Study on providing public transport in cross-border regions – mapping of existing services and legal obstacles

Final Report

Contract: 2019CE160AT093

Written by
Sabine Zilllmer, Frank Holstein, Christian Lüer, Spatial Foresight
Thomas Stumm,EureConsult
Carsten Schürmann, TCP International
Claudia De Stasio, TRT
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Contact: Ricardo Ferreira

E-mail: *REGIO-D2-CROSS-BORDER-COOPERATION@ec.europa.eu*
ricardo.ferreira@ec.europa.eu

European Commission
B-1049 Brussels

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AVV	Aachener Verkehrsverbund (Transport association Aachen)
CBPT	Cross-border public transport (services)
ECBM	European Cross-border Mechanism
EEA	European Economic Area
EGTC	European Grouping of Territorial Cooperation
EMR	Euregio Meuse-Rhine
ERDF	European Regional Development Fund
GIS	Geographic Information Systems
GTFS	General Transit Feed Specification
SPA	Sparsely populated areas
TEN-T	Trans-European Transport Network
VAT	Value-added tax

Abstract

Adding to previous analyses on the infrastructure for cross-border public transport, this study concentrates on the analysis of cross-border public transport services (CBPT). It presents an inventory of CBPT routes and services as of 2019/2020, which can be accessed in a web viewer and analyses the availability of these services in EU border regions. The analysis shows that availability of services and their modes differ heavily across the EU, with some border areas lacking any CBPT despite potential demand. The study analyses the obstacles and solutions related to the provision of CBPT and illustrates these more in-depth in 31 case studies provided in separate files. Most obstacles are due to administrative issues but there are also obstacles related to the legal framework or other issues. Case studies also highlight the benefits of CBPT for residents in border areas. A toolbox provided in a separate file provides insights, illustrations and guidance for stakeholders wishing to establish CBPT by showing ways forward to overcome obstacles. It is bringing together findings from the inventory of obstacles and case studies and includes examples and cross-references. The report closes with some policy pointers for stakeholders and administrations at different levels of governance.

Executive Summary

About 30% of the EU population live in internal border regions (European Commission, 2017a, p. 2). Welfare in these regions depends inter alia on connectivity with other places that may be on both sides of a border. Against this background, border and cross-border regions need particular attention. **Cross-border public transport (CBPT) is central to facilitating cross-border activities**. In recent years this has been increasingly acknowledged through actions including Communications and Reports from the European Commission, studies and the b-solutions initiative to name a few.

Based on previous analyses focusing on infrastructure for CBPT, this study concentrates on the analysis of CBPT services offering insights from different perspectives with various deliverables for stakeholders and CBPT implementers:

- a web-viewer displaying **CBPT routes** as of 2019/2020 (notwithstanding service closures subject to the COVID-19 pandemic) available at www.crossbordertransport.eu;
- an **inventory of obstacles** to CBPT provision summarising 57 legal and administrative obstacles affecting CBPT today in EU border regions;
- **31 case studies** on CBPT services regarding their context, provision, obstacles and solutions;
- a **toolbox** bringing together findings from the inventory of obstacles and case studies and indicating possible ways forward to overcome obstacles, including examples and cross-references to previous deliverables.

The **inventory** illustrates that CBPT services have different geographical arrangements that depend, inter alia, on urban structures, distribution of population and workplaces, infrastructure networks and geographical conditions, domestic public transport services (hubs, stops etc.), and the administrative framework for public transport.

The analysis by **modes** shows that buses and coaches are the most frequent forms of CBPT followed by trains. The number of tram services is the lowest, not least because it is found only in twin city areas with tram networks.

The analysis shows clear differences in the **geographical distribution of CBPT services** and the means of transport. By far the most rail services are in border areas between Germany, Austria and Switzerland. The lowest number or rail services is in more peripheral borders. There are cross-border bus services at all European borders, although less in the East and North. Cross-border tram services exist only between France, Germany and Switzerland. Cross-border ferry services operate with quite different frameworks and different purposes across lakes, rivers and the sea in many parts of Europe.

The vast majority of cross-border rail services are along **TEN-T corridors**, whereas bus services operate more equally along and beyond TEN-T corridors, due to different infrastructure networks and the importance of urban and regional bus lines that operate more often outside TEN-T corridors.

