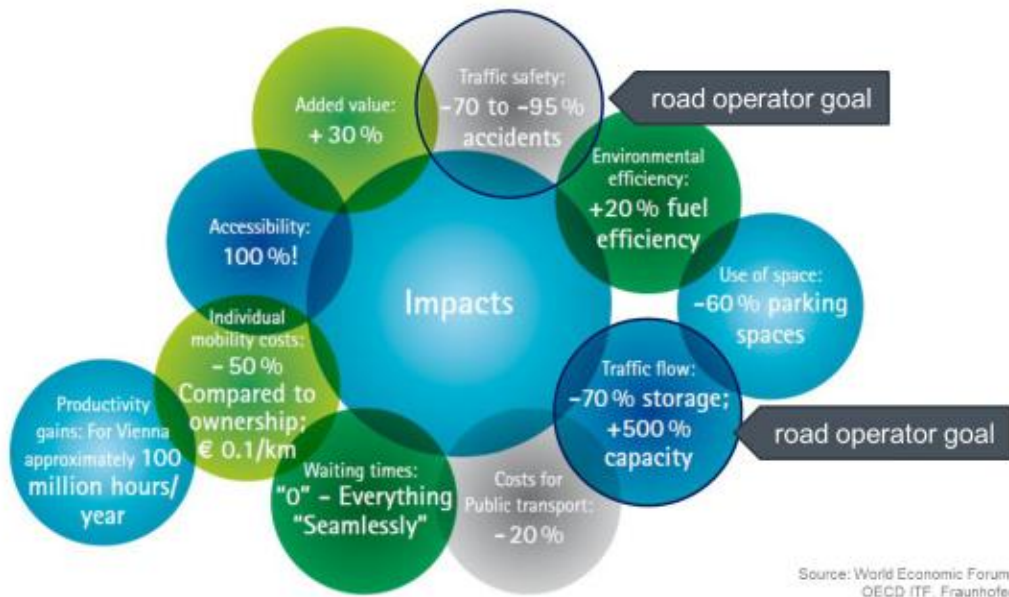
- a harmonised C-ITS road infrastructure communication profile for all C-Roads pilots covering the deployment of Day 1 services (Table A- 8),
- a C-Roads approach for dealing with security issues for C-ITS service provision and secure communication within the EU C-ITS Trust model,
- a C-ITS road infrastructure profile for improving traffic safety for 'on railway level' crossings,
- Common Test and Validation procedures for implementing C-ITS Services in Europe,
- how drivers can effectively be informed without distracting them,
- a methodology for dissemination of C-ITS messages by different communication technologies and their interactions with changing service platforms,
- mechanisms to distribute communication certificates to all C-ITS-stations in a secure way and enable trustworthy communication in the C-ITS network.

Autonomous driving systems have the potential to re-position road transport within the overall transport system. While increased application of driving assistance systems can be considered an incremental innovation in relation to the road vehicle, the introduction of full autonomous driving will radically transform road driving. Due to this potential re-positioning of road transport, the effects of autonomous driving technologies are highly sensitive to parallel developments in other parts of the transport sector, such as innovations in slower modes or public transport. Autonomous driving promises more efficient use of expensive infrastructure and increased road safety. The World Economic Forum, OECD International Transport Forum and Fraunhofer have identified the main impacts especially of fully automated driving (Figure 8). These range from a decrease in individual mobility costs to a reduced need for parking spaces. Two factors relate to the main goals of road operators:

- Road safety: it is estimated that automated driving will reduce accidents by 70–95%. This tremendous gain in safety can be attributed to the elimination of human error when the autopilot takes over.
- Traffic efficiency: the coordination of automated vehicles and platoons leads to better use of road capacity.

The introduction autonomous vehicles is expected to occur gradually in time and in terms of level of automation (Figure A- 1¹⁶ and Table A- 9). The automation level for the introductory phase is expected to cover SAE Level 2–4. Consequently, the benefits of this phase will, to a great extent, be lower.

Figure 8: The benefits of automated driving for overall traffic



In another context, autonomous vehicles and C-ITS are highly regarded in cities and urban areas. Recent studies by the International Transportation Forum in the city of Lisbon concluded that it would be possible to satisfy demand with at least 80% fewer cars^[49]. The reduction of vehicle numbers would have overwhelming impacts on the environment, traffic efficiency and freeing urban space for parks, playgrounds or commerce. Building and maintenance costs would also be reduced. In addition, the transport services themselves would be faster, more reliable and less expensive.

Densely populated areas will be pivotal on the success of the EU strategy towards C-ITS^[44]. The point is that the feasibility of large-scale technological deployments depends on a minimum critical mass of users, which are only available in such regions. Cross-border urban regions, and cities (e.g.: Lille Metropole, in France, or Strasbourg-Ortenaukreis regions, in France and Germany) are in a particularly favourable position to take a leading action, since cross-border interoperability and continuity of C-ITS is a key issue.

EU cross-border regions are diverse, ranging from rural zones, with low population densities and limited mobility needs, to dense metropolitan areas with complex mobility patterns and systems. Connected and autonomous vehicles can be used regardless of context and thus be active contributors to bridging cross-border barriers. Cross-border regions must avoid lagging behind by becoming active players in discussion forums, on research projects and by deploying the proper technological infrastructure. If implementation of the needed infrastructure for autonomous driving happens to be concentrated along the key networks (e.g. the TEN-T core network) there is a risk that cross-border links

¹⁶ The figures with caption in the style Figure A-x, in which x is a number, are available in Annex.

of local or regional dimension become less competitive, thus leading to increased isolation of communities on both sides of the border. Therefore, cross-border regions together with national authorities should play a role in the testing and introduction of automated vehicles. Their main role is to develop the digital infrastructure to support the testing and introduction of automated vehicles in accordance with the EU action plan for automated driving. Digital infrastructure and connectivity are key enablers for managing mixed traffic, especially in the introductory phase of automated driving. In this respect, cooperation with automobile manufacturers and road operators is also critical, especially regarding the interconnection of infrastructure and vehicles.

Yet, potential side-effects of autonomous vehicles also loom over the horizon^{[50], [51]}. The first autonomous vehicles will still require human intervention or, at least driver's readiness of some sort, as full autonomous vehicles are only expected in the long term. The transition period will then dictate the co-existence of different type of technologies (and automation levels) running on the same transport infrastructure. The behaviour of drivers, pedestrian and other human agents in face of such technological mix is unclear. Indeed, the overall public acceptance towards driverless vehicles is still unknown. The cost structure of autonomous vehicles is another issue that remains unknown, with a determinant impact on the provision of the transport service. On the other hand, people who are nowadays limited in their mobility options, such as the elderly, children or disabled persons, will in the future see their mobility needs fulfilled, since no driving skills will be required. Also, regions in which the costs of mobility provision are excessive, due to low demand, may be served by on-demand automated services. Autonomous vehicles are seen as solutions with high potential for neighbourhood (short distance) or feeder services. Notwithstanding the social benefits, the increase in demand will offset to some extent the gains in efficiency.

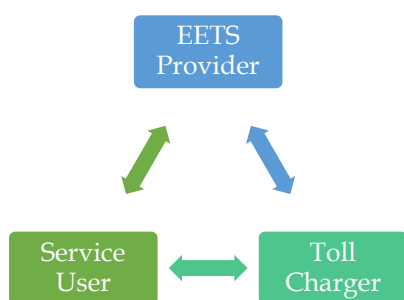
4.6. European Electronic Toll Service (EETS)

At the EU level, the first electronic tolling (e-Toll) systems were launched in the 1990s along the main roadways, notably highways. The technology was largely driven by infrastructure managers that sought reducing the heavy costs of traditional tolling systems (e.g., human resources, land occupancy, equipment, etc.). Independently and progressively, they developed proprietary e-Toll systems. The outcome was, and to a certain extent still is, a patchwork of non-interoperable systems, even within the same country or conurbation depending on the presence of different infrastructure managers. A vehicle crossing the roadways of different infrastructure managers would incur extra costs from the need to install multiple On-Board Units (OBU), establish several contracts or other additional administration. This situation is particularly relevant in a political context favourable to the implementation of user charges for heavy goods vehicles for the use of roadways. The efficiency and accuracy of these payment systems depends on the implementation of automatic and interoperable tolling systems. The situation is particularly vivid in cross-border regions, owing to the likelihood of independent infrastructure managers operating on each side.

Directive 2004/52/EC^[52] and Commission Decision 2009/750/EC^[53] laid down the conditions and rules for implementing the EETS. The EETS will superimpose over the infrastructure managers' individual e-Toll systems, creating an EU-wide interoperable system. With this regulation, a road user just needs to sign a contract with an EETS provider. The provided OBU will be valid within EU space. EETS is expected to reduce cash transactions at tolling stations, improve traffic flow and reduce congestion. The directive has focused on satellite technology (linked to the Galileo project), the flexibility of which allows different tolling policies, and a dedicated short-range communication system (typically used by the OBU) based on a 5.8 GHz frequency. The latter uses two standards, one applicable only in Italy and the other, defined by CEN, applicable in all other countries. The consideration of just two possible technologies closes the door to other emerging technologies like those under development within the scope of connected and automated vehicles^[54].

The legislative framework foresees three market players, whose contractual relations are explained in Figure 9. The EETS Provider is in charge of providing the OBU, ensuring interoperability at EU level and collecting (guaranteeing) the toll due by its customers for the relevant Toll Chargers. The Toll Charger is in charge of defining a toll scheme's rules and tariffs, and providing the motorway service. Finally, the Service User signs a contract with the EETS Provider and pays it the tolls due. It is liable for tolls.

Figure 9: Contractual relations under the EETS Framework



Initial targets aimed at 2012 and 2014 as the years for offering an EETS to truck and buses, and to other vehicles, notably cars, respectively^[55]. Yet, an EU EETS still has to become reality. There have been some important developments (Box 15), but they have been insufficient. At national level, the required EETS interoperability has been largely achieved, but there have been limited cross-border interoperability agreements, which has a direct impact on cross-border regions^[56], ^[57]. Several barriers of different nature – market, regulatory, financial, operational, technological and political – have precluded the effective implementation of the EETS (Figure A- 2). By way of example, despite some advancements brought by Directive EU 2015/413, it does not force Member States to share information on foreign road users for toll enforcement^[58]. Yet fraud and toll evasion by foreign vehicles is a very real problem and a source of heavy costs^[59].

Box 15: EETS-compliant services in a cross-border context – REETS Project

The TEN-T co-funded project Regional European Electronic Toll Service (REETS Project) aims to deploy EETS-compliant services in a cross-border regional project involving seven Member States – Austria, Denmark, France, Germany, Italy, Poland and Spain – and Switzerland.¹⁷

The REETS Project has developed work on a series of relevant issues for the effective and consistent implementation of the EETS: i) contractual framework and risk management, ii) certification process, iii) key reference indicators, iv) back office interfaces and v) interoperability management.

The project has designed and deployed an open information platform involving all participating countries and some pilot project activities for the implementation of the EETS¹⁹. The platform is the single point of access for EETS-related information. It maintains communication between Member States and the European Commission on every matter relevant to the EETS (e.g. national registers or EETS domains) and it provides up-to-date information on EETS developments.

As a consequence, the EU EETS remains more an ambition than a reality. The Commission has recognised the limitations of the existing legal framework and in May 2017 published a proposal^[60] for a recast of Directive 2004/52/EC and a draft Commission Decision to revise Decision 2009/750/EC^[47]. The proposal clarifies certain aspects related with the interoperability of equipment and sets clear requirements (e.g.: allowed frequency bands of communication) the national tooling system must comply to ensure the interoperability with other EU systems.

Cross-border regions have limited scope for steering the implementation of the EETS. Nevertheless, they can be an active voice, focusing governments on this problem and participating in fora and other spaces of public consultation. Cross-border regions can actively work with organisations on the implementation of the EETS. A recent study points out that a key factor for the success of the EETS is precisely the existence of regional networks of partners that accept it^[62]. The study^[63] 'State of the Art of Electronic Road Tolling' highlights the different technical solutions and technologies that have been

¹⁷ More information available at <http://www.reets.eu> (accessed on 16 November 2017).

¹⁸ Accessed on 30 July 2017.

¹⁹ More information available at <http://eetsinfopatform.eu> (accessed on 16 November 2017).

deployed in Europe to support different tolling schemes. Since a toll system is a combination of different technical and operational components, standardisation is required in several fronts, which understandably adds complexity to process. Yet, the initially adopted proprietary solutions are gradually being replaced by more standardised technologies and solutions.

Today the existing toll schemes in Europe mostly make use of technologies that are compliant with the ETC Directive (i.e. Global Navigation Satellite Systems (GNSS), Dedicated Short-Range Communications (DSRC), or Global System for Mobile Communications (GSM)) but legacy solutions are still in place in some cases and countries. This applies to both charging and enforcement. The key technologies that are currently used are (Table A- 10):

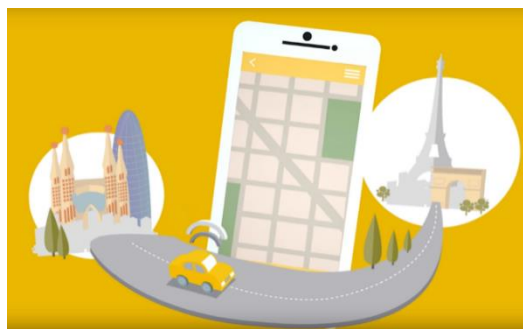
- Automatic Number Plate Recognition (ANPR), also referred to as video tolling,
- DSRC technology,
- Radio Frequency Identification (RFID),
- GNSS technology,
- Tachograph-based technology,
- Mobile communications (GSM and smartphones) tolling systems.

Weakness and strengths of each technology are summarised in Figure A- 3. The European Commission has noted that the list of technologies for use in systems with an OBU was moved to an annex to the directive, allowing better responsiveness to technological progress, but it remains unchanged for the moment. Two successful cases are presented in Box 16 and Box 17.

Box 16: Portuguese tolling: DSRC-based and ANPR

Most the motorways in Portugal have been subject to toll payments, along with a closed tolling architecture. Since 1991, DSRC-based electronic tolling has been introduced and widely applied across the whole Portuguese network, with very high market penetration in terms of OBUs (more than three million subscribers; half of the vehicles are equipped with an OBU). The motorway network includes approximately 2 900 kilometres of road, some of which were toll-free. Part of this network was initially managed by means of shadow tolling mechanisms (called SCUT) and recently being upgraded to an All Electronic Tolling (AET) system. With that, Portugal has become one of the first countries in Europe to introduce a free-flow system for toll payments of all vehicles. On the ex-SCUT, the user is charged in a multilane free-flow environment, using either a DSRC OBU (mainly post-pay but also in pre-pay mode) or video tolling/ANPR mechanisms (pre-pay and post-pay modes).

Box 17: Satelise, an App for toll payment



Satelise²⁰ is a payment method available for iOS, Android and Windows phones, which can be used for Autema, the motorway which connects Sant Cugat, Terrassa and Manresa (C-16), linking Barcelona and France. It is part of the Eje del Llobregat, which is part of the European E-9 route which links Barcelona to France through the Puymorens tunnel, and with Cerdanya and Andorra. Currently in operation since 2016 on the C-16 motorway, it is now being deployed for the remaining Spanish

motorway network. Trials are planned by the end of 2017 also in the Portuguese border area with the Norte Litoral concession.

Currently, the main areas where technology is developing are:

- in-vehicle ITS technology, for example within the cooperative vehicle information systems and communications access for land mobiles areas,

²⁰ More information available at <http://satelise.com/en/> (accessed on 16 November 2017).

- in-vehicle applications such as telematics for vehicle and driver management, e-Call, usage-based insurance and different types of event data recorders,
- low-cost combined GNSS/accelerometer devices to track movements even where satellite visibility may be poor – they serve the fitness and leisure market as well as vehicle navigation and measurement,
- mapping standards, map quality, highway section asset management and algorithms for determining when a vehicle has passed a 'virtual tolling point' or similar 'toid' (Topographic Identifier),
- cloud-based storage and processing, which reduces operating costs and improves the speed of calculating distance driven, toll due and cleaning of erroneous data.

Of the technologies mentioned above, e-Call should in future be mandatory for all new cars, while usage-based insurance and event data recorders are becoming more popular and being installed in a growing number of vehicles (although there are no fixed standards for event data recorders at the moment). These two types of devices alone will be a fundamental component of vehicles before many more road tolling schemes come online. Bringing these different technologies together into 'one box' would have a significant impact on cost for all systems.

4.7. Environmentally Friendly Vehicles (EFV)

The European Commission is strongly advocating EFV as a way to promote a shift towards sustainable development of the EU. The communication^[31] 'A European strategy for low-emission mobility' presents an action plan aimed at: i) achieving a higher efficiency of the transport system, ii) fostering low-emission alternative energies for transport, and iii) promoting low- and zero-emission vehicles. It builds on the objectives described in the 2011 white paper on transport: i) essentially CO₂-free major urban centres by 2030; ii) by mid-century, greenhouse gas emissions from transport should be at least 60% lower than in 1990; iii) encouraging the exchange of best practices and the development of integrated strategies; and iv) improving public procurement procedures^[17]. Other relevant publications include a Commission communication on green public procurement^[64], the Clean Vehicle Directive^[65] and the 2013 urban mobility package^[66].

Internal Combustion Engine Vehicles (ICEV) such as motorbikes, cars, buses or trucks are most often used in people and freight transport. They are responsible for green-house gas emissions (e.g. CO₂) and other air pollutants (notably particulate matter, nitrogen oxide). Increased deployment of EFV can curb this trend. An EFV is a vehicle that produces fewer emissions harmful to the environment than a comparable conventional ICEV running on gasoline or diesel²¹. Hence, a technological transition towards EFVs could materially contribute to alleviate the production of greenhouse gas emissions and other pollutants. There are currently four main alternative energy carriers and propulsion technologies for EFVs available, in different stages of market maturity²²:

- battery-electric vehicles and hybrid-electric vehicles with plug-in,
- hydrogen and fuel cells,
- biofuels, with priority for second generation biofuels,
- natural gas, pure or blended with biomethane.

Among these, Battery-Electric Vehicles (BEV) has gained momentum over recent years^[17]. Key advantages include zero tailpipe emissions, and reduced energy consumption and noise emissions. The sales of light commercial BEVs have been increasing at a fast pace. The year 2015 saw the global threshold of 1 million electric cars on the road exceeded, closing at 1.26 million. This is a symbolic

²¹ In accordance with Directive on the Deployment of Alternative Fuels Infrastructure^[68], alternative fuels include, inter alia: electricity, hydrogen, biofuels, synthetic and paraffinic fuels, natural gas, or liquefied petroleum gas.

²² Energy carrier is either a substance or phenomenon that contains energy which will be converted into mechanical energy to move a vehicle. Examples: electricity, fuel, hydrogen.

achievement thanks to significant efforts deployed jointly by governments and industry over the past ten years. In 2016, the sales of BEVs were at around 91 500 units in the EU-28 and Norway^[67]. Already, the main vehicle manufacturers are producing commercial BEVs. In 2016, Nissan and Renault were the top sellers. Despite the positive evolution, sales of BEVs still represent a marginal value (below 1% in 2016). Indeed, the prices of BEVs remain higher than those for their ICEV counterparts, which precludes a wider market uptake for the moment.

Cross-border regions can work together on the promotion of EFV through the joint deployment of suitable refuelling infrastructure, including electric recharging or refuelling stations. Indeed, a main barrier to the deployment of EFV, notably BEV or natural gas vehicles, is the absence of adequate networks of refuelling stations. Consequently, EFV are limited to specific geographical areas. Naturally, hardly any person will use an EFV in such conditions. Directive 2014/94/EC offers guidelines on the deployment of an alternative fuels infrastructure^[68].

Moreover, CEF funding (through the innovation priority) is a big contributor to addressing the chicken and egg dilemma for the deployment of alternative fuels by supporting the infrastructure deployment for the different types of fuels along the main corridors (Box 18). This will unlock the potential for clean vehicles deployment. Again, it is critical to ensure that border regions not directly located along a Core Network Corridor (CNC) are excluded from infrastructure availability.

Box 18: Promoting EFV through enhanced refuelling stations

The CEF co-funded project BESTWay aims at developing a new generation of natural gas refuelling stations along the TEN-T Atlantic Corridor. The new stations will address current issues in market and technical regulations in terms of security, safety, standardisation, logistics, public access and interoperability, by incorporating advanced solutions for remote management and operations.

4.8. Dynamic pricing and demand management

Traffic data is a vital element both in real time to operate the road network (notably by supplying data for traffic management support systems) and in non-real time to inform public policy and produce relevant statistics. For example, traffic data is used to:

- draw up management, operational and maintenance policies for the national road network,
- monitor transport policy, notably changes in road traffic and its impact on the environment,
- optimise the use of existing infrastructure,
- draw up and monitor the impacts of public road safety policies,
- produce short-, medium- and long-term traffic forecasts, and supply traffic forecast models for the ex-ante assessment of infrastructure policy.

Another possible application of the ability to track vehicles is the introduction of highly efficient dynamic pricing systems. Dynamic pricing can be used to manage traffic flows by making transport behaviour choices more efficient from a micro-economic perspective, eventually leading to more traffic volumes spread more evenly across the day or inducing modal change. Road pricing can reduce congestion and contribute to shorter travel times. It can also be applied to improve urban air quality and reduce road casualties^{[39], [69]–[71]}. The EU-level public consultation²³ 'Charging of the use of road infrastructure' revealed great support for the application of the 'user pays' and 'polluter pays' principles to mobility. Ambitious national schemes of dynamic road pricing have been deeply studied and considered at political level in the Netherlands and Finland, to replace current car use taxation – based mostly on fuel taxation – with a more efficient system. This need to replace road use payment systems

²³ Further information available at: https://ec.europa.eu/transport/modes/road/consultations/2012-11-04-roadcharging_en (accessed on 16 November 2017).

increases with the share of electric vehicles (which do not pay equivalent fuel taxes), to keep public finances balanced as much as for the efficiency of infrastructure use.

4.9. New materials and construction methods

To be able to compete effectively in the global automotive market with ever more stringent regulations on CO₂ emissions, manufacturers seek cost-effective, multi-material solutions that will allow them to roll out more lightweight cars, and adopt new designs and manufacturing practices to reflect changing consumer demands and global emission standards.

For the past four or five decades, the basic shape and design of cars hasn't changed much, but the materials used in car construction have. Significant reductions in car weight have been achieved with new construction materials like high-strength steels and aluminium. These savings have been counteracted by stouter, bigger car designs, as well as heavy new safety features however, limiting their net energy and environmental benefits. Some examples of ongoing or expected future changes are in the use carbon fibre, cellulose nanocrystals, cloth, 3D-printed plastics, metal interiors, composite engines, aerogels and carbon nanotubes. In modern cars, most of the weight comes from steel, which is used to create the underlying chassis or cage beneath the body that forms the skeleton of the vehicle. Door beams, roofs and even body panels created during auto manufacturing are typically made of steel. Steel is also used in a variety of areas throughout the body to accommodate the engine or other parts. Steel manufacturing has evolved greatly, so carmakers these days can make different types of steel for different areas of the vehicle that are rigid or that can crumple to absorb different impacts.

Light weighting through new materials can also be applied to trucks, as well as measures to improve aerodynamics and vehicle design. Additionally, the rethinking of truck design is associated with so-called 'mega-trucks' or vehicles that offer an additional potential of improving efficiency by increasing capacity per vehicle. Such trucks are longer and heavier than conventional trucks (up to 25.25m long and up to 44t heavy). Recent EU legislation appears to prepare for their introduction^[72], but they remain controversial. Some fear that mega-trucks could cannibalise the even more efficient freight transport on rail and inland waterways.

Beyond the expected progress in improving the existing means of transport, foreseeing radical innovations and new means of transport remains a crucial challenge. The Hyperloop proposed by Elon Musk, CEO and product architect of Tesla Motors and CEO and chief designer of SpaceX, provides an example of such radical innovations. The proposed concept of small capsules circulating in low pressure tubes is suggested to be a faster and still more cost-efficient alternative to air travel and high-speed railway lines for distances below 1 500 km. However, experts underline that similar ideas have spread around the world in the past without becoming reality, e.g., the so-called 'Swissmetro' project.

4.10. Harnessing the benefits of the new technologies in cross-border regions

One central question that arises is how suitable EGTC are as an innovative legal tool to plan and implement cross-border investments to enhance the technological infrastructure of cross-regional transport. In other words, what could be the strategic potential of EGTC as a means of strengthening long-term investment in the field of transport from a technological point of view, to reinforce the links between cities, businesses and people on both sides of the border?

To avoid a fragmented approach to deployment and, hence, to be better able to take advantage of network effects and the single market, national, regional and cross-border business cases for the deployment of technological advances should be further developed. The role of incentives and other methods to foster deployment should also be further examined by the relevant authorities. Cross-border regions could take on a greater role as test cases. The support for sustainable (long-term) interconnections and the development of business cases that spread benefits across the border should be enforced.

Positive interactions require specific conditions: fragmented governance can hinder synergies between nodes that could otherwise benefit from them. A concrete vision on needs and opportunities must be developed before starting major infrastructural investments. Actions should come from final users – enterprises, logistics services providers, citizens and local administrative bodies. An integrated process implies explicitly identifying trade-offs and economically inefficient rents/market failures.

Macro-regional strategies can play an important role in focusing the different components of multilevel governance on shared objectives, both at horizontal and vertical level. Synergies should be targeted from the earliest phases of the integration process, identifying soft measures that can deliver in the short term to get the process up and running, while carrying medium-to-long term investments based on an analysis of demand.

As previously highlighted, both formal and informal cross-border structures can contribute to a cooperative and integrative process, developing synergies based on specialisation. The outcome of the process can prove successful for the whole system. Some examples of cooperative processes (spontaneous platform cooperation triggered by a Euroregion) have been mentioned herein. Structures such as EGTC play a major role not only in establishing synergies between local economic actors and platforms, but also in fine-tuning strategic planning across borders.

To be effective, the roll-out of ITS needs to be coherent and properly coordinated across the EU by public and private bodies. This should not only ensure the interoperability and continuity of ITS between regions but also between different modes of transport, to facilitate multimodality.

A wide range of innovative solutions are available, such as digitalisation in passenger and freight transport, and connected and automated driving. To support their development and deployment across Europe, cross-sectoral and CBC is indispensable. We need to fully tap the potential of digital technologies and let the digital society become a reality. It is not sufficient to respond only to current mobility demands, but also to be proactive in anticipating future needs, challenges and options. The ITS Directive, Digital Single Market and Energy Union along with the funding instruments of Horizon 2020 and the Connecting Europe Facility (CEF) are essential in this regard.

The ESIF are involved in realising the European Digital Agenda, one of the flagship initiatives of the Europe 2020 strategy, whose aim is to boost 'EU economy by delivering sustainable economic and social benefits from a digital single market'. The regional and national strategies for smart specialisation should entail a range of ICT-related interventions paying specific attention to the deployment of digital services in cross-border regions.

5. Financing Transport Infrastructure in Cross-Border Regions

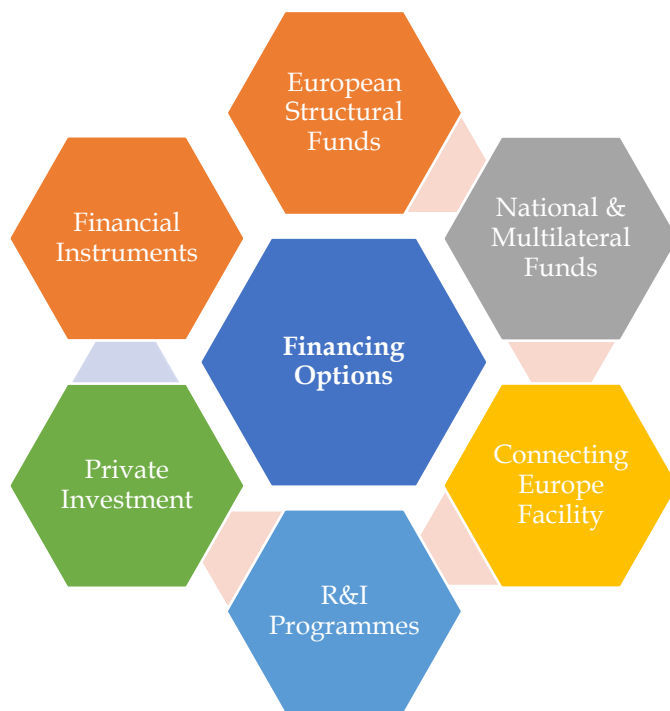
KEY FINDINGS

- The investment needs for European transport infrastructure are substantial, in the order of €750 billion just for completing TEN-T.
- Public funds are not able to cover such budget, so the challenge is attracting private investors. An action plan on making the best use of new financial schemes with twelve concrete recommendations grouped into four blocks was published in 2015. Since then, several measures have been put in place. Many of the recommendations in this plan can help realise missing cross-border links.
- There is a wide range of options for financing transport infrastructure at EU level, including the ESIF, National and Multilateral Funds, CEF, Research and Development (R&D) Programmes, Private Investment or Financial Instruments.
- Relevant ESIF for transport infrastructure are the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), as well as the CEF, the main EU co-funding instrument for TEN-T investments.
- EFSI is a financial instrument that aims at mobilising private financing for strategic investments and stimulating the funding of economically viable projects with higher risk.
- EIB supports through the EIAH is increasing and it is turning into a powerful tool in the definition of financial instruments and blending options, as the European Commission's recent evaluation of the EFSI package has demonstrated.
- The INTERREG programme was and still is the only EU-level instrument which provides substantial and multiannual funding for ETC, remaining the primary source to finance SSCBI projects.
- The specificities of small scale cross-border projects, notably the limited budget, creates difficulties on the mobilisation of financing. Alternatives ways must be sought.
- The main focus of EU funds is the TEN-T core network, but missing small-scale projects are not necessarily located on this network, pointing to the need for a CEF call for SSCBI projects. In 2016, a specific call for SSCBI projects was launched. The call was opened under the Annual Call with a total budget of €110 million.
- Joint utilisation of more than one financing option to exploit complementarities and realise synergies has been advocated by the EC, as a way to overcome the inherent limitations of each option.
- Proposals for the combinations of instruments and programmes are commonly centred around the ESIF. These include the utilisation of ESIF with other EU instruments and programmes, such as CEF, Competitiveness of Enterprises and Small and Medium Sized Enterprises (COSME), Horizon 2020.
- Proposals for the joint combination of ESIF and EFSI have also been proposed.
- The Research and Innovation Strategies for Smart Specialisation (RIS3) is pivotal to provide visibility to cross-border regions and unlock funds for SSCBI projects.

5.1. Introduction

Reliable and efficient financing instruments are key to the successful deployment of any policy or strategy. At the EU level this is no exception and, over the last decades, a wide diversity of instruments were created. Figure 10 lists those most well-known and popular for financing transport infrastructure projects.

The diversity enhances the possibility of finding suitable opportunities. Yet, reality evidences the high difficulty of financing SSCBI projects. Indeed, the preferable solutions remains the INTERREG (an instrument of the Regional and Cohesion Policy).

Figure 10: Sources of Financing Instruments for SSCBI projects

Several factors contribute to the current situation. Some of them were already discussed in Section 2.3. Others are now briefly discussed. Some of the instruments options have been original formulated having in mind (very) large scale projects, such as the TEN-T corridors, which present distinctive characteristics of SSCBI projects. By way of example, the ex-ante assessment studies required for a large project are not feasible in the context of a SSCBI projects. Another example is related with the loans offered by the EIB, such as the Loan Guarantee Instrument for Trans-European Transport Network Projects (LGTT). These standard loans are usually targeted at projects with a volume of

more than €50 million. Bearing in mind that a SSCBI project is by definition inferior to €1 million, they are automatically excluded of such source. On national public financing, the Metis study^[7] has summarised the main issues, as follows:

- Lack of priority given to small scale cross-border projects from national authorities and national transport operators due to its higher costs of operation and maintenance, lower traffic and to a tendency to favour strictly national investments,
- Dependency of Local Regional Authorities (LRA) on national bodies or powerful state enterprises, frequently with lack of bargaining power to secure funds for small scale cross-border,
- Stabilisation and Growth Pact preventing Member States and LRA from engaging in high levels of new long-term debt together with evidence of a lack of information on the on/off balance sheet treatment of privately developed projects,
- State aid rules are perceived as being complex and having difficult exceptions,
- Economic and financial crisis has created lack of funds (public and private) for infrastructure investment, and dependence on the EU. This is aggravated by the increasing number of cleaner vehicles, which reduce public revenues from fuel excise duties.

In what concerns the private financing, the same study highlights that:

- Small-scale cross-border, particularly for road transport, is not profitable enough to attract private investment,
- Potential conflicts between the complex range of MA goals and the profit-oriented focus of private sector fund managers,
- The economic crisis has also scaled back project preparation, meaning fewer 'on the shelf' projects awaiting funding, which creates a lack of long-term visibility in the project pipeline, essential for investors to plan their investments.
- Some Member States are reluctant to use private finance because they prefer EU grants or have had bad experiences with poorly designed Public-private partnerships (PPP) creating a negative environment for investors,

- Regulatory barriers make it difficult for transport projects to materialise and receive the needed long-term investments: lack of clear, harmonised and simple rules to appraise projects and issue permits, lack of adaptation of procurement procedures to the use of private finance, lack of consistency and clarification of state-aid rules,
- Financial regulation (Basel III, Solvency II, etc.) is perceived as a barrier to the supply of private long-term finance,
- Lack of earmarking of revenues and non-monetised benefits of transport. Distortions such as the fact that railways pay carbon taxes even when they divert demand from a more polluting transport mode, the fact that aviation fuel is tax-free and road transport is often subsidised during crisis.

Another situation is related with the regulation of some funds. By way of example, according to the Common Provisions of the ERDF^[73], projects are subject to ex-ante conditionality, meaning they must be part of a comprehensive master, plan or plans for transport investment in accordance with the MS's institutional setup which supports infrastructure development and improves the connectivity to the TEN-T comprehensive and core networks. Moreover, in the case of railways, inland waterways, maritime or inland ports projects, the transport plan must include a mode-specific section. This implies that SSCBI projects have to be previously recognised as a priority in each MS, which, following the above discussion, is of difficult achievement. Moreover, in the case of urban mobility projects, some MS stipulate the development of comprehensive transport plans at regional scale as a pre-condition for these in the respective regional operational programs, although no specific ex-ante conditionality is foreseen in the ERDF regulation.

It is also important to note that the current focus of EU financing is the TEN-T core network. Consequently, SSCBI projects located elsewhere are not eligible. A small, but relevant, step has been given recently in the CEF call for proposals in 2016, where a dedicated section to support SCCBI projects on the TEN-T comprehensive and core networks was included with a total available budget of €110 million.

5.2. Instruments for Financing Small-Scale Cross-Border Infrastructure (SSCBI) Projects

5.2.1. European Structural and Investment Funds (ESIF)

ESIF aims to support the Europe 2020 strategy for smart, inclusive and sustainable growth. There are a total of five ESIF:

- the ERDF,
- the CF,
- the European Social Fund (ESF),
- the European Agricultural Fund for Rural Development (EAFRD) and
- the European Maritime and Fisheries Fund (EMFF).

Its funds are based on multiannual operational programmes that define the overall investment strategies of Member States as agreed with the European Commission. Of specific interest is thematic objective 7, 'Promoting sustainable transport and removing bottlenecks in key network infrastructures', which is closely connected to the TEN-T network and particularly to the core network (integrating or not the core network corridors). The specific legal provisions on financial instruments are set out in Regulation (EU) No 1303/2013 of the EP and of the Council of 17 December 2013. Table A- 11 in Annex describes the ESIF budget, distinguishing between ERDF and CF, for thematic objective 7 per Member States and for Technical Assistance (INTERREG). One of the main objectives of the ESIF policy framework is to emphasise the need for more use of financial instruments, particularly in a context of

fiscal retrenchment: the overall aim is therefore to deliver more ESI funding through financial instruments in future.

With the ESIF 2014-2020 package the European territorial cooperation objective was strengthened^[74]. For the first time, it is not regulated as part of the ERDF regulation, but is subject to a separate regulation. Legal links between the EGTC regulation and EU cohesion policy regulations have been strengthened. References to the EGTC instrument can now be found in both the Common Provisions Regulation and the ETC Regulation^[75].

The ERDF and the CF are the relevant ESIF for transport:

- The ERDF aims to strengthen economic and social cohesion through the correction of imbalances between different regions. There is a thematic concentration in four main priorities with the allocation of resources varying across categories of regions defined against GDP. For the category of low-carbon economy projects minimum ERDF resources are stipulated per type of region. The overall budget for the period is €185 billion.
- The CF aims to support poorer regions through co-financing actions that seek to develop TEN-T and support sustainable transport projects that are not part of TEN-T in order to further the EU's environmental objectives. The co-financing rate is 85 % for 15 Member States²⁴. Nearly €63.4 billion are allocated to projects falling into these two categories: priority TEN-T projects (€10 billion) and the environment. This last category foresees projects aiming to strengthen public transport networks or support inter-modality, but also rail transport development.

The ERDF and the CF together with the ESF are the financial instruments of the EU Regional and Cohesion Policy. The Regional and Cohesion Policy is a main policy of the EU aimed at reducing unbalances and disparities between regions, and improving economic well-being by supporting job creation, business competitiveness, economic growth, sustainable development, and improve citizens' quality of life. It targets all regions in the EU, but the less developed ones are understandably a priority. A total of €351.8 billion were allocated for the period of 2014-2020.

As highlighted on the 25th anniversary of INTERREG, the program was and still is the only EU-level instrument which provides substantial and multiannual funding for European territorial cooperation. The key strengths of INTERREG cross-border programmes have been recently summarised^[76]:

- INTERREG programmes are at the heart of European integration and have a true cooperation focus,
- INTERREG programmes build capacity and trust, facilitate a change in the mind-set of EU citizens and promote a long-term cooperation culture,
- INTERREG cooperation is good at identifying common problems in border regions (land or maritime) and solving them together (i.e., between two-three (or more) countries, on local and regional levels),
- INTERREG cooperation creates a critical mass and enables the joint ownership of the results,
- INTERREG cooperation strengthens the common identity of the cross-border region,
- INTERREG cooperation enables multi-level participation, capacity building and shared responsibility,
- INTERREG cross-border cooperation programmes find innovative ways to overcome political bottlenecks and influence legislation between the countries concerned,
- INTERREG programmes provide the ground for testing and experiencing new solutions at a local level and on a scale necessary for the characteristics of the territory.

²⁴ Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Slovakia and Slovenia.

This funding has allowed the development of many thousands of projects plus many strategic initiatives which would in most cases not have been implemented otherwise, or at least not with the same timing, scope and depth. INTERREG has significantly widened and intensified political and administrative exchanges in many policy fields across Europe, stimulated the Europeanisation of public administrations at all levels, and enhanced a practice of cooperative self-organisation between decentralised government levels from different countries. Nevertheless, a common remark is that relatively few resources are available for decentralised programmes such as INTERREG to bridge missing small-scale links in Europe's border areas, even though these programmes could better consider the local needs of the cross-border region in question.

The assessment of the working group follow-up to the Luxembourg Presidency also reinforced the conclusions from the ex-post evaluation of INTERREG 2007-2013 that ETC programs contribute to overall EU objectives such as the Lisbon Strategy but sometimes lose the focus on specific objectives of cross-border integration. Moreover, it concluded that the support given by INTERREG was insufficient to meet legal and financial challenges. In particular, Member States often transpose the directives without fully taking into account interoperability across borders. Consequently, the intensity of INTERREG funding is inadequate to cover the costs of significant cross-border infrastructure.

5.2.2. Connecting Europe Facility (CEF)

The CEF is the main EU co-funding instrument for TEN-T investment^[29]. Generally speaking, CEF Transport is a facility to fund studies and investments for large-scale infrastructure. The programme's implementation is managed by the Innovation and Networks Executive Agency (INEA), which is also responsible for the implementation of Horizon 2020.

CEF financial support takes primarily two forms:

- grants, which are non-reimbursable investments from the EU budget,
- contributions to innovative financial instruments, developed together with entrusted financial institutions such as the EIB.

CEF aims to create up-to-date, high-performing infrastructure connecting and integrating the EU and its regions. It supports projects that fill missing links and remove bottlenecks, with a focus on EU added value (e.g. cross-border), EU priorities and projects of common interest (as defined in accompanying guidelines). The main objective of CEF Transport is to help complete the TEN-T core network and its corridors by 2030 and the comprehensive network out to 2050. A total budget of €22.4 billion has been set aside for grants for TEN-T projects in Member States for the period 2014-2020. From this budget, €11.3 billion is reserved for projects in Member States eligible for cohesion funds.

Nearly €19.3 billion (approximately 86 % of the CEF budget for transport) was already allocated to TEN-T projects in calls in 2014 and 2015. Preliminary results for the CEF 2016 call, for which €1.9 billion were available, show an over-subscription rate of 3.86 and a budget requested of almost €7.5 billion.²⁵

In 2016, a specific call for SSCBI projects to complement major cross-border projects of the core network was launched. The call was opened under the Annual Call with a total budget of €110 million. Missing links and bottlenecks on cross-border sections located in the comprehensive and core networks (outside the sections identified in Annex I of the CEF Regulation^[77]) and compliant with the definition set out in article 3 of the TEN-T Guidelines (connections between the nearest urban nodes on both sides of the border) are eligible.

Specific points of attention for this call:

- Projects stimulating regional cooperation across borders,
- Projects enhancing accessibility of the core network and core network corridors,

²⁵ 2017 CEF Transport Blending Info Day, 27 February 2017.

- Technical or legal studies (preparation of permission procedures or tenders), financial studies, feasibility studies for public-private partnerships or other forms of project finance models.

As acknowledged previously, several small-scale missing links have been identified on the basis of the inventory undertaken by Cramer^[6] (Greens, Germany). One of those projects was on the Spanish-French border. It was selected for funding under the call for small-scale cross-border projects (Box 19).

Box 19: Pau-Zaragoza cross-border railway section under the CEF call for small-scale cross-border projects

The 310-km Pau-Zaragoza cross-border railway line links France to Spain, crossing the Pyrenees through the Somport tunnel. The Spanish section is operational but not interoperable; the French section needs upgrading to meet the increasing demands for freight and passenger traffic.

The project aims at reopening the cross-border line by re-establishing a missing link and a cross-border section and connecting it with the Zaragoza and Huesca regional logistics hubs, contributing to more dynamic economic activity along the Pyrenees and strengthening the connection of the Iberian Peninsula to the TEN-T network.

In 2017 a novelty in CEF was introduced with the CEF blending call launched in February 2017 for proposal submissions in July and November 2017. Results show that €2.21 billion of funding was requested under the first cut-off date of the call in July 2017 for an indicative budget of 1 billion.

The rationale for this blending call is that support through financial instruments (e.g. debt financing) may not always be sufficient for the projects needed to complete the TEN-T network. A targeted grant would in some cases enable a financial case to be established. This means that blending, in the context of this call, is the use of CEF grants in projects utilising private finance, or with finance from national promotional banks or the EIB. EFSI should be used whenever possible to maximise the leverage of private sector involvement.

This call introduces some specificities and conditionality: first the project total cost should exceed €10 million for implementation until 2023. Only works are supported and impact, maturity and cost-benefit analysis (including funding gap) have been streamlined. An assessment of financial readiness (e.g. letter of support) by public or private financial institutions needs to be provided as well as a PPP/concession model, and the project must be evaluated to assess its maturity.