Geographic and border specificities impact on the availability of CBPT. These are either geographic obstacles (mountains, rivers, lakes) or positive (push) factors such as agglomerations that increase the demand for such services. Low demand in rural and sparsely populated areas (SPA) is reflected in a low share of CBPT compared to other types of border areas. Analysing CBPT for countries according to **EU accession** reveals that nearly 60% of CBPT services are across borders between the EU14 countries (i.e. former EU15 without the UK) although these borders make up only about 35% of the length of all

analysed borders. In contrast, the lowest share of CBPT services is between countries that joined the EU more recently.

Apart from the geographic aspects, the demand for CBPT services is also important. Combining these two aspects reveals the **permeability** of border segments for public transport. Border permeability is very diverse in Europe. There is none at long stretches of Scandinavian, Baltic, some East and South-West European borders. At some borders there is only occasional low permeability. This is not only due to a lack of supply but can also mirror non-existing demand due to low population density. There are borders with few non-permeable segments between Switzerland and Liechtenstein, Germany and Denmark, and France and Luxembourg. Linking permeability with border specificities shows that difficult physical conditions such as mountains, rivers or maritime borders do not automatically lead to no or poor permeability.

CBPT services are clearly different from domestic public transport, which matters for some **obstacles**. The particularities occur, firstly, because of structural features along the state borders and the functional relations between neighbouring regions in different countries. And secondly, crossing state borders implies that CBPT services have to be planned, established and operated in a heterogeneous legal framework often in a complex context. These particularities lead to four drivers of obstacles to CBPT service provision:

- supply restrictions due to a lack of sufficient infrastructure;
- differences in settlement structure, population density and demand:
- heterogeneous national or regional legal frameworks;
- complex institutional, administrative and political contexts.

The analysis identified **57 obstacles to CBPT service provision**, the majority of which are due to **administrative issues** (roughly 60%). About 20% of obstacles concern either EU or national legal frameworks. Finally, another 20% of CBPT obstacles has other roots, either a combination of different difficulties or other restrictions such as structural factors. Indeed, practitioner experience hints at practical difficulties in identifying the clear roots of obstacles with frequent **simultaneous administrative and legal obstacles**.

Administrative obstacles have a broad variety of root causes affecting CBPT provision, especially different forms of lacking coordination. Practitioners hint at asymmetric competences and structural differences between key stakeholders that hamper CBPT development.

National legal obstacles are due to an asymmetric cross-border legal context for CBPT due to different provisions in national or regional laws and administrative directives. Eligibility for public subsidies or railway safety standards can differ, or provisions for local transport timetables and fare systems etc. are incoherent.

Other obstacles can be caused by adverse spatial structures such as unfavourable settlement patterns, population density or infrastructure that lead to unbalanced cross-border commuter flows or limited demand potential. Such complex relationships can make solutions difficult to implement.

The large majority of obstacles concern either the entire length or a smaller segment of an **internal or external EU border**. Negative effects in border segments are most often because of local or regional administrative circumstances and less frequently because of adverse spatial conditions such as discontinuities. Obstacles affecting the full length of a border are most often non-awareness or non-willingness of national authorities that hampers CBPT. Few obstacles concern multiple internal EU borders. Examples include some trilateral cross-border regions and obstacles that hamper CBPT on all borders of one EU Member State, as seen in Slovenia and Hungary.

Obstacles differ depending on the mode of transport. Three quarters of obstacles are relevant for one mode. Nearly the same number of obstacles were identified for cross-border railway services and for local and regional bus services. The much lower number of cross-border ferry and tram services means there are less obstacles for these.

The variety of these obstacles implies different **problems for CBPT services**. These can have negative direct and secondary effects as well as possibly wider impacts. Problems arising from obstacles may concern:

- **new CBPT** services when framework conditions are not adequate to address the complexity of CBPT planning and set-up with tailor-made cooperation approaches;
- **existing CBPT operation**, where the quality and/or scope of the service are not sufficient, for instance, a lack of ticket harmonisation, or inadequate timetables and information sources;

Bringing together the analysis of obstacles and the problems they create highlights **seven problem groups**:

- diverse public transport **governance systems** and different policy concepts, from lacking cooperation between stakeholders (national or regional public authorities, transport providers, etc.), complex administrative procedures or adverse political behaviour;
- inadequate cross-border integration of **domestic tariff systems** and ticket pricing, from non-recognition of free public transport for severely disabled persons or sub-optimal ticketing information;
- unprofitable cross-border services, a lack of public subsidies for CBPT or other aspects leading to **adverse financial effects**;
- inadequate railway **infrastructure** or a lack of interoperability for rolling stock;
- difficult **territorial conditions** and/or missing demand potential for CBPT;
- **sub-optimal development** of cross-border services;
- sub-optimal **timetable coordination** or non-user-friendly timetables.

Problems caused by these obstacles have various negative effects and impacts including:

- **direct effects** for stakeholders and users. Obstacles have often more than one direct negative effect. Negative effects concern especially the mobility of citizens in areas with a low demand, long, inconvenient or costly cross-border travelling, expensive CBPT service costs or other effects requiring extensive efforts by stakeholders to set-up CBPT services.
- **secondary effects**. These may result from direct effects or other contextual factors that reinforce the direct effects. Typical secondary effects are congestion and pollution due to the use of private motorised transport rather than CBPT services, reduced internal accessibility in the cross-border region or negative effects for economic integration and job seekers across the border. Insufficient infrastructure, language barriers or other contextual factors can further hamper CBPT.
- **wider impacts** on the development of cross-border regions. These concern wider socio-economic development such as limits to fully using the potential of a cross-border labour market, functional integration and the quality of life for citizens in the border area.

The variety of obstacles and problems, as well as effects and impacts they induce shows there is no ‘one-size-fits-all’ solution. **Tailor-made solutions are needed for different obstacles and spatial and institutional contexts**. Before putting solutions into action, three principal aspects need to be considered:

- **Identify the scope of the problem constellation**. Whether there is a straightforward relationship between the source of an obstacle, the problems it

induces and their effects or a complex relationship matters for the complexity of a tailor-made solution. While straightforward relationships may be solved relatively easily this does not need to be the case if the required action is challenging.

- **Identify possible actions**. The analysis differentiates 15 types of action ranging from different levels of legislation to changes in the institutional framework for CBPT and more intense cross-border cooperation. These types of actions have been further differentiated into tools (see Toolbox) that may be combined in a tailor-made way. Most often it is necessary to combine several types of action.
- **Identify stakeholders to initiate action**. In most cases regional authorities are crucial for this process. National authorities come into play especially if legislative action is necessary or if they are transport organisers. Other initiators may be transport associations, local authorities, cross-border entities or even individual transport companies. Normally, however, several of these stakeholders must be involved during the process.

Case studies on 31 CBPT services offer lessons on the variety of business models for these services. The business model refers to the **service's provisions to operate and address a specific transport demand**. A business model may be specific to one service or the same for multiple services along the same border segment. Case studies cover four transport modes train, bus, ferry and tram.

These lessons from the case studies show that **governance structures for CBPT are often complex** based on multiple collaborations and are shaped by the normative base for public transport in the involved countries. In consequence, **capacities to facilitate such processes** are crucial, especially at local and regional level where experience and capacities to deal with CBPT may be scarce. This may be further aggravated if national priorities focus on national or domestic perspectives. In this context, practical experience shows that **cross-border entities** can be key to bringing the relevant players together. Although they lack the competences for CBPT, their capacities and networks and cross-border perspective help with initiating and implementing CBPT development. **Interreg funding** helps initiate collaboration and setting up cross-border structures for CBPT development if the collaboration continues after the Interreg project finishes. Long-term **cooperation may be formalised through agreements** that contribute to building the normative basis for CBPT provision. These agreements may result in bilateral or unilateral management and service provision models but take time and continuous efforts to set up.

Practical experience from the case studies highlights **other organisational changes** that should be considered for successful CBPT. These refer, inter alia, to the awareness of added value of CBPT services through data collection and considering the cross-border dimension in domestic plans and strategies. Once successfully operating and proving the value added, CBPT services tend to be resilient. Case studies show that services which temporarily ceased to run due to the COVID-19 pandemic and its border restrictions were re-activated based on the previous governance arrangements.

Apart from governance arrangements **operational provisions further shape CBPT**. They describe some of the most noticeable features for users such as timetables, fare systems and ticketing, but also quality standards, maintenance of infrastructure and finance of the service.

The previously mentioned **agreements also matter for operational provisions** as they can define the features of service provision. Bus services furthermore must respect the EU Directive on Cabotage rules. Operational provisions may be specific to one cross-border connection to best tailor the CBPT service to the demand. At the same time, provisions are usually **embedded in the wider networks of cross-border connections** and may also consider other means of transport, such as rental cars or bikes. In consequence, case studies show that operational provisions are very diverse and defined by many contextual conditions.

Benefits of CBPT are multi-dimensional, despite their marginal role in cross-border flows. Case studies highlight several of these benefits:

- enhance connectivity in border regions;
- access and use of other cross-border services;
- promoting the potential of cross-border labour markets;
- environment-friendly transport options, and may reduce congestion;
- highlight functional links across the border;
- provide access to domestic transport networks on both sides of a border.