A specific requirement of the CEF is formal approval of a project by all the countries where it will be implemented. This formal procedure can limit the potential for cross-border regions to take a more active role in the programme, notably when projects fall outside the core network or if they are not backed up by national transport priorities.

CEF, the CF and ERDF are meant to complement each other: the ERDF can be used where a project's business case is weak or lacking, while CEF financial instruments are meant to make specific projects commercially viable by ensuring lower interest rates and longer contract periods.

5.2.3. National and Multilateral Funds

Owing to the local dimension of the SSCBI projects, LRA are commonly in charge for executing these projects. Depending on the size, LRA may use own budget or apply for other regional or national level funding opportunities. Additionally, MS may establish specific bilateral or multilateral agreements. A good example is the Euroregion Aquitaine-Euskadi and Aquitaine-Navarre's interregional funds, which are supported by the regional governments and intended to finance bilateral projects of CBC between Aquitaine (now Nouvelle Aquitaine) and one of the Spanish autonomous communities²⁶. Also the tram running between Strasbourg (France) and Kehl (Germany) was largely funded by national contributions

²⁶ As of 2017, EGTC Nouvelle Aquitaine-Euskadi – Navarre.

combined across the border. The example in Box 20 highlights a dedicated fund for cross-border commuting in the Canton of Basel-Stadt.

Box 20: Basel-Stadt 'Pendlerfonds'

The Canton of Basel-Stadt includes three municipalities in a densely-populated area of nearly 5 300 inhabitants per square kilometre. It is the centre of a tri-national region (Switzerland, France and Germany) joined by the River Rhine with about 800 000 inhabitants.

The transport policy of Basel makes it a legal obligation to act to reduce private motorised traffic by at least 10 % until 2020 (national motorways are excluded) and creates a fund for this, which is fed by 80% of the revenues from commuter and visitor parking tickets. Through this fund, it is possible to co-finance projects which support a sustainable reduction in individual motorised traffic in the Canton of Basel-Stadt, or the demand for public parking space. Co-financing is for projects within the tri-national region, managed by public as well as private organisations from inside and outside of the Canton.

The fund can be used for planning, the construction of parking facilities and other infrastructure for environmentally-friendly commuter traffic, for running public transport or for new pricing models. It is also valid for start-up financing (maximum three years) and in connection with a P&R-facility outside of the Canton Basel-Stadt. In terms of functioning, there are two competitive calls per year (in March and September) for a maximum co-financing budget of CHF2 million per project. Project evaluation considers the (quantifiable) benefit for the Canton Basel-Stadt in terms of reducing private motorised traffic and/or of parking on public roads.

The program started in 2013 with a CHF2 million loan. Increasing revenues depends on the stepwise implementation of the city-wide parking space management. Expected annual revenue from 2017: CHF2 to 3 million.

5.2.4. Research, Innovation and Competitiveness-related Programmes

The EU strategic political agendas offer additional opportunities for financing SSCBI projects. Looking into the current top priorities of the European Commission for the period 2015-2019, several are relevant for these projects, such as the Jobs, Growth and Investment; Digital Single Market; Internal Market; or the Energy Union and Climate. Each strategy is used as a reference framework for activities at regional, national and EU levels, being supported through a generous programme and multiannual budget.

The EU framework programme for R&D is the Horizon 2020 or H2020. It runs from 2014 to 2020 with a budget of nearly €80 billion. The H2020 is a key instrument to secure EU's global competitiveness. H2020 programme has three main priorities: scientific excellence, industrial leadership and tackling societal challenges. It offers a wide variety of instruments for research and innovation activities. H2020 can be an additional source of financing, provided such activities can be included in any stage of a SSCBI project. Examples of such instruments include the:

- Research & Innovation Actions,
- Marie Skłodowska-Curie Grants,
- ERA-NET Funds,
- Knowledge and Innovation Communities of the European Institute of Innovation and Technology,
- Joint Research Centre.

By way of example, the small scale cross-border project may be a case study or a pilot case of a R&D project; or it may be object of ex-ante or ex-post assessment exercises.

The H2020 projects can leverage the deployment of technological solutions, by using as pilot cases cross-border regions. Several of the examples listed in Section 3 (e.g., REETS Project, the Bonvoyage Project or SocialCar Project) are examples of such possibilities. The projects have the main advantage of bearing the risk of the initiative, while the benefits are for the regions. Naturally, these are only small-scale

pilots, often in the form of prototypes, but allow to assess the advantages and viability of the business model.

Other relevant example is the Erasmus+ programme, the EU programme for education, training, youth and sport. The budget for the 2014-2020 period is of €14.7 billion and it is expected to involve as much as 4 million Europeans. Erasmus+ plus has three main pillars: mobility exchange, cooperation projects, and promoting physical activity. The first two pillars can be of use in the case of SSCBI projects. They are dedicated to raise and consolidate competences of people and organisations. In the case of the mobility exchange pillar, Erasmus+ supports vocational education and training students as well as staff mobility. In the case of the cooperation projects, it is supported knowledge alliances or sector skills alliances. The lack of expertise and competences of LRA is a known barrier to the widespread utilisation of other more complex or less known funding schemes, discussed in the following sub-sections. The Erasmus+ programme offers an opportunity for LRA raising the competence level of their human resources, either by hiring new professionals or by training their own.

The COSME aims to make it easier for small and medium-sized enterprises to access finance in all phases of their lifecycle – creation, expansion, or business transfer. In particular, the programme supports businesses to access new markets in the EU and beyond. COSME facilitates access to loans and equity finance for SMEs where market gaps have been identified. It has two main instruments: the loan guarantee facility and the equity facility for growth. In the former, COSME will fund guarantees and counter-guarantees for financial intermediaries. In the latter, COSME will invest in risk-capital funds that provide venture capital and mezzanine finance to expansion and growth-stage SMEs, in particular those operating across borders.

Finally, a brief mention to the Creative Europe programme. It aims to help the cultural and creative sectors to seize the opportunities of the 'digital age' and globalisation while safeguarding and developing European cultural and linguistic diversity. The programme facilitates the access to finance for cultural and creative sectors.

5.2.5. Financial Instruments (FI)

5.2.5.1 European Fund for Strategic Investments (EFSI)

EFSI is a joint initiative of the EIB and the European Commission which aims to overcome current market failures by addressing market gaps and mobilising private investment. EFSI support can be combined with EU grants from the CEF and Horizon 2020 as well as from those^[78]. EU funds implemented by Member States authorities under shared management, namely the ESIF. Its portfolio of projects covers strategic infrastructure investment including the digital, transport and energy sectors.

A specificity for EFSI is that projects have to be bankable and contribute to EU objectives, namely sustainable growth and employment. Potential beneficiaries are, besides companies, banks and public sector entities, also funds and collective investment vehicles. Investments supported by EFSI require a volume of at least €75 million.

The EIAH that started operating on 1 September 2015 is a joint initiative of the Commission and the EIB to support EFSI implementation. The hub provides a single access point to wide-ranging advisory support for projects and investments engaging with public and private promoters at all levels of the project cycle, from upstream project identification, through to planning and preparation to implementation. The hub is managed by the EIB and builds on a network of partner institutions, including national promotional banks.

The European Commission is also providing support through the European Investment Project Portal, a web portal that lets EU-based project promoters – public or private – reach out to potential investors worldwide. The portal is hosted by the Commission and is designed in response to investors' desire to see more potential EU investment opportunities via a central information platform. Projects with a total budget of €5 million or more are eligible. Cross-border projects with non-EU countries are also

permitted as long as the investment benefits and takes place in (at least in part) one EU Member States. Promoters are required to pay a fee to publish their project.

The FI-Compass platform²⁷ was also established to support managing authorities wishing to co-fund financial instruments under their structural fund programmes, notably in the context of the Jeremie, Jessica and Jasmine programmes. This platform provides advisory services for all Member States and types of Financial Instruments (FI). The work is carried out by the EIB to promote the development of FI in sectors with high potential but limited experience and to provide multiregional assistance, or support for the use of FI targeting development objectives or market failures shared by several regions. A further strand covers bilateral assistance including ex-ante assessments of FI supporting managing authorities intending to implement FI in their territory. Member States must use their own technical assistance budgets for tasks such as the ex-ante assessment.

On 14 September 2016, the European Commission, in accordance with Article 18 of Regulation (EU) 2015/1017, proposed to extend EFSI until 31 December 2020 and introduce technical enhancements for it and the EIAH.

The new proposal, referred to as EFSI 2.0, includes an increase in the EU guarantee from €16 to 26 billion and in EIB capital from €5 to 7.5 billion, which should mobilise private and public investment of €500 billion over the period until 2020^[79]. The proposal also focuses on project sustainability, enhancement of geographical coverage and ways to reinforce take-up in less developed regions. It aims to enhance the transparency of investment decisions and governance procedures, and reinforce the social dimension by means of additional financial instruments. COP21-oriented projects and cross-border projects will be reinforced with EFSI 2.0. Figure 11 presents the key features of the Commission proposal.

Figure 11: Key features of the European Commission's proposal on EFSI (extension of duration; technical enhancements for the Fund and the EIAH)



One of the European Commission's recommendations is to place a stronger emphasis on leveraging local knowledge through the EIAH. The hub will provide more targeted local technical assistance across the EU. Its plans are further detailed in Box 21.

²⁷ More information available at: <https://www.fi-compass.eu/> (accessed on 16th November 2017).

Box 21: European Investment Advisory Hub

EIAH 2016-2020

Main sectoral and thematic priorities:

- EFSI 1.0: energy efficiency, TEN-T and urban mobility;
- EFSI 2.0: COP21-oriented, potential interest for EFSI and possibly cross-border projects;
- Investment platforms and capacity-building activities (cross-border platforms are also envisaged).

Main strategic orientations:

- Strengthening, expanding and deepening partnerships with a view to promoting a cooperative approach, notably by clarifying roles and responsibilities, ensuring alignment of interests, demonstrating the hub's added value via a pilot phase of deepening on a voluntary basis, and defining a common reporting structure;
- Consolidating the hub's relevance, additionality and improvements for a greater impact on the real economy; in particular, increase visibility, address market asymmetries, streamline the management of requests and enhance synergies with EFSI.

Source: EIB presentation during the 3rd working group meeting on innovative solutions to cross-border obstacles, Luxembourg Presidency of the EU follow-up, December 2016

Article 2 of the EFSI Regulation also introduces the concepts of investment platforms such as a Special Purpose Vehicle (SPV), managed account, contract-based co-financing or risk-sharing arrangement or arrangement established by any other means by which entities channel a financial contribution to finance a number of investment projects. Investment platforms may include:

- national or sub-national platforms that group together several investment projects on the territory of a given Member States,
- multi-country or regional platforms that group together partners from several Member States or third countries interested in projects in a given geographic area,
- thematic platforms that group together investment projects in a given sector.

The key features of investment platforms reveal interesting opportunities for cross-border projects and notably an opportunity to enhance the role of EGTC in EFSI:

- pooling of projects with a thematic or geographic focus,
- flexible geographic scope – possibility to finance projects in a region, country or group of countries including macro-regions,
- flexible form – co-financing agreement, SPV, fund, etc. possible,
- possibility for an EGTC to set up investment platforms not yet explored,
- more efficient risk allocation between investors (lower transaction and information costs),
- useful to pool or bundle small projects,
- possibility to combine EFSI and ESIF, EIB and/or other support (from Member States, private investors),
- cooperation with national promotional banks and institutions under specific rules (explicitly envisaging a 'regional cross-border platform'),
- EIB-AS and EIF-MM Services dedicated to the design of and support to local/regional investment platforms.

In addition, an EU report on ESIF/EFSI complementarities notes the following possible combinations:

- MA could set up a new investment platform in which EFSI and other investors invest their resources including in the form of a layered fund,

- MA could make an ESI Funds programme contribution into an existing investment platform set up with EFSI resources (and other private sector investment) at national, regional, transnational or cross-border level,
- MA could set up a financial instrument (with or without a fund of funds (FoF)) in which the investment platform set up with EFSI support could participate as an investor (at the level of FoF or financial intermediary),
- MA could set up a financial instrument with ESI Funds programme contributions. The investment platform set up with EFSI support would intervene directly at project level on a deal by deal basis.

5.2.5.2 *European Investment Bank (EIB)*

The EIB also supports investment through loans and financial instruments such as lending, a structured finance facility and a LGTT. Fund investment from public and/or private sources such as the Marguerite fund and the European Energy Efficiency Fund are also possible. These standard loans are usually targeted at projects with a volume of more than €50 million.

The main instruments provided by the EIB to support transport and infrastructure projects are:

- Lending, often with maturities of more than 30 years, directly for major projects and via intermediaries such as local banks for smaller operations. Direct loans are provided for individual projects with total investment budgets of more than €25 million. In certain cases, direct loans can go to midcap companies with up to 3 000 employees with a loan volume of between €7.5 million and €25 million. These loans can cover up to 50% of a project's total cost, but the average contribution is about one-third. Projects classed as TEN-T can get extra help^[80].
- A Structured Finance Facility allowing a higher degree of credit risk in project financing in the form of additional support for priority projects using instruments with a higher risk profile than are normally accepted^[81]. These priority areas include TEN-T and other infrastructure.
- A LGTT, launched by the EIB and the Commission in 2008. It aims to promote private sector (e.g. PPP) involvement by helping private investors overcome the most critical ramp-up phase which is 5-7 years after the opening of a project. LGTT provides guarantees against demand risk in this period of up to 20 % of total senior debt. It gives the EIB the possibility of accepting debt with higher financial risk than normal. A basic condition is that the project is financially viable, i.e. the financial problem to be overcome via the LGTT is only expected to be temporary.
- Fund investment from public or private sources such as the Marguerite Fund. Targeting a minimum investment of €10 million and a maximum of 10 % of the fund's total size; at least 65% of the Fund shall be invested in green field projects.

Furthermore, the Europe 2020 Project Bond Initiative, initiated by the European Commission and EIB, aims to revive and expand capital market options to finance large TEN projects in transport, energy and communications. The Project Bond Credit Enhancement facility has been established. This instrument supports senior project bonds issued by infrastructure project companies. The Europe 2020 Project Bond Initiative is the issuing of private debt by the project company, which is split into senior and subordinate tranches. The EIB finances the subordinate tranche (by loan or a contingent credit line), which enhances the credit standing of the project to a level where institutional investors such as insurance companies or pension funds are willing to buy bonds from projects otherwise perceived as risky. EIB direct financing is in general targeted at projects with a volume of more than €50 million. Smaller projects are funded via global grants or infrastructure funds (Box 22).

Box 22: Lisbon's EIB Loan

The city of Lisbon has recently successfully applied to a 30 year €250 million EIB loan. Following the financial crisis, Portuguese banks have been unable to provide lending which is sufficiently long-term to support major infrastructure projects. This market gap in long-term lending meant that the EIB was also able to use the EU budget guarantee and its own funds behind the Investment Plan for Europe's

EFSD, making Lisbon the first EU municipality to receive direct support from the Plan. The loan will enable Lisbon's urban renewal strategy for the 21st century. The strategy foresees investments in numerous streams, including transport sector under the title 'innovative mobility and car parking facilities'.

5.2.6. Private Investment

The idea of raising private capital to complement sparse public budgets is growing. Apart from new infrastructure, there is a need to renew the already existing but ageing infrastructure, which implies further additional investments. Investments in innovative solutions contributing both to decarbonisation (e.g. alternative fuels deployment) and to make better use of existing infrastructure (e.g. for ITS deployment) will generate a pool of projects too for which it is also necessary to secure financing.

This type of investment is typically the responsibility of the public sector. But in a fiscally constrained environment private participation becomes very important (concession financing, PPP or direct private sector investments). A procurement model that allows for optimal risk allocation and sets incentives for the project's costs and revenues to be optimised during implementation and operation is the goal.

The liquidity available on capital markets is very high, with the OECD estimating that it corresponds to nearly 90 % of the EU's GDP^[82]. Institutional investors such as pension funds and insurers are a reliable source of long-term capital, as they need to match their liabilities with long-maturity assets. This makes institutional investors particularly suited to undertake counter-cyclical, long-term investments in sectors of the real economy characterised by high productivity and therefore able to generate stable revenue streams^[19].

A growing interest in infrastructure debt is appearing. Such debt is usually long-dated and provides a more attractive yield than other fixed-income products such as government or corporate bonds. It is a good fit with institutional investors' dated liabilities such as pensions and insurance pay-outs. However, the inclusion of private sector financing poses specific problems, which were discussed in the CBS Report^[19]. The resulting action plan focused on a set of measures to make best use of financial schemes with a particular emphasis on European transport infrastructure projects. Whether those findings and learnings could also be adapted to small-scale cross-border projects needs further elaboration.

5.2.6.1 Public-private partnerships (PPP)

Transport infrastructure has traditionally been considered a precondition for economic development at various geographical levels (local, regional, national, European). At the same time the reduced ability of public budgets to directly fund transport infrastructure has in recent years led to the adoption of funding schemes involving private funds and contractual models known as PPP. These schemes have been operating across Europe for several years already, in different arrangements and with varying degrees of success.

Motorways with tolls, ports, airports and even logistics platforms have been implemented as PPP, following a diversity of business models. The activities developed within the BENEFIT research project²⁸ concluded that while the implementation context (macro-economic conditions, country competitiveness, supporting institutions) is beyond the control of project decision-makers and may significantly influence project performance, there are also actionable factors (endogenous to the project) that may be influenced by them^[83]. One such actionable factor is governance. The quality of project governance may reduce or improve the effect of institutional support.

Actionable factors may be categorised as structural and policy. Structural factors are mostly defined during a project's planning, tendering and award stages (project maturity, business model and contractual conditions/configuration). Their improvement improves the potential for achieving project

²⁸ More information available at: <http://www.benefit4transport.eu/> (accessed on 16 November 2017).

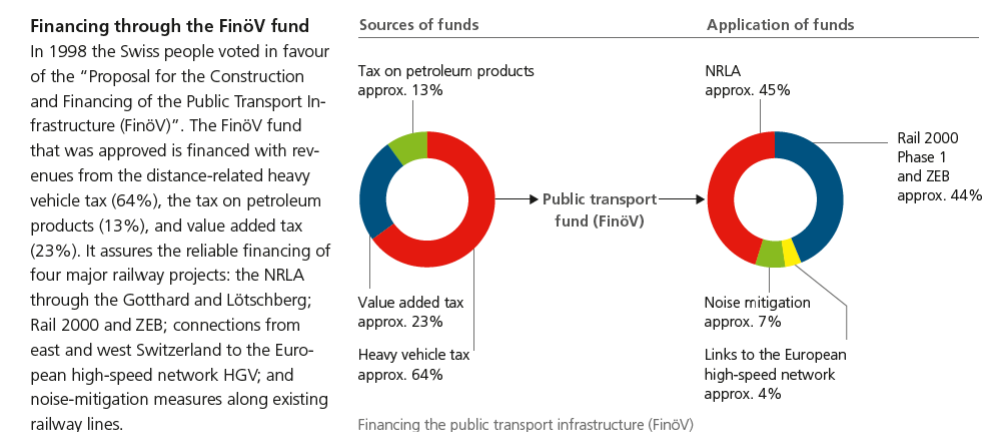
targets. Policy factors are actionable throughout the project life-cycle and might induce trade-offs with respect to the achievement of project outcomes (financing structure, project income (remuneration scheme) and project revenue streams). The German PPP models, notably the A-model (private contractor receives the road toll paid by heavy duty vehicles for use of a certain road section as refinancing) is highlighted in the CBS report^[19] as an efficient model. This report also records that procurement with a life cycle approach has proven to be efficient, with strong competition and adequate pricing guaranteed by efficient risk allocation. Moreover, this can facilitate a reduction in construction time combined with high levels of quality in both construction and operation. In the case of railways, the report highlights two private funding business models:

- Life cycle concession/concession-like models, where the concessionaire provides the infrastructure while the state, railway undertakings and infrastructure manager pay amortisation and interest;
- Dedicated transport funds from a mix of environmental taxes, road charges and taxes earmarked for this that are pooled together (see the Finov case below - Figure 12).

In the Metis study^[7], the question is raised about the adequacy of such models for small-scale projects, given the difficulty of revenue generation. Cross-funding solutions aimed at value capture are not uncommon for infrastructure or in other utility sectors and might represent a potential business model.

A special case for the use of private funds to finance transport infrastructure through a PPP comes from the implementation of the 'user pays' principle, which states that users shall be responsible for paying the costs associated with the services or products they consume. In this case, the principle would imply that the payment of transport infrastructure investments would originate from the user, for example through fares, fees or tolls. It would constitute a form of private investment. Most PPP associated with user pays schemes essentially represent a case where the private investor is given a concession over a certain period of time in exchange for funding the immediate investment for the infrastructure. In return, they are given the chance to charge certain fees or fares to users, allowing them to the investment with a given rate of return.

Figure 12: Financing transport infrastructure, the case of the FinöV fund^[84]



These special cases are particularly relevant for ports and airports but, as both PPP and user payments become more common, they are being extended to roads, railways and public transport. Importantly, certain directives, of which the most important is the Eurovignette Directive, stipulate the cost categories that can be leveraged through tolls and vignettes to road users (e.g. for constructing, operating and developing infrastructure)^[85].

In addition, the application of the polluter pays principle, which is established by Article 191(2) of The Treaty of the EU, may lead to the application of higher charges, tolls or fees to internalise the environmental costs of transport. Whether some of the revenues from such activities shall be used to finance transport infrastructure is often a controversial issue. For example, the Eurovignette Directive

has provisions for the internalisation of the external costs but no mandatory provisions concerning the use of revenues (with the exception of specific provisions such as the mark-ups established in Article 7f).

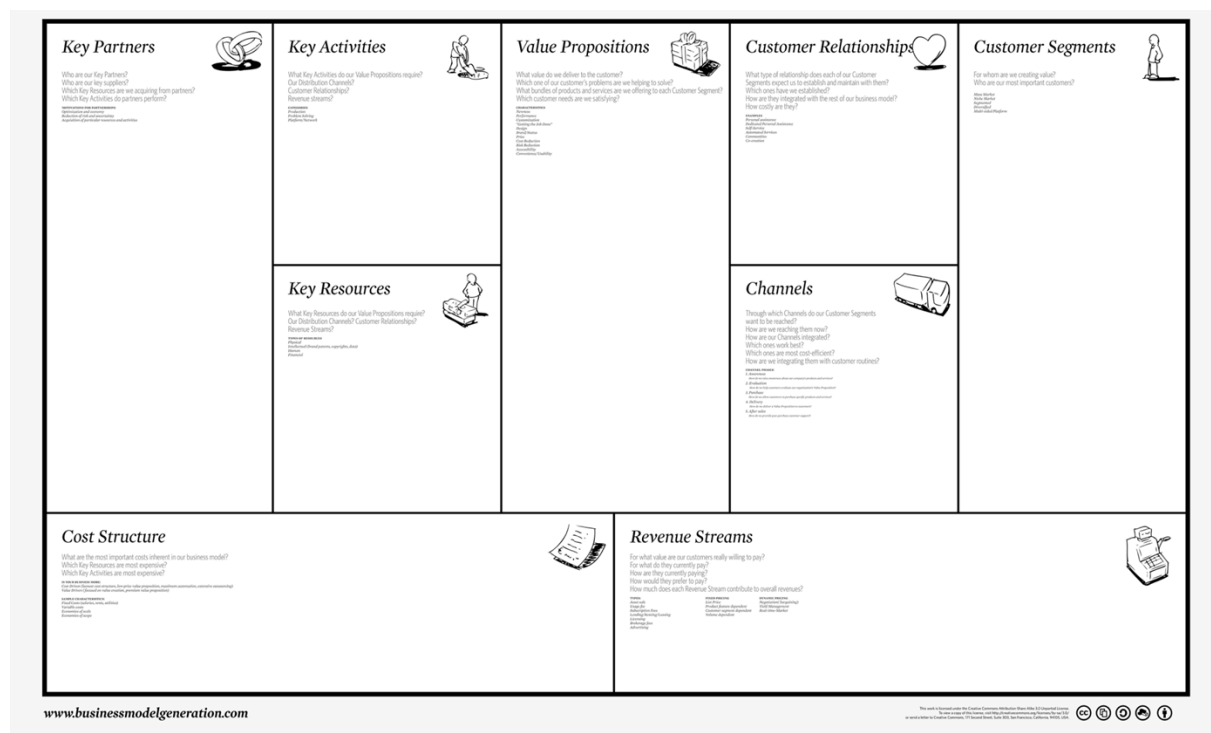
5.2.6.2 Innovative Business Models supporting small scale cross-border Projects

Private organisations are another possible source of funding small scale projects. Their interest depends on the identification of viable business models that can generate enough revenues to cover costs. However, there is a common belief, perceptible in many discourses or documents, that small scale cross-border projects fail to generate viable business models. It is then necessary to invest in viable business models that could support those projects.

The term business model gained popularity in the 1990s to describe the business of the new fast-growing breed of digital and web-based companies (so-called Dot Com companies). Since then the term has gained popularity and nowadays is applied in all economic sectors. The transport sector is no exception. An increasing number of research projects have dealt with business models on various transport domains. Examples include the HERMES project²⁹ (proposed business model for long distance intermodal transport services), TURBLOG project³⁰ (proposed business models for urban logistics services) or BENEFIT project³¹ (proposed business for PPP).

A simple definition was proposed by Osterwalder and Pigneur^[86] that says that a 'business model describes the rationale of how an organisation creates, delivers and captures value'. The value generation is the core of a business models, since it is through the generation of a value that a company attracts customers and generate revenues. These authors popularised a framework, labelled as business model canvas, for analysing business models (Figure 13).

Figure 13: The business model canvas^[86]



²⁹ Further information available at <https://trimis.ec.europa.eu/project/high-efficient-and-reliable-arrangements-crossmodal-transport> (accessed on 16th November 2017)

³⁰ Further information available at <https://trimis.ec.europa.eu/project/transferability-urban-logistics-concepts-and-practices-world-wide-perspective> (accessed on 16th November 2017)

³¹ Further information available at <https://trimis.ec.europa.eu/project/business-models-enhancing-funding-and-enabling-financing-infrastructure-transport> (accessed on 16th November 2017)

The business model canvas offers some insights on how small-scale cross-border project can be considered in the private company's business models. Foremost, these projects could add value to customers, which, therefore, will be willing to pay for it. Many cross-border transport-related PPP follow this business model (e.g., bridge or tunnel toll). A second option is to consider the SSCBI project a resource of the business. The SSCBI project is an enabler of value generation (it does not generate value per se. An example is the case of a hotel, tourist resort or other similar activities that uses (as a resource) the SSCBI to provide access (e.g., road access) to its customers. In this case the SSCBI project is a cost element that needs to be covered by the revenues.

The identification of value generation opportunities in SSCBI projects and the subsequent development of viable business models is not a trivial matter. Tailored initiatives, such as stakeholder engagement or focus groups, needed to be conducted, which entails availability of resources and know-how. Yet, the identification of a viable business model is not an end by itself. Interested organisations in investing are also needed to be found and attracted. This means that SSCBI projects must be actively promoted and disseminated within European investors' forums and other similar events (e.g., start-up companies' gatherings, fairs or conventions). Again, resources are required to conduct such initiatives.

R&D projects can be of valuable support. By way of example, the recently H2020 co-founded HiReach project - High reach innovative mobility solutions to cope with transport poverty, aims at developing viable business models of technological oriented (i.e. ICT) transport solutions in rural areas socially depressed including cross-border regions. Events with local populations and relevant stakeholders, in several pilot areas, will collect elements to support the development of the business models. In addition, the project will organise several events (such as boot camps or start-up accelerator events) awareness and attracting the interest of entrepreneurs.

5.3. Financing Small-Scale Cross-Border Infrastructure Projects

5.3.1. Recommendations to promote small scale cross-border project access to financing

Several projects and reports have addressed the challenge of financing small scale projects. The recently published Metis study^[7] discussed possible financing options and solutions:

- Reform of the EU objectives in transport policy to prioritise small scale cross-border projects outside TEN-T (increase co-funding rates to make up for lower interest of Member States in SSCBI). Cooperation of the EU with national governments to overcome bias in favour of strictly national infrastructure, pointing to the need to reinforce the CEF call for small scale projects.
- Focus on EIB 'standard' loans as a more realistic alternative to Financial Instruments (FI).
- Inclusion of small scale projects in a 'package' or as a more comprehensive development project, highlighting the example of Czech municipalities as a good case.
- EU funding for innovative and cost-efficient business models for operation and maintenance, in order to strengthen LRA's bargaining power and position. In the case of railways, this includes strategies such as:
 - Regionalisation of railway systems via tendering of concessions e.g. revitalisation of Vinschgaubahn in Austria,
 - Supporting the entry of smaller service providers who have lower operation costs but face economies of scale constraints e.g. the case of Landersnahverkehrsgesellschaft Niedersachsen in Germany where local authorities obtained a vehicle pool, lowering the purchase price.
- In the case of roads, business models only apply to charged sections (such as tunnels, bridges and motorway sections), in which case PPP models such as the German approach can work well (Austria is also discussing a new PPP model).

- Foresee less costly solutions such as long-distance buses instead of railways, liberalisation of bus transport, renewal of existing infrastructure and making it interoperable instead of building new infrastructure.
- Use of EGTC for financing, either as owner or investor (with the national level for more safety), or as the project beneficiary, or use the EGTC structure to divide projects into several partial projects eligible for structural funds' support.
- Decouple use of the European Regional Development Fund (ERDF) for upgrading or constructing secondary cross-border links from TEN-T. This is to enable small scale to be funded as part of the CBC programmes (such as INTERREG) and to increase the resources allocated to it accordingly.
- Capitalise on the growing of interest from institutional investors in transport infrastructure by providing FI and blending them with EU grants whenever projects produce revenues or cost savings.

The relevant CBS report^[19] brings forward twelve recommendations, grouped in four blocks, on this topic. For most of the recommendations presented in the report, progress has been made, as the recent EFSI evaluation demonstrates^[79]. For the four most relevant recommendations for this report, the key points are revisited in the boxes below.

1. Strengthening the project pipeline

There is a need for a sound, stable and robust project pipeline (Box 23). In this respect, assistance for the project pipeline, including the identification and financial structuring of projects should be a priority. Dedicated technical assistance, through the EIAH and national advisory and training structures, should focus on supporting stakeholders for project preparation. This includes dealing with environmental aspects as well as project finance and procurement as PPP or setting up a SPV for example. The idea is to help Member States identify projects that could use project finance and advise them on how to adapt their procurement procedures/legal framework to encourage them to do so.

Box 23: Progress on strengthening the project pipeline

For TEN-T, the priority projects identified in Annex I of the CEF Regulation underpin the project pipeline^[77]. Moreover, each TEN-T corridor has identified the main projects to address critical issues and bottlenecks. The mapping exercise carried out as part of individual corridor studies will feed this pipeline with the more mature and relevant projects. Note that for cohesion countries, ex-ante conditionality applies (i.e. projects must be part of a national transport master plan).

For small-scale cross-border projects, notably starting from the pool of possible projects identified in EP and CoR studies, a joint planning process – which could go beyond the transport sector and include other economic activities – can and should be envisaged. This could be encouraged by making use of INTERREG programmes to facilitate the planning of cross-border infrastructure, perform the necessary technical and economic studies, and pool together a map of mature projects.

In addition to EIAH, the investment platforms (regional or thematic) foreseen under EFSI 2.0 represent a major opportunity to promote small-scale cross-border projects.

Box 24: Progress on procurement, permitting and State aid consistency

The EIAH operates as a one-stop-shop for technical assistance for project structuring, financing and, where relevant, legal advice. National structures support project coordination. Several Member States have already integrated various steps – environmental permitting, spatial planning and construction permitting – into a single permitting procedure. In some cases, a leading authority has also been appointed for this procedure.

A 'fast track' procedure for clearance on State aid for financial instruments managed by the EU has been implemented^[87]. In other words, EFSI-supported EIB interventions do not constitute State aid and are not subject to State aid controls. To facilitate the deployment of EFSI, the European Commission will assess EFSI projects as a matter of priority and give them fast-track treatment. The Commission aims to complete its assessment within six weeks of receiving the complete notification from Member States.

A study on permitting and facilitating the preparation of TEN-T core network projects has proposed a set of measures to streamline and simplify cross-border projects (Table A- 12)^[9]. New EU procurement directives also contribute to the simplification of cross-border projects^[88]. These rules address joint contracting by authorities from different Member States, including the use of centralised purchasing activities by central purchasing bodies located in another Member States, and bring clarity to the applicable national laws.

2. Cut the red tape: procurement, permitting and State aid consistency

There is a need to streamline, adapt and simplify procurement procedures to accelerate project implementation and facilitate the use of alternative financing models (Box 24). A number of regulatory barriers are creating difficulties for transport projects to materialise and receive the needed long-term investments: lack of clear, harmonised and simple rules to appraise projects and issue permits; lack of adaptation of procurement procedures to the use of private finance; lack of consistency and clarification of the applicability of State aid rules. Some of the measures proposed aim to accelerate permitting procedures (e.g. one-stop-shop systems) also by streamlining different local or national rules, for example on environmental impact assessments, water quality and nature protection. Notably, the aim is to gather all relevant authorities in a single forum, promote standard guidelines and procurement procedures, and issue early warnings about the possible need to (pre)notify projects to the European Commission under state aid rules and ex-ante screening. For procurement, specific know-how and procedures are needed, since PPP/project financing is a particular process and adequate risk sharing is crucial.

3. Broadening funding and financing

Opportunities to generate revenues – including cross-financing – should be sought to enhance project profitability. Blending of funding and financing can apply to a wide range of projects. This might include de-coupling State budgets and infrastructure financing, polluter-pays and user-pays principles to reduce the burden on taxpayers, rewarding external benefits, enlarging the role of the EU Emission Trading Scheme, or including as part of the costs of a project not only its construction but also its maintenance and operation (like PPP do). Life cycle concessions or concession-like models as well as dedicated transport funds for strategic long term infrastructure development are highlighted as successful business models (Box 25).

Box 25: Example of broadening funding and financing

Swiss Fabi investment and finance scheme

Switzerland has concluded international treaties with its neighbours Germany and Italy to ensure an expansion of approach routes to its primary tunnels, to let them handle the growing volume of traffic. In February 2014, the Swiss people approved a proposal for the financing and expansion of rail infrastructure in a popular vote. This proposal will safeguard the financing of the necessary rail infrastructure, including maintenance and expansion, in the long term. At the same time, as part of the strategic development programme for rail infrastructure, a decision was made on the basic tenets of future railway expansion and on the first specific phase of expansion for the period up to 2025. This includes projects costing

CHF6.4 billion (around €6.1 billion), which are primarily aimed at eliminating bottlenecks in and around stations in large Swiss cities.

The Fund is based on a long-term infrastructure investment plan. The revenue sources to finance these life cycle costs include revenues from rail track charges, payments for service obligations, mark-ups for fuel taxes and motorway vignettes from passenger cars.

Box 26: Progress in treatment of PPP

A guide to the statistical treatment of public and private partnerships, produced by Eurostat in cooperation with the EIB and addressed mainly to private stakeholders, was released in 2016^[89]. The European PPP Expertise centre (EPEC) also published a document entitled 'Hurdles to PPP investments: a contribution to the third pillar of the investment plan for Europe' which discusses and illustrates some of the most frequent hurdles to delivering public investment projects through PPP^[90]. It found that many hurdles are linked to the underlying projects (e.g. poorly prepared projects, delays/failure to obtain authorisations, poorly conducted public consultation processes) rather than to their delivery as PPP.

The Commission has also provided practical guidance on the application of state aid rules to the public funding of infrastructure^[91].

4. Financial regulation and budgetary accounting for PPP; stakeholders' involvement and communication

This set of recommendations aimed to create a more positive environment for financial markets by addressing two main issues: 1) mitigating the unintended impacts of financial regulation (e.g. Solvency 2 and Basel III) on long-term financing for infrastructure (financial regulation should seek to mobilise currently high levels of liquidity and put it to productive use); 2) establishing a clear treatment of and incentives for PPP. This latter targets a revision of Eurostat rules so as not to penalise concessions and PPP, and to formally clarify the conditions a PPP must fulfil to be kept off-balance sheet, as well as to create an incentive for the public sector to engage with them (Box 26).

A progress report of the CBS report has been promised for the end of 2017, two years after the publication of the first report. At the moment of writing this report, an abstract of the progress report^[20] had been published. The authors acknowledge progresses have been made:

- The implementation and running of the EIAH and of the European investment Project Portal,
- The definition for all TEN-T core network corridors of a detailed list of projects and investment needs until 2030,
- The provision of guidance for the simplification of EU permitting rules from the permitting study conducted by DG MOVE,
- The amendment of the General Block Exemption Regulation which extends its scope to other categories of transport projects,
- The first CEF blending call which provides learnings for the possible setting-up of blending facilities for bankable transport projects under the revised CEF Regulation,
- The adoption of the implementing act on Solvency 2 (for institutional investors) for 'qualifying infrastructure investment', or
- The guide issued in September 2016 by Eurostat and EPEC on the appraisal of PPP.

Whilst some relevant achievements have been obtained, more is needed to be done to mobilise the resources for the EU transport infrastructure. The authors identify key challenges and point out domains of improvement. They call for a stronger investment plan for Europe across the three pillars of the Juncker Investment Plan. In particular, the EFSI in conjunction with CEF grants, together with a specific blending instrument for transport (and other long term infrastructure) investment, should be more accessible at local level and more targeted technical assistance for strategic projects. Also,

investment opportunities should have greater visibility to help the development of a strong project pipeline. Finally, they emphasise the need to remove regulatory barriers at both national and EU levels and to widen the one-stop-shop concept towards more project clearance upfront.

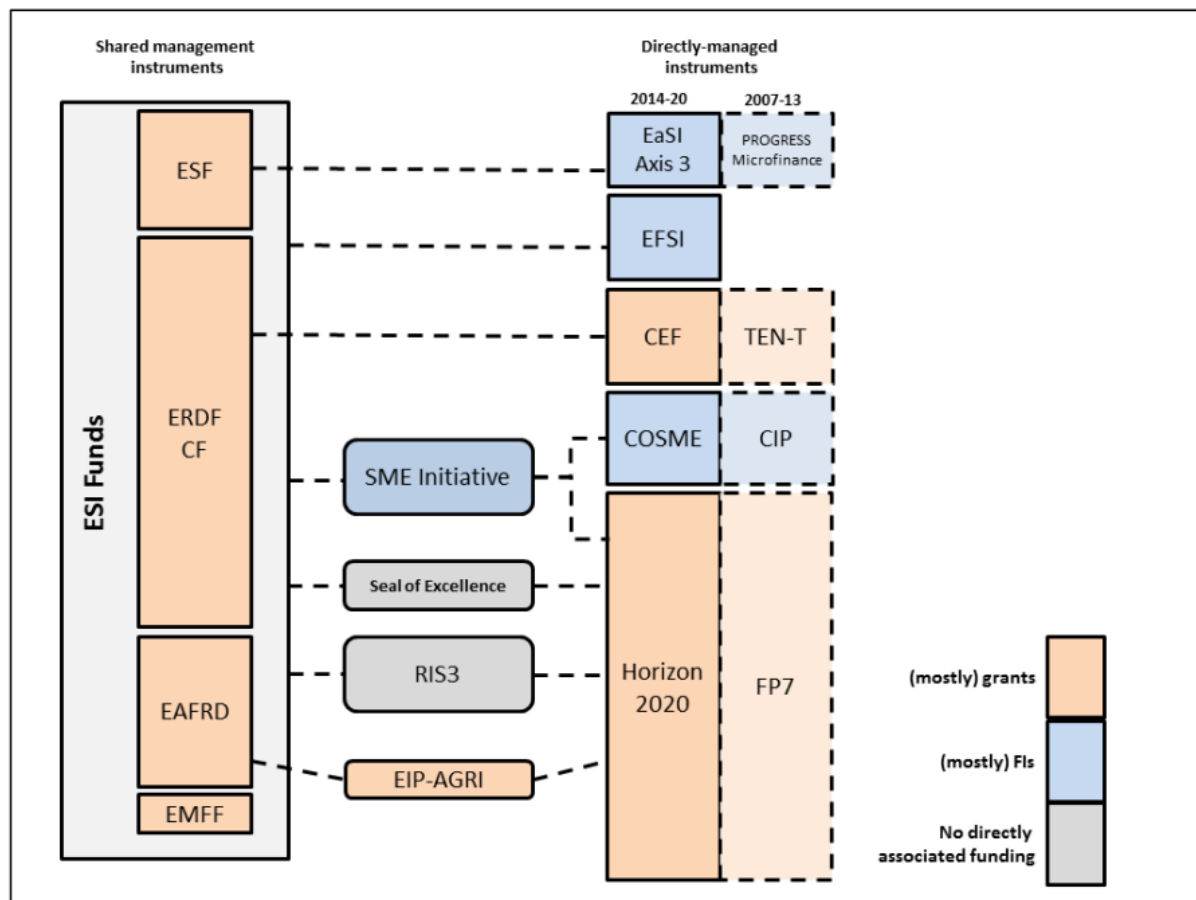
5.3.2. Exploiting Complementarities and Realising Synergies between Instruments

The European Commission^{[87], [92]} has been promoting the joint utilisation of more than one instrument in a same project to exploit complementarities and realise synergies. In the abstract of the progress report of the CBS report^[20], authors advocate the joint utilisation of EFSI, CEF and other blending instruments. Also, in the previous Sections, several examples of joint utilisation of financing instruments were provided and discussed. Even so, a study^[93] recently published by the European Parliament concluded for a still very limited scope of synergies generated (up to the year of 2014). Indeed, the practice of combining instruments was rare and often button up depending on the interest of individuals or organisations. Hence, further efforts should be made on promotion of these options.

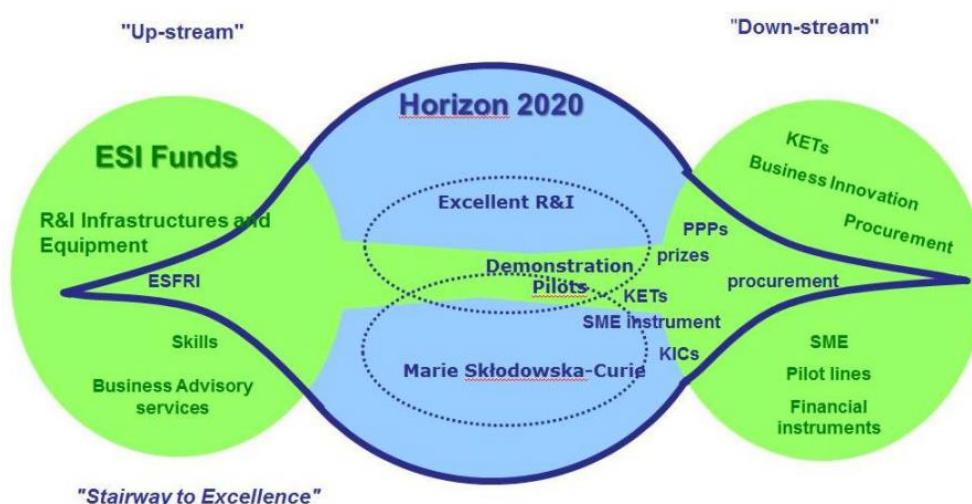
According to the European Commission, synergies are about obtaining more impacts on the competitiveness, jobs and growth in the EU by combining several instruments in a strategic and also cohesion-oriented manner, than would be obtained by their individual deployment. On the other hand, complementarity is distinct from synergy in that it does not require interaction between the two entities or processes, nor does it require the outcome of this interaction to be greater than the value of their individual effects. Complementarity assumes distinct operations or spheres of responsibility, non-contradiction of outcomes, and also a common goal to which all efforts are directed. In practical terms, owing to the specific mission and purpose of each one, the eligible costs items vary among financing instrument. Hence, the joint combination enables supporting a wider set of cost items (naturally, no double financing is ever allowed). Accordingly, synergies can be achieved by^[92]:

- bringing together different instruments or programmes in the same project. This can be a single action or a group of coordinated actions/operations, but always provided that there is no double funding of the same expenditure item) in view of achieving greater impact and efficiency,
- successive projects that build on each other or,
- parallel projects that complement each other.