In other words, these benefits show that CBPT services address negative secondary and wider impacts of obstacles.

A **toolbox** has been developed using insights from different tasks of the study. The objective is to offer guidance and information to CBPT stakeholders. Tools are described in a standardised ways and offer links and cross-references to case studies, obstacles, other solutions and information sources. The toolbox offers 'building blocks' for CBPT development rather than a step-by-step guide, to allow for flexible use.

The report concludes with policy pointers which can be summarised as follows:

- If no CBPT services are provided but there is potential demand, the priority may be to **develop CBPT services to enhance the permeability of borders**. This is especially relevant for borders that have few or no cross-border bus services.
- **Integration of CBPT with domestic networks** can contribute to broader policy objectives ('de-carbonisation of transport') especially where there are domestic and cross-border services but the full benefits of CBPT are not used. For other regions the focus may be first on CBPT development.
- **Integration of CBPT has many dimensions** depending on the specific demand in a cross-border region and **addressing the specific lack of integration**. Integration can refer to a lack of links despite coordinated timetables on both sides of a border. It also refers to a lack of timetable coordination between a cross-border service and domestic services or inadequate operating hours or destinations.
- While integration may yield more benefits, it can be very useful to **start with targeted CBPT to facilitate a specific demand** (e.g. of students or employees). This may give rise to further CBPT development in the long run.
- With a long-term objective of CBPT service provision in mind, **tailor-made solutions** should be developed.
- **Experience, understanding and knowledge about CBPT** is not equally developed in all European cross-border regions and would benefit from further **knowledge creation**. In this context and to enhance complex governance solutions, **cross-border entities** such as Euroregions can play an important role.
- **EU level actors** can contribute to enhancing knowledge and capacities of local and regional stakeholders. Showcasing the wider impacts of CBPT in a region and its adequate and visible communication may be crucial to overcoming the domestic focus of many stakeholders in CBPT service development.
- Further specific solutions could be thought of in terms of **searching for strategic alliances**, including **interaction with private operators acting under market conditions** and look into the **ambivalences of TEN-T planning and development**.

Synthèse

Environ 30 % de la population de l'UE vit dans des régions frontalières internes (Commission européenne, 2017, p. 2). Le bien-être dans ces régions dépend notamment de la connectivité avec d'autres lieux qui peuvent se trouver de part et d'autre d'une frontière. Dans ce contexte, les régions frontalières et transfrontalières nécessitent une attention particulière. Les **transports publics transfrontaliers (TPTF) sont essentiels pour faciliter les activités transfrontalières**. Ces dernières années, cet aspect a bénéficié d'une reconnaissance croissante par des actions telles que des communications et des rapports de la Commission européenne, des études et l'initiative b-solutions, pour n'en citer que quelques-unes.

Sur la base d'analyses antérieures centrées sur les infrastructures de TPTF, cette étude se concentre sur l'analyse des services de TPTF en offrant des perspectives multiples et des livrables à destination des parties prenantes et responsables de leur mise en œuvre :

- un visualiseur web affichant les **itinéraires de TPTF** opérationnels en 2019/2020 (nonobstant les fermetures de service liées à la pandémie COVID-19) disponible sur www.crossbordertransport.eu ;
- un **inventaire des obstacles** à la fourniture de TPTF, qui résume 57 obstacles juridiques et administratifs affectant aujourd'hui les TPTF dans les régions frontalières de l'UE ;
- **31 études de cas** sur les services de TPTF détaillant leur contexte, leur fourniture, les obstacles et les solutions ;
- une **boîte à outils** rassemblant les conclusions de l'inventaire des obstacles et des études de cas et indiquant les moyens possibles de surmonter les obstacles, y compris des exemples et des références croisées avec les livrables précédents.

L'**inventaire** montre que le déploiement géographique des services de TPTF dépend, entre autres, des structures urbaines, de la répartition de la population et des lieux de travail, des réseaux d'infrastructures et des conditions géographiques, des services de transports publics nationaux (hubs, arrêts, etc.) et du cadre administratif des transports publics.

L'analyse par **mode** montre que les autobus et les autocars sont les formes les plus fréquentes de TPTF, suivis par les trains. Le nombre de services de tramway est le plus faible, notamment parce qu'on ne le trouve que dans les zones de villes jumelées déjà dotées de réseaux de tramway.