Owing to the relevancy of the ESIS to the development of the EU, combinations of instruments and programmes are commonly centred around it. Figure 14 offers an overview about the spectrum of complementarities between the ESIF and other EU instruments.

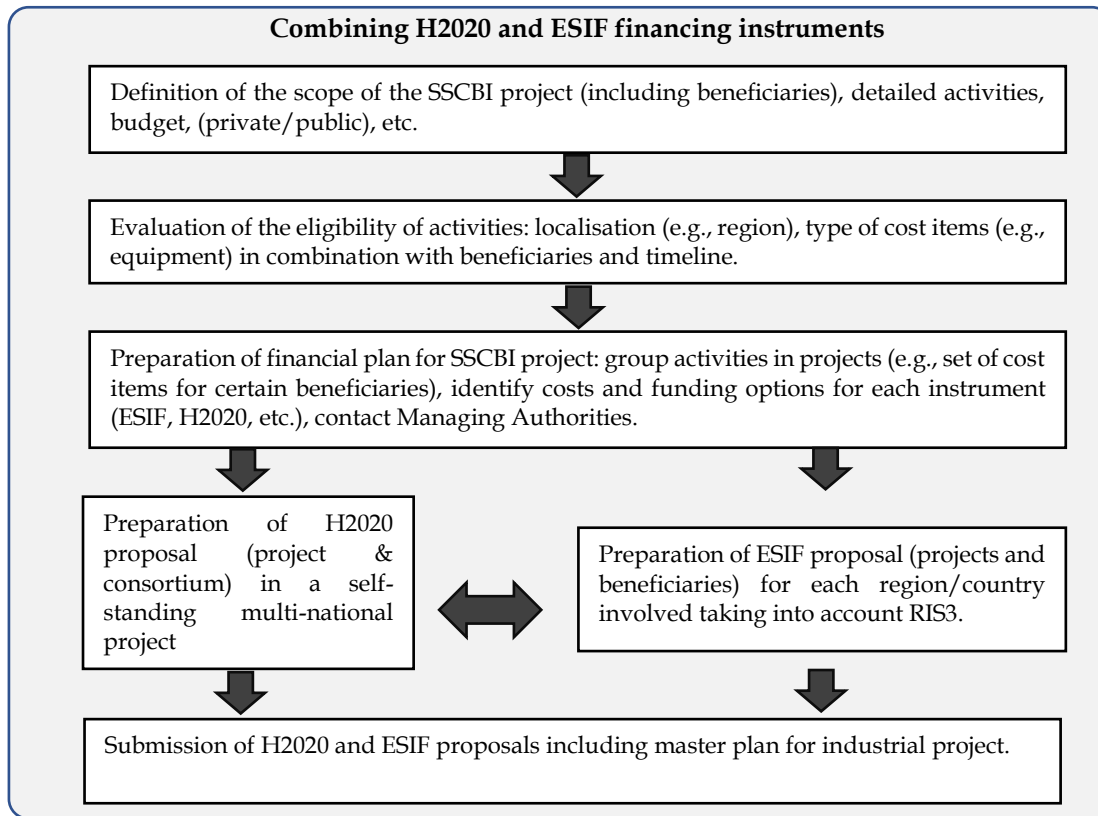
Figure 14: Relationships between ESIF and EU instruments^[93]

Complementarities between ESIF and the Research, Innovation and Competitiveness-related programmes can be explored, notably with the H2020. Figure 15 offer an overview about the range of complementarities among Horizon 2020 and ESIF. On the one hand, the H2020 focus on industrial leadership and tackling major societal challenges, maximising the competitiveness impact of research and innovation and raising and spreading levels of excellence in R&I. It includes actions to close the research and innovation divide: ERA Chairs, EIT Regional Innovation Scheme, teaming and twinning, research infrastructure development, etc. On the other hand, cohesion policy will partly increase the capacity of regions and Member States to participate in H2020 and partly fund R&D&I activities in a MS/region that can build on FP7 and H2020 projects. Horizon 2020 can provide support for the policy development at national and regional levels. Moreover, ESIF programmes can take up good practices and project formats that were tested under Horizon 2020, e.g. public procurement of innovative solutions, pre-commercial public procurement, stage-gating for projects (like in the SME instrument), knowledge-triangle settings like in the EIT-KICs, 'proof-of-concept' type of actions like under the ERC, social and public sector innovation approaches, etc. Summing up, the financing opportunities of the H2020 are geared toward development of human resources, business generation and new knowledge (e.g., technologies, hardware, etc.). The ESIF is oriented to the project business implementation and development. Hence the success of a joint combination depends on a thorough understanding about the characteristics of every programme and instrument, so that the complementarities could be properly exploited.

Figure 15: Complementarity opportunities between ESIF and Horizon 2020^[92]

The scheme in Figure 16 presents a possible stepwise approach to combine H2020 and ESIF instruments to finance a same small scale projects. It is important to note that the approval by one programme does not provide up-front advantage in the other, meaning that the project may obtain financing only in one of the two instruments. A key element to a successful synergy between Horizon 2020 and ESIF programmes is the medium to long term alignment of the national and regional strategies, notably, the Research and Innovation Strategies for Smart Specialisation (RIS3). RIS3 strategies set out the national or regional frameworks for investments in research and innovation not only from ESIF, but from all funding sources. RIS3 strategies prioritise fields, identified through the involvement of stakeholders ('entrepreneurial discovery process'). These strategies orientate research and innovation activities towards the needs of the industries/public sector in the territory, stimulate private RDI investment, facilitate the information flows and achieve practical synergies. In this context, it is important to note that RIS3 is not only about science and technology-driven innovation, but should consider, as a focus area or as part of the policy mix, other forms of innovation as well, such as public sector innovation, social innovation, organisational innovation, service innovation, user-centred innovation, demand stimulation for innovations, etc. Authorities directly concerned by Horizon 2020 and other EU programmes in the given territories shall thus be associated in this process. The European Commission documents provide a wide set of recommendations and guidelines on how to promote joint combination of these and other programmes^{[87], [92]}.

Synergies between ESIF and EFSI can also be sought. The EFSI aims to allow the EIB to take higher risk in order to mobilise private capital providing additional financing for investments. ESIF programmes aim at contributing to the achievement of the cohesion and territorial policy of the EU. The EFSI Regulation allows Member States to use ESIF programme resources (including resources programmed to be delivered through financial instruments) with a view to contributing to the financing of projects receiving EFSI support. In addition, the legal basis for the ESIF allows that beneficiaries and final recipients receiving support from grants and financial instruments under ESIF programmes may also receive assistance from other instruments supported by the Union budget.

Figure 16: Stepwise approach to develop a joint H2020 and ESIF financing of a SSCBI project

Combination of ESIF and EFSI is possible either^[93]:

- at individual project, in this case an operation may receive support from ESIF or EU instruments, provided that the expenditure item included in a request for payment for reimbursement by one of the ESIF does not receive support from another fund or Union instrument, or support from the same fund under another programme, or
- at financial instrument and/or investment platform level, in which several situation are possible: 1) a managing authority can set up a new investment platform in which EFSI and other investors would invest their resources including in the form of a layered fund, 2) the managing authority could make an ESIF programme contribution into an existing investment platform set up with EFSI resources at national, regional, transnational or cross-border level, 3) the managing authority can set up a financial instrument in which the investment platform set up with EFSI support could participate as an investor and other investors may also participate, or 4) the managing authority could set up a financial instrument with ESIF programme contributions

EFSI and ESIF programmes may cover different risks and may support different or same parts of the capital structure of a project or layered investment platform (e.g. equity or debt financing) provided that the rules on double funding and preferential remuneration are complied with. The key benefits of complementarities and synergies of ESIF and EFSI include:

- Higher Volume of Investments, as ESIF accompanied by EFSI provide higher policy impact for each managing authority. Moreover, some projects are not eligible under ESIF programmes may be supported by EFSI and by this contribute to regional development.
- Leverage More Private Investments, as the two combined EU streams are likely to attract more private investors even in regions traditionally not attractive to private investors.

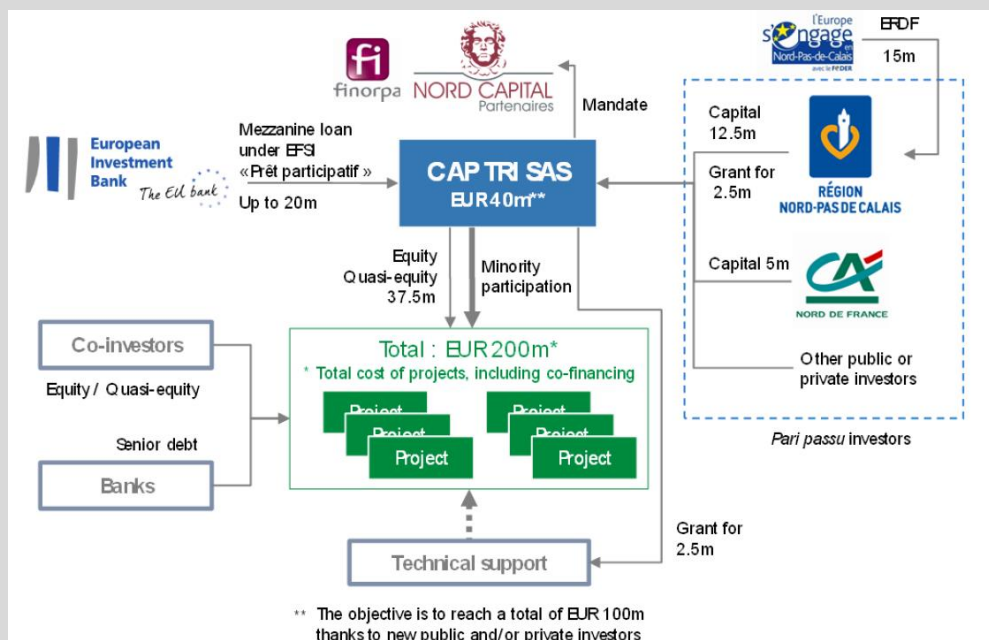
- Financing Riskier Projects, as ESIF and EFSI will usually cover first and mezzanine risk tranche creating possibilities for private investors to come in (including at more senior positions).
- Optimal Delivery Mechanism, as the combination of ESIF and EFSI may take place at the level of investment platforms managed in a professional way and backed by the experience of EIB.
- Reaching Out Further, as EFSI combined with support from ESIF programmes may reach out to more regions (EFSI stream accompanying ESI Funds regional programmes).

An example of ESIF and EFSI complementary in the region of Nord Pas de Calais (France) is provided in Box 27.

Box 27: EFSI and ESIF in Nord Pas de Calais (France)^[93]

An EFSI financial instrument has been included in the ERDF-ESF operational programme 'Nord-Pas de Calais' 2014-2020, aimed to contribute to the 'Troisième Révolution Industrielle (TRI)', a programme targeting zero carbon emissions by 2050. The low-carbon economy investment plan will entail job creation, economic development and more sustainable energy supply and usage. This represents a first for Europe in combining ESI Funds with EFSI in a climate action instrument, the financial instrument assists business-led investments in 'low-carbon economy' projects.

With an initial financing capacity of EUR 40 million, the financial instrument – CAP TRI SAS (see following scheme) – a loan to an investment company set up by public and private investors to invest in the low-carbon economy in the region. EIB financing under EFSI is €15 million. EFSI fits both in terms of strategy and method of delivery. Key to this integrated approach was EIB's 'double role', as EFSI manager on the one hand and provider of technical assistance for the implementation of FIs with ERDF co-funding on the other hand. A relevant aspect to the success of the initiative was EIB's regular contacts with the LRA and managing authorities, which created informal channels for exchange of information at preparation meetings. It raised the region's awareness of EFSI as an additional source of funding, while it was designing the FI and setting up arrangements between co-investors. This informal channel allowed EIB to identify favourable timing and led to its early involvement.



6. Policy Options

Housing over a third of the EU population, cross-border regions have a significant social and economic dimension, playing a pivotal role in the fulfilment of the founding principles of EU, notably the territorial integration. Over the last 25 years, the EU has been investing in CBC via the INTERREG, which is funded under the ETC goal of the ESIF. Much has been achieved to enhance cooperation and alleviate cross-border barriers. Luxembourg is a paradigmatic case, receiving every day around 160.000 daily commuters from neighbour MS. But other cases of success can be pointed out, such as: the Belgian region of the Province Luxembourg (which borders France and Luxembourg) in which around one quarter of all employed people commutes from bordering MS of France and Luxembourg, or the north-eastern French region of Lorraine, in which more than 10% of regional workforce commutes across border daily from Germany, Lichtenstein or Switzerland. The constitution of the EGTC in 2006 was another relevant step forward.

The EGTC is a European legal instrument designed to facilitate and promote cross-border, transnational and interregional cooperation that can enable regional and local authorities and other public bodies from different member states, to set up cooperation groupings with a legal personality. In September 2017, out of the 66 active EGTC, 38 signalled transport as one of their respective fields of activity. The scope of action was quite diverse including railway services, road maintenance or integrated transport services. EGTC has become an important tool for developing joint cross-border projects. However, it cannot replace national legislation; hence, LRA still have to comply with the respective national rules. Another pivotal instrument to the territorial integration of the EU is the TEN-T policy.

Over the last 20 years, this programme has been working on the integration of the EU transport infrastructure by alleviating gaps between MS transport networks that still hamper the smooth functioning of the internal market and by overcoming technical barriers such as incompatible standards for railway traffic. In the recent version, the TEN-T Policy is focussed and organised around nine core corridors linking the East, West, North and South of the EU. A significant amount of the budget comes from ESIF, including the CF and the ERDF. Notwithstanding its role, the cross-border dimension of the TEN-T policy is somewhat limited as the corridor-based approach narrows down the cross-border integration to the crossing points at the borders along those corridors.

Despite these and other achievements, the success cases are limited and continuity across cross-border regions remains more of an ambition than a reality in many EU cross-border regions. In a recent study, the Commission listed more than 200 obstacles to cross-border projects in the EU^[5]. The study also identified public transport and mobility as the third biggest problem for cross-border life, after the labour market and education, social security and health care. Indeed, nowadays, the internal borders still mean a barrier for the development of the regions and, the closer is the border, the stronger is the effect. They continue hampering the mobility of people and goods, with a negative effect on the social, economic and sustainable development of the affected regions and of the EU. Missing cross-border links are not admissible under the spirit of the EU long-term strategies and vision.

Missing links in the transport infrastructure are being dealt with specifically designed mechanisms, of which the abovementioned TEN-T and the associated CEF is the flagship programme. CEF Transport is a facility to fund studies and investments for large-scale infrastructure, notably those over the core network. Several other specific mechanisms have been created to facilitate access to funds. The EFSI is such a case. The EFSI is a joint initiative of the EIB and the Commission which mobilises private investment. EFSI support can be combined with EU grants from the CEF and Horizon 2020. A specificity of EFSI is that the projects have to be bankable and require a volume of at least €75 million. The EIB also supports investment through loans and financial instruments such as lending, a structured finance facility or a LGTT. Fund investment from public or private sources such as the Marguerite fund and the European Energy Efficiency Fund are also possible. These standard loans are usually targeted at projects with a volume of more than €50 million.

These examples reveal an important shortcoming in the current financing mechanisms and reflect the biasing of public policies towards large investment projects. However, many missing links in the transport infrastructure are of small-scale, involving projects below €1 million (or, at most, of a few million). These projects are routinely left untouched, to be solved on an ad-hoc basis depending on the interest of the MS involved. The problem was recently recognised at the political level. In 2016, a specific call for small-scale projects was opened under the Annual Call of the CEF with a total budget of €110 million. Further actions are deemed necessary.

Technological advancements in the fields of ICT, internet or digital technologies are transforming the transport sector and reshaping the mobility paradigms at EU and worldwide level. The European Commission digital agenda for Europe, presented in 2010, aimed at better exploiting the potential of new technologies and digital services in order to foster innovation, economic growth and progress. The ambition was to boost EU's economy by delivering sustainable economic and social benefits by creating a digital single market. The digital single market is one where people and businesses can seamlessly access and exercise online activities irrespective of their nationality or current location. A digital single market strategy was published in 2015, and recently (in 2017) reviewed, by the Commission. The transport sector is included in the strategy, in the section concerning the digitisation of industry and service sectors. Among other proposed actions, the Commission calls for a shift towards cooperative, connected and automated mobility, as a way to reduce accidents, pollution and congestion; enhance traffic management and energy efficiency.

Fuelled by this and other agendas (e.g., jobs, growth and investment agenda), a new breed of innovative and technological trends have emerged. These were briefly reviewed in Section 4, including: i) Intelligent Transport Systems (ITS), ii) seamless passenger information and payment systems (e.g., journey planners with integrated ticketing systems), iii) Mobility as a Service (MaaS) and other emergent mobility concepts, iv) connected and automated mobility, v) electronic toll services, including the European Electronic Toll Services (EETS), vi) new vehicular technology, including the Environmentally Friendly Vehicles (EFV), vii) traffic management systems, including dynamic pricing techniques, and viii) new kinds of materials and construction methods.

As with transport infrastructure, EU technological infrastructure has evolved independently in each MS. Consequently, internal borders also act as barriers to the interoperability and continuity of technological systems and to the portability of on-line services. They artificially increase the costs of mobility on international trips, notably in cross-border regions where people frequently commute. Public and political recognition about the importance of cross-border regions for the technological integration of the EU is on the rise, largely due to the emergence of the connected and automated mobility paradigms and the need for truly pan-EU travel planning and information providers.

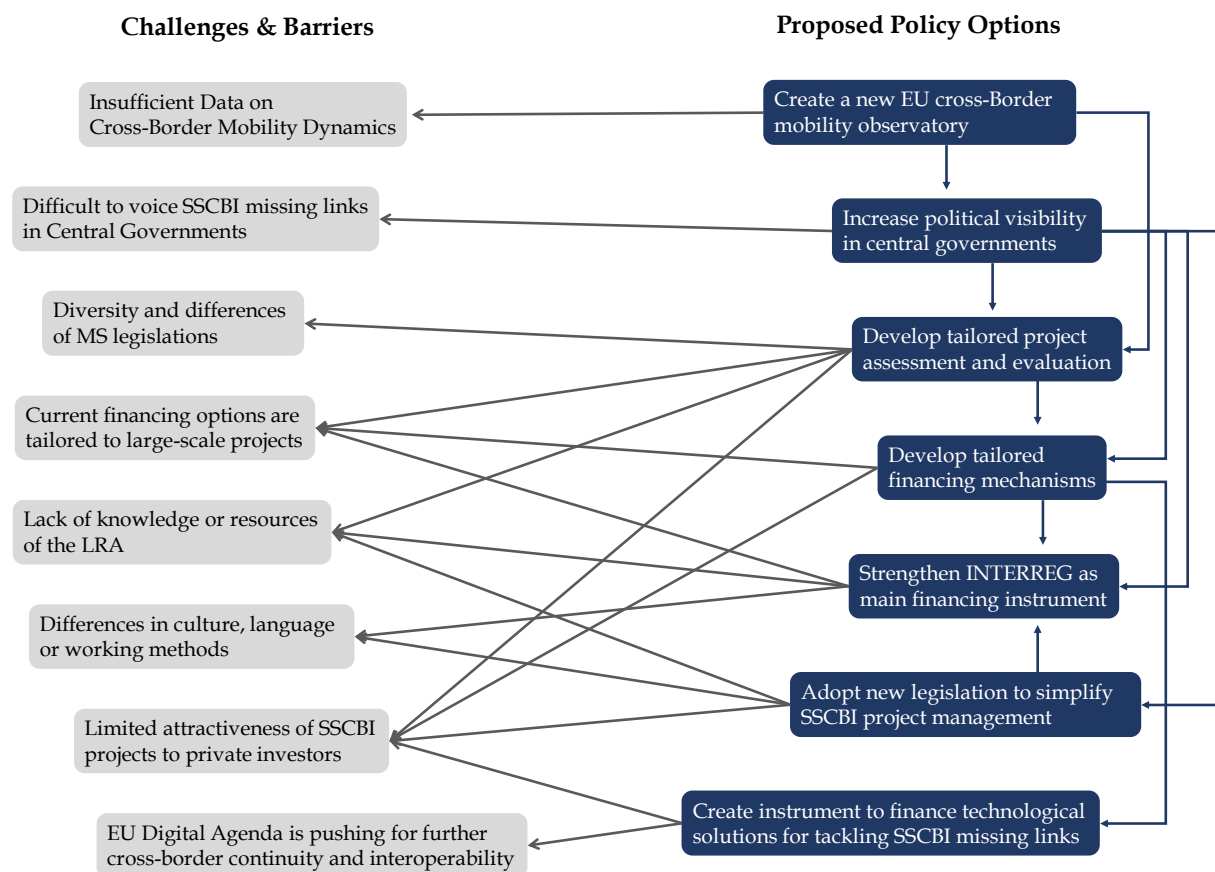
In this context, cross-border institutions – notably the EGTC – are strategically positioned to shape the future development of technology. They know the mobility problems of people and freight. Additionally, they have a close relationship with citizens and companies directly affected by the technological barriers, being in a privileged position to facilitate dialogue, deployment and dissemination. The direct engagement of the EGTC in R&D initiatives, technological development, or policy formulation should therefore be promoted.

Three main types of cross-border missing links were identified, being: i) transport infrastructure related, when there is no (or, if existing, is of inappropriate nature) connectivity or continuity in the transport infrastructure (e.g., missing bridge or tunnel), ii) transport operations or services related, when cross-border accessibility is inappropriate (e.g., cross-border transport services are limited or missing), and iii) transport technology related, when cross-border technological interoperability is inappropriate or missing (e.g. no integrated journey planners). Section 2 identified the key challenges and barriers precluding the successful mitigation of the missing links. They are summarised in Figure 17 and briefly discussed below:

- *Data-related* – available data on cross-border mobility patterns remains scarce and scattered across different institutions and MS. Apart some noble exceptions, building an adequate picture of the mobility patterns is not possible in many cross-border regions.
- *Political* – low political visibility of local and regional authorities (LRA) at the political decision centres, means additional challenges to voice their problems and to gather political support.
- *Policy-related* – EU policy, such as the TEN-T, is oriented towards the development of seamless international corridors spanning several MS. Cross-border connections are necessarily needed to fulfil this ambition. Yet, no particular attention has been dedicated to cross-border regions outside these corridors.
- *Limitations of LRA* – lack of knowledge or resources (e.g., human, technology or financial) of LRA to develop joint projects or jointly access funds, limit the exploitation of available financing mechanisms.
- *Differences in culture, language or working methods* – management of cross-border teams is inherently complex. Cultural elements and working methods often differ across MS and are not necessarily aligned. Additionally, communication is often difficult as people lack sufficient language skills.
- *Finance-related* – mirroring the EU policy vision, financing mechanisms and regulations were formulated and tailored according to the specificities of large-scale projects, leaving small-scale projects out.
- *Limited attractiveness of Small-Scale Cross-Border Investment (SSCBI) projects to private investors* – the reduced financial dimension of small-scale projects, coupled with a lack of information (precluding proper financial and economic analyses), limits the interest of private investors.
- *Technology-related* – current EU policy is supporting the provision of seamless technological services across cross-border regions. However, the focus is being made in cities and other largely populated regions. Tailored technologies are required to tackle the uniqueness of cross-border regions.

The difficulties in eliminating the abovementioned challenges and barriers, together with the continued existence of numerous cross-border missing-links justify and call for further policy action. In this study, we propose a set of seven *policy options* (Figure 17). They were elaborated pursuant the project development methodology presented in Figure 1. Each policy option is expected to contribute alleviating at least one challenge or barrier. Also, we also identified positive or reinforcement influences among them, which indicates that enhanced results could be obtained provided they are implemented together. The proposed list of policy option is:

- *Policy Option 1:* Create an EU observatory on cross-border transport and mobility dynamics,
- *Policy Option 2:* Raise the political visibility of small-scale cross-border projects,
- *Policy Option 3:* Develop new project assessment and evaluation guidelines for small-scale cross-border projects,
- *Policy Option 4:* Create a new financing mechanism tailored to small-scale cross-border projects,
- *Policy Option 5:* Strengthen INTERREG programme as the chief financing instrument for cross-border regions,
- *Policy Option 6:* Adopt new legislation to simplify cross-border projects,
- *Policy Option 7:* Create instrument to finance technological solutions for tackling small-scale cross-border missing links.

Figure 17: Proposed Policy Actions to overcome Challenges and Barriers in SSCBI projects

Policy Option 1: Create an EU observatory on cross-border transport and mobility dynamics

As discussed in Section 2.4, available data on cross-border dynamics is relatively scarce and unreliable^{[7], [14]}. It is essentially limited to the main international transport links (highways, railways or inland waterways). Other datasets (e.g., labour or employment) are being used to derive information about the mobility patterns, but, of course, with other types of limitations. Another problem is related with the fragmentation of data across different national and European institutions. Commonly, they follow different data gathering processes, which makes any comparison a difficult, if not unfeasible, exercise.

The lack of reliable and comprehensive datasets at the EU level creates problems of different order. Foremost, it makes accurate diagnosis of the mobility patterns, including the assessment of the social and economic impact of the missing links, difficult. Likewise, benchmarking exercises across regions and MS are of difficult realisation. Thirdly, the policy decision-making process is conducted without the appropriate ground data and information, which increases the margin of error of the decision. Finally, business and private investors are unable to run financial and business analytics, reducing their interest for cross-border investments.

A new EU Observatory on cross-border transport and mobility dynamics would overcome these, and other, data shortcomings. Overall, an Observatory is an entity responsible for building and managing repositories of Data³², Information³³ and Knowledge³⁴ (DIK) on a specific topic. The main functions include the collection, storage and analysis of DIK. Regarding collection, the Observatory is

³² Data are the raw elements collected from the real world.

³³ Information refers to organised data (e.g., charts, pictures, or tables) to a specific receptor.

³⁴ Knowledge refers to data or information organised and processed in order to transmit a greater understanding, experience and accumulated learning, applied to a problem or activity

responsible for collecting data on a systematic³⁵ and standard³⁶ (or transparent) way. The collection can be undertaken directly by the Observatory or rely on third parties. Regarding storage, the Observatory manages a data warehouse centre, where the DIK is stored and made available to third parties. Regarding analysis, the Observatory run analysis over the data to unveil new relevant and unknown insights. The Observatory will be the EU focal point on cross-border mobility in the EU. By providing unbiased and comprehensive datasets, it will allow alleviating the abovementioned problems.

The value of an Observatory lies on the robustness of the historical datasets, which entails long-term stability. The Joint Research Centre on Energy and Transport or the ESPON could be a possible institution to host such initiative, the later already initiating projects in this field. In any case, further studies are required to identify hosting institutions, develop feasible business models, propose an architecture and taxonomy of the observatory, or, even, technologies and techniques for data collection in such specific regions are the cross-borders.

Policy Option 2: Raise the political visibility of small-scale cross-border projects

A recurrent complaint voiced³⁷ by the Local and Regional Authorities (LRA) located cross-border regions is that they are below the political radar of central governments. They refer facing difficulties to include their topics in the central governments' agenda. Indeed, the problems begin earlier with difficulty in establishing a dialogue with central institutions and government. Even with recent advancements in ICT, the physical distance still acts an actual barrier to communication and interaction. For example, LRA stated the difficulty in finding an appropriate contact point or in scheduling meetings. The creation of dedicated national contact points would help alleviate this difficulty.

Still, there are signals that the situation has been improving. ETC policies have created instruments such as EGTC and INTERREG that have funded many small-scale cross-border projects. The number of cross-border transport and mobility plans has been on the rise, although there is still untapped potential for these to take better account of the investment needs of cross-border regions and notably for projects that go beyond the TEN-T core network corridors. Several ongoing initiatives map out a way forward.

The 'Corridor Forum' for TEN-T core corridors serves as a good example of consultation, and there is scope for more sharing of best practice, leveraging of advisory hubs, project streamlining and special legal instruments such as that proposed in the wake of the Luxembourg EU Presidency. This would allow to extend specific legislation from one country to another to cover a cross-border region, on a case by case assessment.

Cohesion policy is very closely linked to the TEN-T programme. However, unlike the CEF, the cohesion policy follows a programme and not a project approach. The problem is that programmes are national, stopping at the border. Similarly, regional programmes co-funded by the ERDF 'read as if on an island'. Also, many funding programmes come with heavy administrative costs, and there are legal, institutional and cultural differences across borders, that can preclude, in practical terms, their use for small-scale cross-border projects. Also, ERDF support is limited to those goals listed under the respective MS's ETC. However, as the number of goals is limited, transport-related projects may not be included. In such cases, no ERDF support can be channelled to cross-border missing links.

The so-called 'integrated territorial investment' could combine INTERREG and mainstream EU funds for cross-border transport projects, which entail political visibility within central government and

³⁵ Systematic means that data and information are collected regularly over time.

³⁶ Standard means that all necessary details (e.g., parameters, locations, timings, accuracy, etc.) about the datasets are available. The objective is to eliminate misinterpretations between users.

³⁷ Evidenced obtained in the interviews and workshops.

decision-making bodies. These projects can be carried out by EGTC. Developing initiatives to raise the awareness and visibility of cross-border projects could be beneficial for their approval. The creation of dedicated offices (or contact points) in central institutions and governments would facilitate the communication with the LRA and contribute to raise visibility and presence in central governmental agenda. In addition, adoption of cross-border sustainable mobility plans, interoperable solutions and joint consultations should be a condition for cross-border investments, notably when LRA are able to combine transport with other economic sectors.

Policy Option 3: Develop new project assessment and evaluation guidelines for small-scale cross-border projects

Available project assessment and evaluation guidelines were originally formulated for large-scale projects. Unsurprisingly, transferring such guidelines to small-scale projects is often difficult, if not unfeasible. By way of example, guidelines in large-scale projects often involve a substantial collection of data, a strong commitment and involvement of stakeholder, or the development of complex calculations, which are not compatible with the limited budget, or human and technological resources available in small-scale projects. Consequently, these projects often lack a proper assessment and evaluation analyses. However, without them, the investments cannot be prioritised and national budget cannot be allocated. Moreover, private investors disregard prospective investments lacking a proper financial assessment evaluation.

Consequently, small-scale projects are hardly attractive to private investors and, even at political level often play second fiddle to other more popular or visible projects. These projects need to become more mature with a clear cost-benefit analysis showing that they are needed for Europe and attractive for private investors. Tailored project assessment and evaluation guidelines should be developed considering the specificities of small scale cross-border projects and the limited (human and technological) resources and timeframe of LRA.

In the development of tailored guidelines, projects' life cycle should be considered, with a separate section for each phase (e.g. for planning, design, procurement, construction, operation and maintenance). Such segmentation would shed light onto which parts of the project might be attractive to private investors. Risks could be better shared between the public and private sectors, and the ex-ante conditionality of access to EU funds strengthened, for example by requiring a project to be linked to a national transport master plan to benefit from the ESIF.

The interest of private investors is inherently linked to the likely existence of viable of business models, which evidence the prospect of profits. Hence, the guidelines should also include dedicated sections to business models. However, small scale cross-border projects rarely produce viable business models. The reasons are diverse but they may include an unclear added-value, an insufficient demand, or a high-cost structure. Therefore, innovative business models are required, which requires specialised competences and skills.

Moreover, when such projects are undertaken, they often take years to get off the ground, as governments prefer large investments. By way of example, EU funds are allocated per country but a big cross-border project like that at the Brenner Pass will be run by an international company and may develop into a PPP jointly operated by the two countries it connects. It is worth noting that certain parts of a project may be interesting to market players; in the Brenner Pass example, it is a geothermal power station that will produce energy for the railway and local use. They are achievable by developing improved structures for technical assistance, with a higher focus on individual country problems, for example.

Policy Option 4: Create a new financing mechanism tailored to small-scale cross-border projects

For local and regional authorities, the smaller missing links across borders are as important as completing the TEN-T network and main transport corridors. Most EU funding goes to the latter,

however. Small-scale projects are often either too small or not bankable. The only dedicated source of funds for small-scale cross-border links is INTERREG, which presents just 3% of cohesion policy funds. By way of example, in a Czech-Polish cross-border programme, there were sufficient funds for just four out of 30 potential transport projects. Small-scale cross-border projects do not necessarily require a new fund or stronger CEF, but would benefit from a more flexible INTERREG programme for example. The EU's thematic objectives for 2020 also are a limitation for many INTERREG projects, for example by limiting financing to projects linked to the TEN-T network. Even so, it is subject to debate whether INTERREG needs more money. The infrastructure and investment needs vary per border.

The creation of tailored financing mechanisms, with simplified rules and stable budgets, would help increase the rate of supported small scale cross-border projects. Although the actual design of the new mechanisms should be the object of further studies, some alternatives can be discussed. In Section 5, we explore new opportunities offered by current financing mechanisms, including blending and pooling. The limitations of some mechanisms, which set excessively high minimum financing limits, can be overcome by coupling small scale projects with other regional investments, such as tourism, housing, social programmes, technological infrastructure, etc. Alternatively, complementarities between different mechanisms can be exploited (e.g., combining H2020 and ESFI financing instruments). The downsizing of this approach is the increase in the administrative complexity, due to the need to manage independent mechanisms, with specific regulations, among MS, which may be difficult for LRA or EGTC.

A possible way forward is to design a new fund specifically for projects with long implementation times, low returns and EU benefits, which would complement the CEF. Other alternatives lie ahead that could secure new financing for infrastructure projects. Examples include: i) promoting cross-financing (e.g. highway toll revenues funding railways), ii) extending the polluter pays principle to value positive externalities (e.g. recognising the environmental benefits of rail versus road), iii) developing banking laws that recognise infrastructure's special needs, or iv) promoting the participation of private investors (e.g., through PPP by taking them off balance sheet).

Cross-border transport projects also need to be examined from a business model perspective to raise interest among private investors. The design of viable business models in small scale cross-border projects is, therefore, needed, although, as discussed in the previous policy option, it would be a challenge owing to the specificities of these projects. The actual form of investment participation should be the object of further studies. (e.g., cash, kind, or others).

Policy Option 5: Strengthen INTERREG programme as the chief financing instrument for cross-border regions

INTERREG programme has gained wide popularity, over the last decades, as the primary source of financing for SSCBI projects located outside the TEN-T corridors. The advantages and strengths were briefly discussed in Section 5. Even so, it contains some limitations that preclude a full exploitation of its benefits. By way of example, approval of expenses requires independent approval by each MS. Owing to different approval timings and procedures between MS, the overall process can take quite some time to be completed, during which LRA cannot apply for further financing. Also, each LRA must comply with the respective national legislation in what concerns project approval. Hence, a cross-border project is in practical terms a set of independent projects, each one following specific legislation and timeframes. Consequently, the management of a cross-border project is quite cumbersome. The adaptation and simplification of INTERREG rules and procedures would greatly help LRA³⁸. Also, the scope of INTERREG programme is limited to a small set (maximum of four) goals listed under the respective MS's ETC. This means that governments have to flag

³⁸ This situation is discussed in detail in the following Policy Option.

transport-related projects as a priority, which, as already discussed, does not always happen owing to the lower visibility of these problems at cross-border regions.

Improvements in INTERREG conditions could facilitate implementation and promote cross-border projects. Follows a list of key domains of intervention and a brief description of proposed actions^[76]:

- Legal framework and Budget conditions:
 - Review and simplify EU legislation by creating a single regulation reflecting INTERREG-specific implementation provisions,
 - Harmonise national and EU regulation to avoid overregulation, so that the rules at national level do not become stricter than the ones at EU level,
 - Increase INTERREG funding allocation, particularly in what concerns technical assistance,
 - Exempt INTERREG from state aid rules as the impact of these programmes on competition is quite limited.
- Thematic Focus:
 - Focus on the specific the needs of cross-border regions, instead of defining general goals (or thematic menus),
 - Define investment priorities to better address the various degree of integration,
 - Allow better thematic flexibility to adjust to new challenges faced by programming area during the implementation period.
- Harmonisation and Simplification of Regulations
 - Define a set of common indicators tailored to the needs of INTERREG programme,
 - Simplify rules (e.g., cost or location eligibility, or cost reporting).
- Management and Control System
 - Adjust INTERREG programme governance to better respond to thematic priorities.
 - Shift focus of control activities from financial details to results,
 - Reduce the amount of obligatory reporting activities,
 - Improve and enhance communication between different stakeholders (e.g., LRA, MS or European Commission),
 - Clarify and adapt the rules of auditing to the specificities of INTERREG programme.

Policy Option 6: Adopt new legislation to simplify cross-border projects

The need to abide by national regulations is repeatedly pointed out as a key barrier. Border projects always require individual approval by the each MS. Variations among MS (e.g., legal requirements, timeframes or data and inputs) results in a cumbersome and lengthy process. Even the adoption of a *border friendliness approach* in the transposition of EU laws does not guarantee a good fit on the border because of many other differences (e.g. labour regulations, cultural dimensions, etc.). EU public procurement rules already contain special rules on joint procurement.

Member States could simplify their procurement and permitting procedures for cross-border projects, by creating special rules. Such legislation should override national laws and not depend on them. In this new context, cross-border projects would be subject to a single legislative framework and could be developed faster, and with lower risks and costs. A good example is the recent extension of route D of the Strasbourg (France) tram network to the German city of Kehl. The new extension is operated by the Compagnie des Transports Strasbourgeois, which is the public transport operator in Strasbourg. Regulations and principles (e.g., tariffs, operations, labour rules, etc.) on route D, including German territory, are equivalent to those adopted in the rest of the Strasbourg network (French side). Some aspects (e.g., jurisdiction in case of fraud, theft or other incidents) required additional agreements from both French and German authorities.

In some parts of Europe, such as the Benelux, governments have gone further and given EGTC real regulatory powers. An EGTC can take on the role of a cross-border transport authority to trial and build demand for cross-border transport services which are ultimately, if successful, transferred back to the competence of the respective regional transport authorities. EGTC could be more active, from promoting sustainable urban mobility plans at a cross-border level to helping with their implementation, operation and maintenance (e.g. France and Spain created an EGTC purely to maintain a motorway). EGTC such as the Central European Transport Corridor-EGTC (CETC-EGTC) use transport as a tool for regional development. Some EGTC may only exist for cooperation on transport, but most will cooperate closely on a wide range of cross-border interests. EGTC have one role and that is coordinating investment in cross-border infrastructure. But there may be even greater added value in operating such infrastructure. That requires a long-term commitment and some kind of public sector involvement. EGTC are in a good position to deliver this. Member states could entrust parts of their national and regional programmes to EGTC but usually do not. They need to learn to trust their regions, LRA and EGTC.

Policy Option 7: Create instrument to finance technological solutions for tackling small scale cross-border missing links

Environmentally friendly vehicles, connected and automated mobility, and electronic tolling are technological changes that seem irreversible. If no action is taken to specifically look at opportunities from these technologies to improve cross-border mobility they are likely to further aggravate the barrier effect of the border. ITS in particular can provide invaluable information on actual demand in cross-border regions. Other useful innovations are seamless cross-border payment systems and technologies that enable shared use of products, services and infrastructure. The financing mechanisms to help cross-border regions are available; the problem is accessing them. New, more risk-based financing schemes are not a preferred choice of most LRA, however. Finally, cost-benefit analyses of small-scale projects are not yet widely practised, which makes it harder to prioritise and drive investments in them. The European institutions should consider devoting special attention to projects targeting the implementation of new technologies in cross-border regions beyond TEN-T, making these regions laboratories for demonstrating such technologies and, consequently, frontrunners rather than laggards in their adoption.

In Section 5, the role of research, innovation and competitiveness related programmes in helping to finance small scale cross-border projects is discussed. These programmes, notably those of research and innovation, are particularly suitable to support the development and deployment of new technological solutions in cross-border regions. Despite a privileged understanding about cross-border mobility barriers, the participation of cross-border LRA and other organisations in international fora or research projects remains limited, and they risk lagging behind. Their voice should be heard, and their participation should be promoted. Several options are available.

Many ITS and other technologies are still in the first stages of development. Thus, cross-border regions can still actively contribute to the design and development of such future technologies, ensuring that cross-border barriers and gaps are effectively considered and addressed in the final technological solutions. Cross-border regions could become active members of EU discussion fora and platforms, participate in EU co-funded research projects, and prove that they have the resources to deploy new technologies. The call for proposals could address specific cross-border problems and specificities, require the active participation of LRA or other organisations located in these, or foresee the development of pilots or case studies in these areas. Alternatively, the inclusion of cross-border partners (or pilots) in the proposal could be a markup factor in the evaluation process.

A different approach may involve the attraction of investors and entrepreneurs. The EU ecosystem of entrepreneurs and start-ups revolving around mobility concepts is flourishing, with a growing number of technologies and (web-based) services being developed and released. However, it remains

largely centred in or around cities or urban areas, usually as part of Smart City initiatives. It is now time to enlarge the geographical scope to include cross-border regions. Attracting risk capital, notably venture capital, could be a way forward. These are specialised instruments in financing innovative, and often disruptive, business ideas of Small and medium Sized Enterprises (SMEs) or start-up companies. By way of example, the EIB can help venture capital and private equity fund managers provide risk capital to growth SMEs, including start-up companies. Through its venture capital facility, the EIB finances venture capital funds and security packages for funds as well as offering conditional and subordinated loans.