L'analyse révèle de nettes différences dans la **répartition géographique des services de TPTF** et des moyens de transport associés. Les services ferroviaires sont de loin les plus nombreux dans les zones frontalières entre l'Allemagne, l'Autriche et la Suisse. Le nombre le plus faible de services ferroviaires se trouve dans les zones frontalières plus périphériques. Il existe des services de bus transfrontaliers à toutes les frontières européennes, mais moins à l'est et au nord. Les services de tramway transfrontaliers n'existent qu'entre la France, l'Allemagne et la Suisse. Dans de nombreuses régions d'Europe, les services de ferry transfrontaliers fonctionnent dans des cadres et avec des objectifs très différents pour traverser les lacs, les rivières et la mer.

La grande majorité des services ferroviaires transfrontaliers se situent le long des **corridors RTE-T**, tandis que les services de bus fonctionnent à parts égales le long des corridors RTE-T et le long d'autres axes, en raison des différences entre réseaux d'infrastructures et de l'importance relative des lignes de bus urbaines et régionales qui fonctionnent le plus souvent en dehors des corridors RTE-T.

Les **spécificités géographiques et frontalières** ont un impact sur la disponibilité des TPTF. Il s'agit soit d'obstacles géographiques (montagnes, rivières, lacs), soit de facteurs positifs (*push*) tels que les agglomérations qui augmentent la demande de tels services. La faible demande dans les zones rurales et faiblement peuplées se traduit par une faible part de TPTF par rapport aux autres types de zones frontalières. L'analyse des TPTF pour les pays en fonction de leur date d'**adhésion à l'UE** révèle que près de 60 % des services de TPTF sont transfrontaliers entre les pays de l'UE14 (c'est-à-dire l'ancienne UE15 sans le Royaume-Uni), bien que ces frontières ne représentent qu'environ 35 % de la longueur de toutes les frontières analysées. En revanche, la part la plus faible des services de TPTF se situe entre les pays qui ont rejoint l'UE plus récemment.

Outre les aspects géographiques, la demande de services de TPTF est également importante. La combinaison de ces deux aspects révèle la **perméabilité** des segments frontaliers pour les transports publics. La perméabilité des frontières est très diverse en Europe. Elle est inexistante sur de longs tronçons des frontières scandinaves, baltes et sur certaines frontières de l'Europe de l'Est et du Sud-Ouest. Certaines frontières ne présentent qu'une faible perméabilité occasionnelle. Cela n'est pas seulement dû à un manque d'offre, mais peut aussi refléter une demande inexistante due à une faible densité de population. Il existe des frontières avec peu de segments non perméables entre la Suisse et le Liechtenstein, l'Allemagne et le Danemark, et la France et le Luxembourg. L'établissement d'un lien entre la perméabilité et les spécificités des frontières montre que des conditions physiques difficiles telles que des montagnes, des rivières ou des frontières maritimes ne conduisent pas automatiquement à une perméabilité nulle ou faible.

Les services de TPTF se distinguent nettement des transports publics nationaux, ce qui explique certains **obstacles**. Ces particularités sont dues, premièrement, aux caractéristiques structurelles le long des frontières des États et aux relations fonctionnelles entre les régions voisines de différents pays. Ensuite, le franchissement des frontières nationales implique que les services de TPTF soient planifiés, établis et exploités dans un cadre juridique hétérogène, souvent dans un contexte complexe. Ces particularités conduisent à identifier quatre facteurs majeurs d'obstacles à la fourniture de services de TPTF :

- une offre limitée due à l'absence d'infrastructures suffisantes ;
- des différences de structure résidentielle, de densité de population et de demande de services ;
- des cadres juridiques nationaux ou régionaux hétérogènes ;
- des contextes institutionnels, administratifs et politiques complexes.

L'analyse a identifié **57 obstacles à la fourniture de services de TPTF**, dont la majorité est due à des **questions administratives** (environ 60%). Environ 20% des obstacles concernent les cadres juridiques européens ou nationaux. Enfin, 20% des obstacles aux TPTF sont liés à d'autres facteurs, soit une combinaison de différentes difficultés ou d'autres restrictions telles que des facteurs structurels. En effet, l'expérience des praticiens laisse entrevoir des difficultés pour identifier les racines claires des obstacles, lorsque se combinent **obstacles administratifs et juridiques**.

Les **obstacles administratifs** ont une grande variété de causes profondes affectant la fourniture de TPTF, notamment différentes formes de manque de coordination. Les praticiens évoquent des compétences asymétriques et des différences structurelles entre les principales parties prenantes qui entravent le développement de TPTF.