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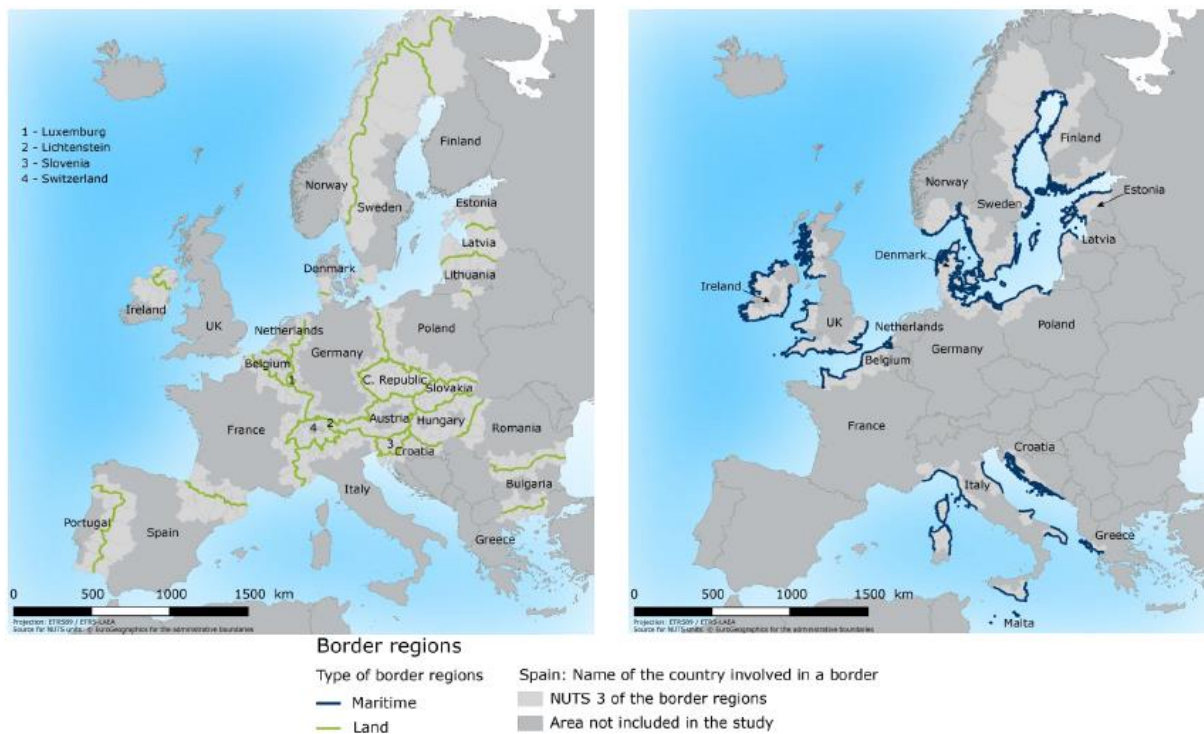
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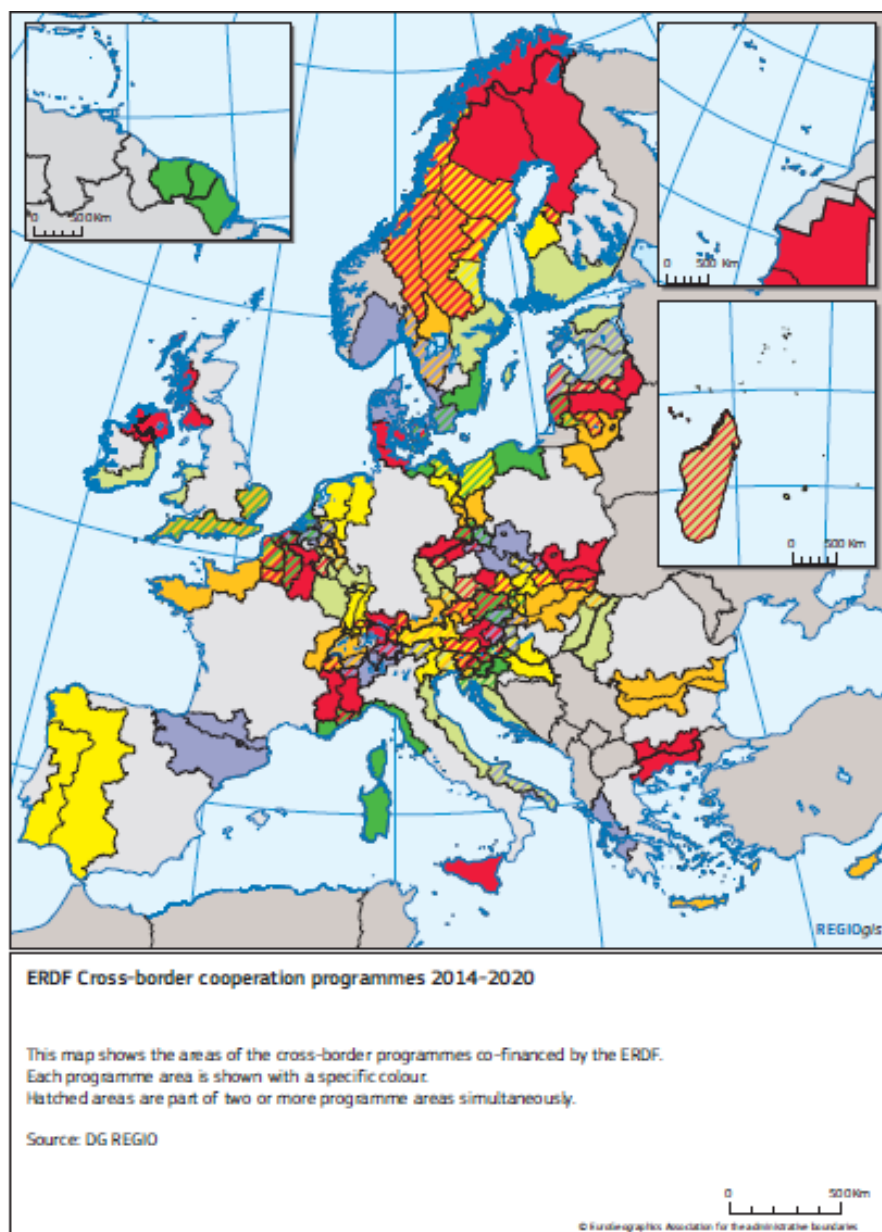
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Annexes

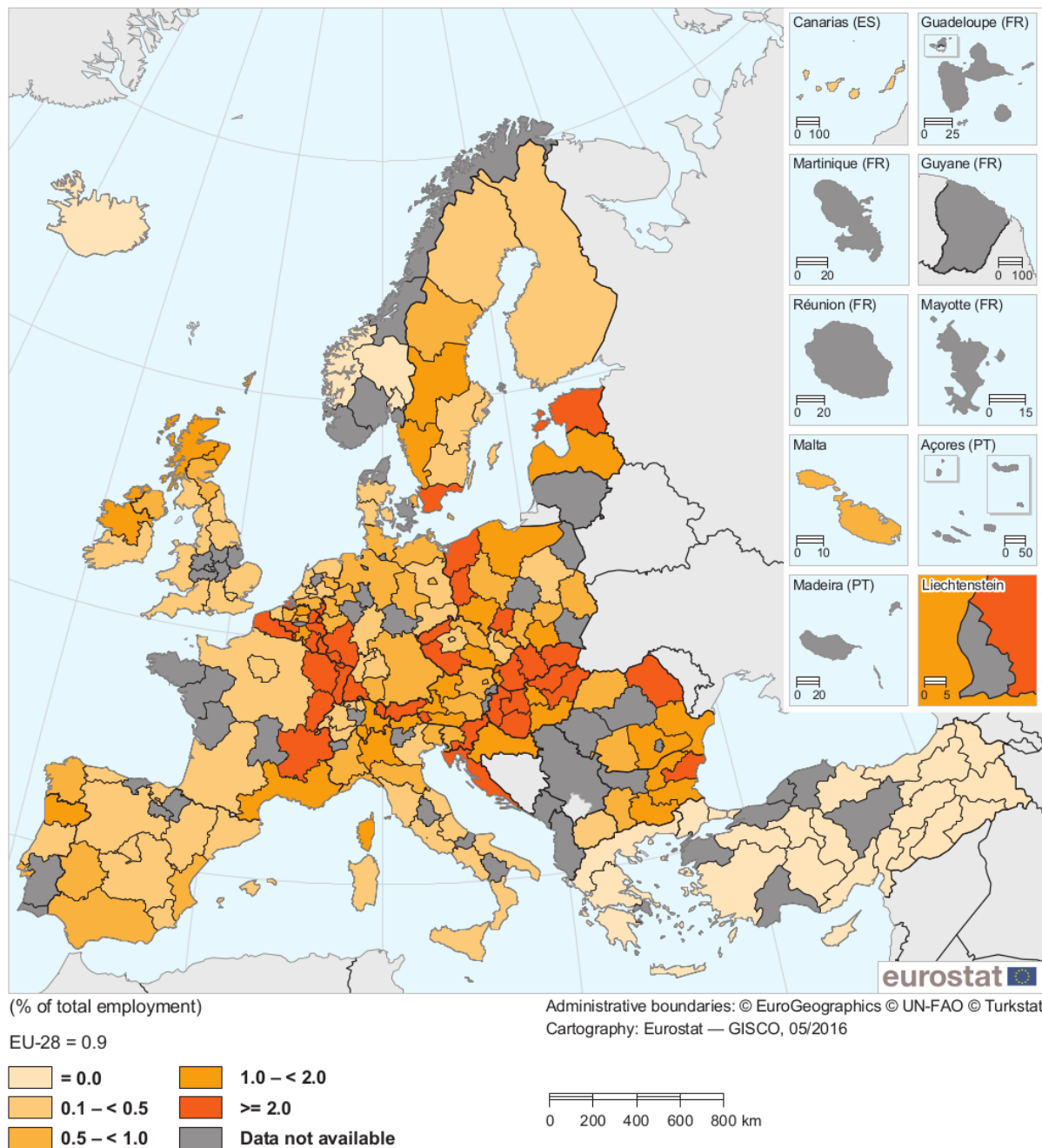
Map A- 1: Land and Maritime border regions^[5]



Map A- 2: CBC programs



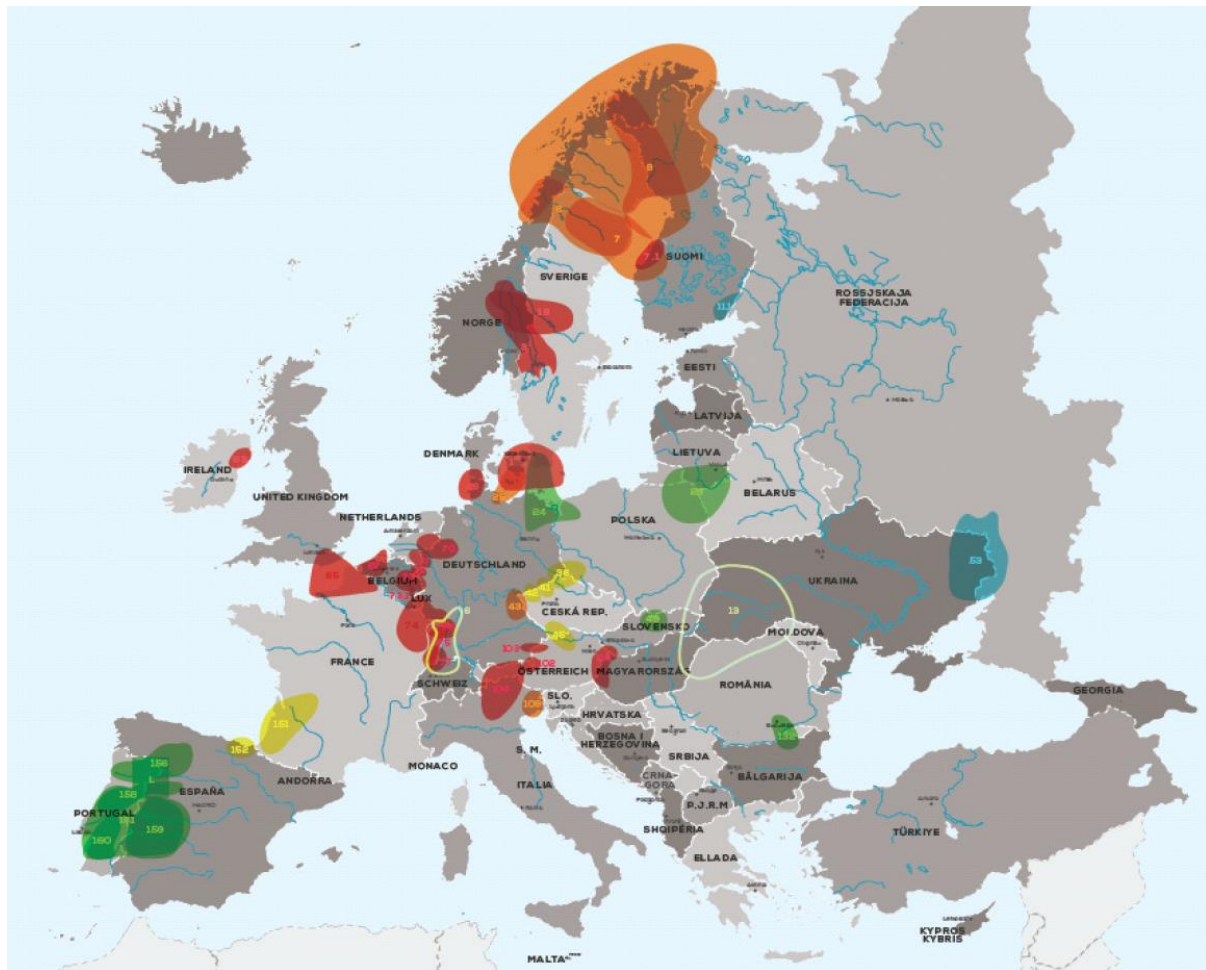
Map A- 3: Share of total employment (outbound) commuting across national borders by NUTS 2 regions, 2015 (% of total employment)



(*) Bayern, Hessen, Niedersachsen, Rheinland-Pfalz, Sachsen (Germany), Voreia Ellada, Kentriki Ellada (Greece), Bassin Parisien, Sud-Ouest, Méditerranée (France), Noord-Nederland (the Netherlands), Region Północny (Poland), Manner-Suomi (Finland), North East, North West, Yorkshire and The Humber, East of England, London, South East, South West, Wales (the United Kingdom) and Ege (Turkey): NUTS level 1. Yugozapaden (Bulgaria), Calabria, Sardegna, Marche (Italy), Sud_vest Oltenia (Romania), East of England, North Eastern Scotland, Highlands and Islands (the United Kingdom), Région lémanique and Espace Mittelland (Switzerland): 2014. Mecklenburg-Vorpommern (Germany), Utrecht (the Netherlands), Kärnten (Austria) and Eastern Scotland (the United Kingdom): 2013. Prov. Namur (Belgium), Wales and South Western Scotland (the United Kingdom): 2012. Includes data of low reliability for some regions.

Source: Eurostat (online data codes: [lfst_r_lfe2ecomm](#) and [lfst_r_lfe2emp](#))

Map A- 4: Border regions indicating the level of cross-border commuting^[32]



High degree of cross-border labour mobility

Medium-high or medium degree of cross-border labour mobility

Medium-low degree of cross-border labour mobility

Low degree of cross-border labour mobility

Particular conditions (eg. external borders)

Large-scale Cross-border Cooperation

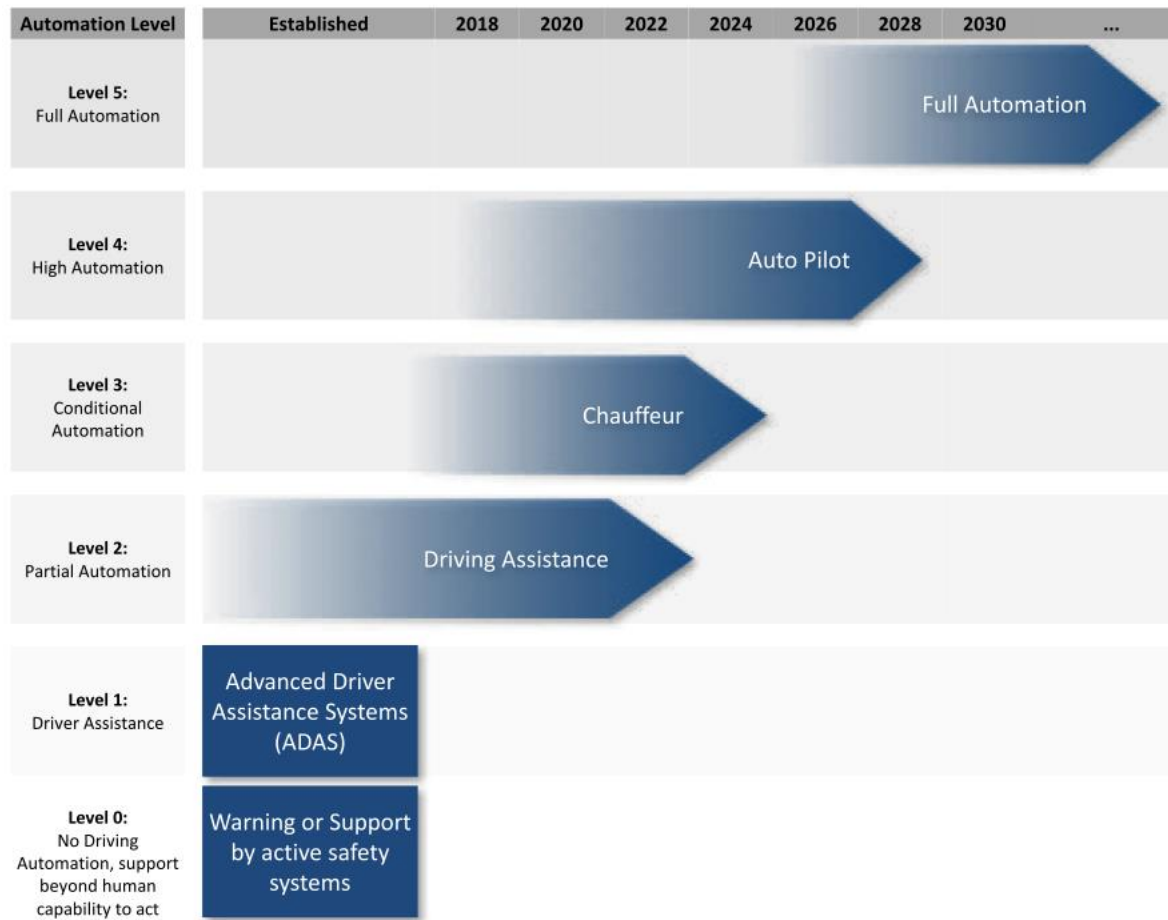
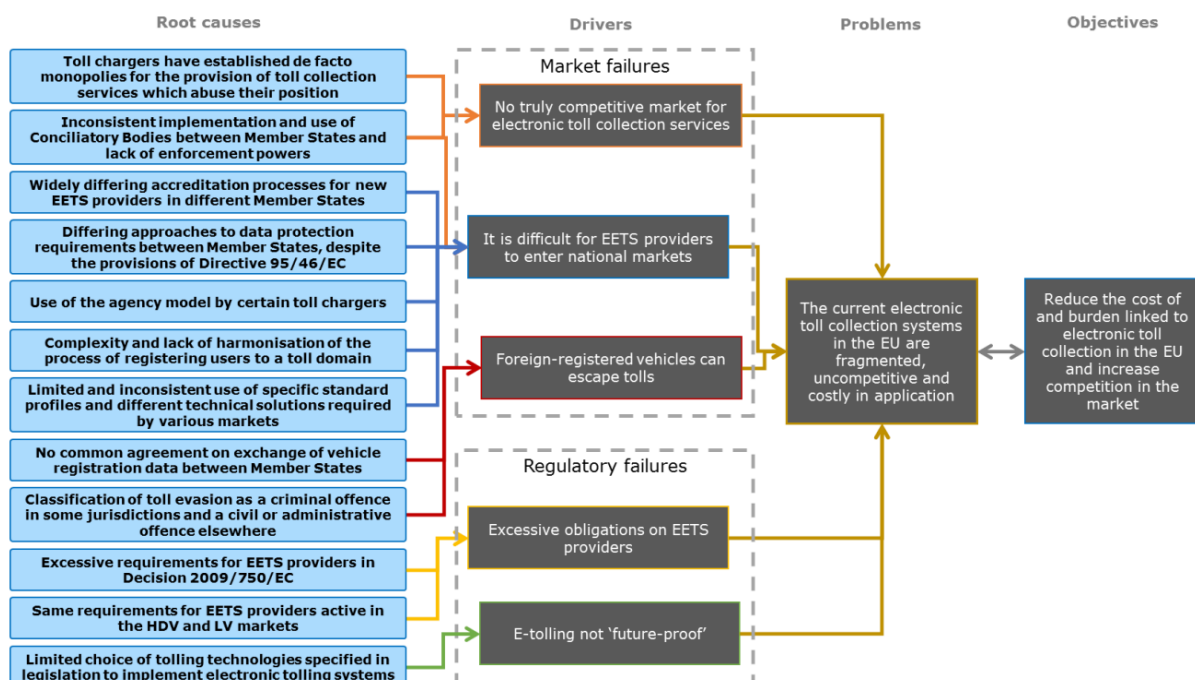
Figure A- 1: Vehicle Automation Development Paths – ERTRAC^[94]Figure A- 2: Barriers and problems to the implementation of EU EETS^[59]

Figure A- 3: Matrix and scoring for technology options^[63]

	Scenario	DSRC Only	GNSS Only	ANPR Only	DSRC + ANPR	GNSS + ANPR	GNSS + DSRC ANPR	RFID Only	RFID + ANPR	RFID + ANPR +DSRC
	Charging & Enforcement									
1	Maturity of the technology	5	3	4	5	4	4	4	5	5
2	Availability of the technology	5	4	4	5	5	4	4	5	5
3	Suitability for Charging	5	4	4	5	4	5	4	4	5
4	Reliance on Mapping/GIS accuracy for charging?	5	1	5	5	2	2	5	5	5
5	Suitability for Enforcement	1	1	5	5	5	5	1	5	5
	Customer									
6	Safeguard personal data	5	3	4	4	4	3	5	4	4
	Operations, Maint and Cost									
7	Maintainability	5	3	5	5	5	4	5	5	5
8	Safety	5	5	5	5	5	5	5	5	5
9	Operates under power supply failure	5	2	5	5	2	2	5	5	5
10	Additional services to share technology costs	2	5	2	2	5	5	2	2	2
	Regulatory									
11	Approved/Recognised by EFC Directive	5	5	1	5	5	5	1	1	5
	Customer Channels									
12	Access to web-based internet account	5	5	5	5	5	5	5	5	5
13	Vending machines/Occasional User	4	2	3	4	2	2	5	5	5
14	Does not require user cooperation/ sign-up	1	1	3	1	1	1	1	1	1
15	Does not rely on end user installation	1	1	5	1	1	1	1	1	1
	Long Term Technology Future									
16	Well defined roadmap for road pricing	5	3	3	4	5	4	5	5	5
17	Well defined use in future vehicles	3	4	5	5	5	4	4	4	4

Table A- 1: Study Interviews

Entity	Key contacts
European Commission, DG REGIO	Alexander Ferstl Dirk Peters
European Commission, DG MOVE	Carlo Secchi (TEN-T Coordinator)
Committee of the Regions	Slaven Klobučar Pavel Branda
MOT, Mission Opérationnelle Transfrontalière	Petia Tzvetanova
Ministère du Développement durable et des Infrastructures (Luxembourg)	Marie Josée Vidal
Association of European Border Regions (AEBR)	Martin Guillemos-Ramirez
AECT Portalet	Santiago Fábregas Reigosa
Eixo Atlântico – Minho Galiza	Xóan Vasquez Mao José Maria Costa
Bau- und Verkehrsdepartement Basel-Stadt	Antje Hammer
GECT Eurodistrict Strasbourg-Ortenau	Lioba MARKL-HUMMEL
EGTC Aquitaine-Euskadi (project manager for Transfarmiga project)	Julien de Labaca
Region Nouvelle Aquitaine	Marie-Pierre Mesplede
Quattropole region	Michel Sohn
EGTC Rhine Alpine	Jörg Saalbach
EGTC Central European Transport Corridor (CETC)	Krzysztof Zarna

Table A- 2: Overview of options, instruments and applicable projects

Option	Type of instrument	Applicable projects
Organisation of the permitting procedure		
EU level permitting procedure ■ Covering all parts of the permitting procedure ■ Covering parts of the permitting procedure derived from EU rules	Permitting procedure	Projects of high EU significance/EU
Single leading authority at national level ■ Leading authority with comprehensive decision-making powers ■ Leading authority with limited decision-making powers	Permitting procedure	All TEN-T core network projects not considered highest priority
Establishing time limits in the permitting process	Special rules or legal requirements	All TEN-T core network projects in either permitting procedure
Building public acceptance		
Requirement for public involvement before permitting application is submitted	Special rules or legal requirements	All TEN-T core network projects
Principles for the conduct of public consultation procedures for TEN-T projects	Special rules or legal requirements	All TEN-T core network projects
Carry out a TEN-T public information campaign	Special rules or legal requirements	All TEN-T core network projects
Improvements to the process for appeals of decisions on development consent	Special rules or legal requirements	Projects of high EU significance
Environmental assessment		
Mandatory joint procedure for all environmental assessment procedures stemming from EU legislation Sub-option: Mandatory cross-border joint procedure for environmental assessment of cross-border TEN-T projects	Special rules or legal requirements	All TEN-T core network projects Projects of high EU significance where relevant
Technical clarification and/or guidance on defining and understanding the impacts of waterborne transport project activities on water bodies Sub-Option: Targeted technical assistance to determine how to comply with legislation and a Commission opinion	Special rules or legal requirements	All TEN-T core network projects where relevant Projects of high EU significance where relevant
Technical clarification and/or guidance on defining and understanding the impacts of TEN-T project activities on Natura 2000 sites and the procedures for compliance with provisions of the Habitats Directive Sub-Option: Targeted technical assistance to determine how to comply with legislation and a Commission opinion	Special rules or legal requirements	All TEN-T core network projects where relevant Projects of high EU significance where relevant Key projects of EU importance
Provide more dedicated external technical assistance services for the preparation of TEN-T projects, focused on environmental assessments	Technical assistance programme	All TEN-T core network projects

Option	Type of instrument	Applicable projects
Public procurement		
Special procurement regime/rules applicable to all projects aiming at speeding up procurement and review procedures	Special rules or legal requirements	All TEN-T core network projects
Special procurement rules for cross-border projects, covering the choice of law applicable and the use of language	Special rules or legal requirements	All TEN-T core network projects where relevant
Technical assistance services for the preparation of TEN-T tenders	Technical assistance programme	All TEN-T core network projects
Capacity building measures for public contracting authorities (PPPs)	Technical assistance programme	All TEN-T core network projects where relevant
Flexibility under the Stability and Growth Pact – technical assistance	Special rules or legal requirements or Technical assistance programme	Projects of high EU significance where relevant
State aid		
Reducing State aid decision timeframes for selected TEN-TA projects	Special rules or legal requirements	Projects of high EU significance where relevant

Table A- 3: Possible involvement of EGTC at different stages of an investment

Stages of the project	Potential strengths of the EGTC
Project development	The EGTC representing a long-term commitment could become a safe and stable framework to guide the project through all stages. EGTC as a cooperation vehicle could see its specific role in <u>building a bridge</u> between countries with differing regulatory environment (such as e.g. has been the case for the Hospital de Cerdanya).
Planning, implementation approach	Experience with cross-border investment shows that it usually requires an intense and dedicated process management and that the pathway to shared understanding and definition of the best solution takes longer than for purely national approaches – again the stable framework of an EGTC could be an asset.
Procurement	The Directive on Public Procurement would allow for EGTCs a certain flexibility in the application of the national rules.
Implementation	Again the EGTC could act as multi-lingual and multi-level bridge in the day-to-day management of the implementation process e.g. foreseeing regular and shared monitoring of progress. In case of a service or a financial instrument other aspects might come in – management skills and bridging functions might be more important and of a more permanent nature.
Operation and maintenance	A continuous involvement of the EGTC in operation and maintenance seems rather likely in case of health or social infrastructure due to the aspect of staff management as well as the continuous need for supply management; with the Hospital de la Cerdanya an excellent example exists. When it comes to technical infrastructure the role of the expectable EGTC would be rather in management of an external service provider or a bridging function between two authorities in charge of maintenance.

Table A- 4: Potential role of EGTC in ESIF investments

Funding Instrument	Considerations on the options and challenges for EGTCs
European Territorial Cooperation (ETC) (ERDF)	ETC is the Objective of Cohesion Policy (CP) where EGTC act as beneficiaries and models for the implementation of cross-border and transnational investments exist. In this case the EGTC as sole beneficiary might be in an attractive position coming up with a pre-negotiated and pre-discussed ‘all-in-one’ solution.
ERDF, Cohesion Fund (CF) (in a national	Realistically speaking in case an EGTC ventures into a ‘mainstream’-programme the intended investment will exceed the usual volume of an ETC project.

Funding Instrument	Considerations on the options and challenges for EGTCs
Operational Programme)	<u>Financing challenge:</u> First there might be the pre-financing challenge. In particular in EU-13 such programmes are mostly set up at national level and the reimbursement principle is often a challenge for LRAs as the key stakeholders of an EGTC. <u>The project set-up:</u> It is obvious that the most challenging venture is an infrastructure investment which physically crosses the border. In the view of the Consultant the most adequate option would be a project set-up which is based on cross-funding. The resulting option could be that a larger project is being split into several partial projects which are partly funded from national mainstream programmes and e.g. partly from ETC. In any case such arrangements will require a strong political backing of the EGTC in both MS.
Connecting Europe Facility (CEF)	The types of intended projects are pre-defined since the CEF is the instrument for the implementation of projects of common interest as part of the Trans-European Networks (TEN) in transport, energy and broadband networks. The scope and character of the project will involve in almost all cases authorities at national level. A fact which clearly limits the options for most of the current EGTCs to act immediately and directly in the framework of the CEF. <u>The project set-up:</u> The Commission sees a major gap in the institutional and administrative capacity required in order to develop projects of significant European added-value. Thus with a view to this gap the potential role of EGTCs in CEF might be primarily in the preparation of the projects.
Financial Instruments (FI)	The common provisions on ESIF foresee the option of a cross-border or transnational FI. <u>Financing challenge:</u> The funding volume for an FI poses quite a challenge: the Interact Study speaks of a recommended size of about 40 to 100 MEUR in order to achieve the diversification of risk and a balanced portfolio. <u>The project set-up:</u> In any case a strong rationale for the cross-border niche addressed by the FI is required: given the numerous offers at national level it might be difficult to define the niche for the cross-border product. EGTCs could act as implementing agency or as intermediary. In order to become first choice in the development and management of a FI most probably a new set-up of EGTC would be required: partners with relevant expertise in the field would be the key asset. The concept of an EGTC acting as cross-border business development agency remains tempting and could become a model.

Table A- 5: Transport Innovation scenarios (passenger side)

Passenger side	Scenarios		
	Unlimited	Passivity and collapse	Responsible growth
Issues	Key challenges		
Globalisation	Corresponding infrastructure is needed, in particular for aviation.	Significant reduction in air transport and an increase in shorter distances needs different kinds of infrastructure	Demand for sustainable products that meet society's needs.
Growth in passenger transport	Capacity of infrastructure will constrain passenger transport growth. Also, there is a huge demand for efficient zero-emission vehicles.	Energy efficiency of transport modes. High demand for smart and cheap and small cars.	People expect resource efficient innovations to be politically fostered. Efficient busses for smaller cities needed.
Urbanisation	Congestion is a problem. The travel preferences of city and countryside residents are different.	Financing of infrastructures is a major challenge. PPP schemes are needed.	Many smaller cities require cost and energy efficient solution for urban transport. Rail linkages between cities are extended.
Change in factors influencing modal choice	Difficult to provide the appropriate amount of capacities.	Not much demand for expensive high quality transport products and services.	Re-allocation of public funding; much more goes into small-medium cities.
Openness for innovation	High demand for vehicle designs between e-bikes and e-cars.	Challenge of getting funds for new developments and difficulties in bringing them to the market .	Innovations offering new and/or more efficient and saver mobility options are expected by the public.

Table A- 6: Transport Innovation scenarios (freight side)

Freight side	Scenarios		
	Unlimited	Passivity and collapse	Responsible growth
Issues	Key challenges		
Freight volumes in relation to global economy	Depletion of natural resources. Demand for new warehousing management technologies. Creation of customised logistics for 3D printing.	Overcoming the ageing condition of transport Infrastructure with limited resources and lack of investment.	Achieving more environmentally friendly means of transport.
Openness of global International trade markets	Development of quick and reliable freight services. Protection of natural resources of small developing economies from globalised markets.	Difficulty in border crossing for freight services.	Development of quick, reliable, safe and environmentally friendly services.
Consumption behaviour in relation to ethical values	Customer demand for on time delivery will require flexible logistics systems	Coping with demand based on migration patterns in an environment with limited infrastructure and resources.	Survival of small companies is going to be difficult due to the increased responsibilities of the full product life cycle.
Switch from "Ownership" to "Sharing"	Nomadism will cause housing demand and freight related to construction equipment and materials.	The cost for infrastructure will have to be absorbed by producers/shippers/energy companies that use the transport network.	Demand for better planning techniques that will help freight transport companies to cope with serving multiple customers that need products delivered on time.
Innovative technologies for logistics	Large production of new advanced technological materials.	Investments on technologies by few people will create two gear societies: technologically advanced or deprived.	Investments on green & reverse logistics.
New technologies for Energy saving and environmental awareness	Achieve the dual objective of cost effective and environmental friendly freight transport.	Achieving these sustainable technologies and start re-using and recycling more of existing materials.	Shift towards green sources of energy.

Table A- 7: Selected ITS project co-funded by CEF involving cross-border regions

Project Name	Objective	Member States
Crocodile 2 (link)	Enhance cross-border traffic and transport through implementing harmonised and synchronised ITS applications to deliver high quality traveller information services.	Austria, Cyprus, Czech Republic, Germany, Greece, Italy, Poland, Romania, Slovenia
NordicWay (link)	Large-scale pilot using cellular communication (3G and LTE/4G) for C-ITS. The project aims at offering continuous interoperable services to the users with roaming between different mobile networks and cross-border.	Denmark, Finland, Sweden
SCOOP@F (link)	Validation of C-ITS services in open roads, cross-border tests with other EU Member States and development of a hybrid communication solution (3G-4G/ITS G5).	Austria, Spain, France, Portugal
NEXT-ITS 2 (link)	The project aims at improving TS services that enhance road safety and efficiency (e.g. hard shoulder running, real-time traffic and weather monitoring, variable speed limits).	Germany, Denmark, Finland, Sweden
MedTIS II (link)	The project aims at I will deliver traffic management services and travel information. Deployment activities focus on road data collection and monitoring, upgrade of traffic control centres, enhancement of alert services and related traveller information. It includes five cross-border regions.	France, Italy, Portugal, Spain
Arc Atlantique Corridor Phase 2 (link)	The project focuses on the deployment of road ITS Services (i.e., traffic management and traffic information) on the Arc Atlantique Corridor.	Belgium, Spain, France, Ireland, The Netherlands, United Kingdom

Table A- 8: C-ITS Services List

List of services to be available at deployment (Day 1)	List of services to be available after deployment (Day 1.5)
Hazardous location notifications: ○ Slow or stationary vehicle(s) & Traffic ahead warning ○ Road works warning ○ Weather conditions ○ Emergency brake light ○ Emergency vehicle approaching ○ Other hazardous notifications Signage applications: ○ In-vehicle signage ○ In-vehicle speed limits ○ Signal violation / Intersection Safety ○ Traffic signal priority request by designated vehicles ○ Green Light Optimal Speed Advisory (GLOSA) ○ Probe vehicle data ○ Shockwave Damping (falls under ETSI Category 'local hazard warning')	○ Information on fuelling & charging stations for alternative fuel vehicles ○ Vulnerable Road user protection ○ On street parking management & information ○ Off street parking information ○ Park & Ride information ○ Connected & Cooperative navigation into and out of the city (1st and last mile, parking, route advice, coordinated traffic lights) ○ Traffic information & Smart routing

Table A- 9: SAE Levels of driving automation for on-road vehicles

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the dynamic driving task with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes

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Table A- 10: Main technologies in use for tolling

Automatic Recognition (ANPR)	Number Plate	This is a solution being used for electronic toll collection where the vehicle is recognised by means of its number plate, rather than on the base of an OBU installed within the vehicle (i.e. using cameras and optical character recognition for vehicle identification). A charging mechanism based on the recognition of a license plate is often provided as an alternative to the use of an OBU, in particular for occasional users. The license plate number is registered and associated to the user account, together with a valid payment means, so that a toll transaction is produced and accounted onto the user account as soon as the specific license plate is recognised It is a mature technology and needs 'less costly' roadside equipment. The experience made by different system operators in Europe shows that a significant performance (with an automatic recognition rate of about 85% of the plates) can be achieved in most cases, where the performance can be significantly improved when a system is characterised mostly by local vehicles (same nationality and same type of license plate). However it needs to be supported by a shared licence plate database and common transnational standardisation of licence plates for a wider European adoption. Mostly used for enforcement purposes, ANPR technology is mainly used in urban congestion charging schemes, such as London, Stockholm and Milan, as well as for charging on interurban infrastructures where video tolling mechanisms are offered to the users. The use of such technology for tolling purposes is not really covered by Directive 2004/52/EC for EETS.
DSRC		It is the most widely adopted across Europe, based on bidirectional radio communication between a fixed roadside equipment (RSE) and a mobile device (OBU) that is installed in a vehicle; 5.8 GHz ISM communication channel is mostly used, even if in some specific cases legacy systems make use of other proprietary solutions. By means of such communication, the road user (and its vehicle) are identified by the roadside infrastructure, in order to trigger the payment. The DSRC technology is used either in a single lane environment or in a free-flow environment. It requires significant amount of roadside equipment as toll transactions are registered on the base of the elements recorded by a radio communication occurring between a roadside equipment (in this case installed on a physical gantry) and the OBUs. DSRC has CEN standards available and uses inexpensive OBUs. However, it requires the installation of costly roadside equipment and is a rigid scheme, which makes modifications difficult, and is not interoperable with other ETC systems.

Radio Frequency Identification (RFID)	It uses radio waves to automatically identify on-board devices, very much like for the DSRC technology. But operating on a different frequency bandwidth (in the range of 915 MHz) RFID-based tolling systems still make use of a 'tag' installed in the vehicle, which is detected and identified by means of a reader antenna installed within a toll plaza or over the carriageways. More recent RFID technology achieves similar performance levels to DSRC, although the lower frequency and the limitations on the emitted power imply a certain reduction of service level, especially in a free-flow multilane environment. Interoperability with existing ETC systems may require significant investment. RFID achieves similar performance levels to DSRC and is a mature technology, but it has not been widely implemented in the EU and interoperability with existing ETC systems would require significant investment. Its main advantage is the cost of OBUs which is significantly lower than for DSRC or GNSS, however the costs for the road side equipment are similar to those of the DSRC.
GNSS technology	GNSS systems allow to determine the vehicle's position on the base of the signals received from a network of orbiting satellites (part of the GPS, GLONASS and in the future Galileo scheme). In this case the on-board unit (OBU) is more complex, since it needs to identify its location and to collect and process the necessary information to measure the road usage, without the aid of roadside units. It uses GSM and its successor technologies (GPRS, 3G and 4G) to pass data between the OBU and back office computer systems used for billing. GNSS-based technology requires the creation, maintenance and continuous updating of a digital map of the chargeable road sections or areas. This map allows the system to accurately determine the position of a vehicle for charging purposes. The charging system can, in theory, be applied to any road without the need for costly RSE (gantries). In practice however, gantries are needed for the enforcement cameras and most schemes allow vehicles without OBUs to pass through, relying on ANPR detection along a predetermined route. Unlike DSRC technology, it offers the possibility of charging without setting up any tolling plazas, extra lanes or speed restrictions. Only predefined sections or points on the tolled road network, called 'virtual charging points', need to be identified. These virtual charging points are included in the digital map and replace tolling gantries used in DSRC approaches. GNSS requires minimal roadside equipment, and modifications to the tolled road network can be made easily. However, it is expensive to install and operate.
Tachograph-based technology	It is based on the registration of the mileage driven by the vehicle within a toll domain by means of an OBU connected electronically to the vehicle's odometer. Mileage data is copied to a special chip card, provided by the tolling authorities and integrated within the OBU. At the end of each month, the information recorded within the

chip card are transferred to the operator for billing purposes. The tolling system is complemented with roadside equipment (RSE) at border control stations, which activate and deactivate the OBU when crossing the border so as to charge only for mileage driven within the country. It is the system used in Switzerland to collect road charges for heavy good vehicle traffic. It has the advantage of avoiding issues of users' privacy and limits the roadside equipment needed to border crossings, but it is not commonly used and needs a complex and expensive OBU.

Mobile communications

A mobile phone (or an equivalent mobile communications device) is used as the on-board device that identifies the road user and the vehicle. The mobile phone, by correlating the different signals that it receives from the GSM base stations, is able to identify the path taken by the vehicle and can therefore generate the corresponding toll charging elements. Mobile phone and smartphone-based tolling do not require in-vehicle devices, allowing for lower initial investment costs when compared with other technologies.

With the growing usage of smartphones using 3G, and 4G, and sooner 5G, the wider adoption of mobile solutions is expected to be wider adopted. However, review of the current EFC Directive and EETS Decision should be considered, with the aim of removing reference to GSM technology and inserting a more general statement about using available, mature, area-wide mobile communications to transmit EFC-related data securely from the OBU to the proxies and back office

Table A- 11: ESIF budget for Thematic Objective 7^[14]

Country	CF	ERDF	Grand Total
BG	1 346 690 897	331 226 440	1 677 917 337
CY	100 000 000	16 764 706	116 764 706
CZ	4 293 238 968	3 115 539 199	7 408 778 167
EE	583 780 862		583 780 862
ES		2 852 370 632	2 852 370 632
FR		837 846 563	837 846 563
GR	980 932 725	2 119 279 040	3 100 211 765
HR	1 070 830 307	470 588 240	1 541 418 547
HU	3 177 304 648	742 469 740	3 919 774 388
IT		3 438 995 788	3 438 995 788
LT	897 830 717	459 559 075	1 357 389 792
LV	1 087 405 057	277 032 428	1 364 437 485
MT	89 658 516	35 504 700	125 163 216
PL	17 108 325 743	11 005 590 686	28 113 916 429
PT	716 470 589	294 117 648	1 010 588 237
RO	4 539 007 093	3 418 711 272	7 957 718 365
SE		152 868 168	152 868 168
SI	262 461 506	49 585 025	312 046 531
SK	2 714 281 374	1 414 928 776	4 129 210 150
UK		234 434 452	234 434 452
TA (Interreg)		1 161 695 718	1 161 695 718
Total budget TO 7	38 968 219 002	32 429 108 296	71 397 327 298

Table A- 12: Relevant legislation (EU vs national) at each key step in the authorisation framework for transport infrastructure projects^[9]

Stage of procedure	Legislation
Strategic level	
National/regional transport plan	National
Spatial plan	National
River Basin Management Plans (RBMPs)	Water Framework Directive 2000/60/EC
Maritime Spatial Plans (MSPs)	Maritime Spatial Planning Directive 2014/89/EU
Strategic Environmental Assessment (SEA)	Strategic Environmental Assessment Directive 2001/42/EC
Project planning	
Feasibility studies, technical studies, CBA	National EU funding programmes (e.g. Structural Funds or CEF)
Project permitting	
Spatial planning permit	National
Environmental Impact Assessment (EIA) report report/environmental permit	Environmental Impact Assessment Directive 2011/92/EU amended by 2014/52/EU
Other environmental assessment procedures and possible permits	Water Framework Directive 2000/60/EC Habitats Directive 92/43/EEC Birds Directive 2009/147/EC Seveso Directive 2012/18/EU Others may be applicable
Other permits (e.g. forest, land clearing, archaeological etc.)	National
Public procurement	
Public procurement, including public-private partnerships (PPPs)	Concessions Directive 2014/23/EU Public Procurement Directive 2014/24/EU Utilities Directive 2014/25/EU Remedies Directive for the utilities sector 92/12/EEC amended by 2007/66/EC Remedies Directive for the public sector 89/665/EEC amended by 2007/66/EC
State aid	
State aid notification	EU Regulation laying down detailed rules for the application of Article 108 of the TFEU

This study assesses a range of mechanisms to finance transport infrastructure projects in cross-border regions, and analyses the strategic role that European Groupings of Territorial Cohesion (EGTC) could play in the planning and implementation of cross-border investments. Special attention is given to often neglected small-scale projects, whose investment is up to €1 million.

Building on an in-depth literature review, and supported by interviews with various regional cooperation structures and an experts' workshop, the study analyses the current situation regarding the availability of financing tools for new technologies that enhance transport infrastructure in cross-border regions. It also outlines sources of financial support that could meet investment needs and assesses technological challenges and trends in the field of Intelligent Transport Systems, with a focus on regional interoperability. The study ends with suggestions of policy options to facilitate and accelerate cross-border transport infrastructure projects.

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