Les **obstacles juridiques nationaux** sont dus à un contexte juridique transfrontalier asymétrique pour les TPTF en raison de dispositions différentes dans les lois et directives administratives nationales ou régionales. L'éligibilité aux subventions publiques ou les normes de sécurité ferroviaire peuvent différer, tout comme les dispositions relatives aux horaires et aux systèmes de tarification des transports locaux.

D'autres obstacles peuvent être dus à des structures spatiales défavorables, liées au morcellement du tissu résidentiel, une densité de population défavorable ou des infrastructures de mauvaise qualité, qui entraînent un déséquilibre des flux transfrontaliers de navetteurs ou une demande potentielle limitée. Ces relations complexes peuvent rendre les solutions difficiles à mettre en œuvre.

La grande majorité des obstacles concernent soit la longueur totale, soit un segment plus petit d'une **frontière intérieure ou extérieure de l'UE**. Les effets négatifs affectant certains segments frontaliers sont le plus souvent dus à des circonstances administratives locales ou régionales et moins fréquemment à des conditions spatiales défavorables telles que des discontinuités. Les obstacles affectant la totalité d'une frontière sont le plus souvent dus à un défaut de sensibilisation ou à la réticence des autorités nationales, ce qui entrave la mise en œuvre des TPTF. Quelques obstacles concernent plusieurs frontières intérieures de l'UE. C'est le cas notamment d'obstacles qui affectent certaines régions transfrontalières trilatérales et d'obstacles qui entravent la mise en place de TPTF à toutes les frontières d'un État membre donné de l'UE, comme c'est le cas pour la Slovénie et la Hongrie.

Les obstacles diffèrent selon le mode de transport. Trois quarts des obstacles concernent un mode de transport donné uniquement. Presque le même nombre d'obstacles a été identifié pour les services ferroviaires transfrontaliers et pour les services d'autobus locaux et régionaux. Le nombre beaucoup plus faible de services transfrontaliers de ferry et de tramway amène à observer moins d'obstacles pour ceux-ci.

La variété de ces obstacles implique différents **problèmes pour les services de TPTF.** Ceux-ci peuvent avoir des effets négatifs directs et secondaires, ainsi que d'éventuelles répercussions plus larges. Les problèmes découlant des obstacles peuvent concerner :

- de **nouveaux TPTF** lorsque les conditions-cadres ne permettent pas de faire face à la complexité de la planification et de la mise en place de TPTF avec des approches de coopération sur mesure ;
- **l'exploitation de TPTF existants**, quand la qualité et/ou l'étendue du service ne sont pas suffisantes, par exemple, lorsque les services de billetteries ne sont pas harmonisés ou que les horaires ou les sources d'information sont inadéquats.

La synthèse de l'analyse des obstacles et des problèmes qu'ils créent met en évidence **sept groupes de problèmes** :

- des **systèmes de gouvernance et de politique** des transports publics dissemblables, qui peuvent générer un manque de coopération entre les parties prenantes (autorités publiques nationales ou régionales, prestataires de transport, etc.), des procédures administratives complexes ou des comportements politiques adverses ;
- l'intégration transfrontalière inadéquate des **systèmes tarifaires** et de la tarification des billets **nationaux**, qui peuvent mener à la non-reconnaissance de la gratuité des transports publics pour les personnes gravement handicapées ou à des informations sur la billetterie non optimales ;
- des services transfrontaliers non rentables, un manque de subventions publiques pour les TPTF (ou d'autres aspects) entraînant des **effets financiers négatifs** ;
- une **infrastructure** ferroviaire inadéquate ou un manque d'interopérabilité du matériel roulant ;
- des **conditions territoriales** difficiles et/ou une demande potentielle insuffisante pour les TPTF;
- le **développement sous-optimal** d'autres services transfrontaliers ;
- **une coordination** sous-optimale **des horaires** ou des horaires non-adaptés aux usages.

Les problèmes causés par ces obstacles ont divers effets et impacts négatifs, notamment :

- des **effets directs** pour les parties prenantes et les utilisateurs. Les obstacles ont souvent plus d'un effet négatif direct. Les effets négatifs concernent notamment la mobilité des citoyens dans les zones à faible demande, des déplacements transfrontaliers longs, incommodes ou coûteux, les coûts élevés des services de TPTF ou d'autres effets nécessitant des efforts importants de la part des parties prenantes pour mettre en place les services de TPTF.
- des **effets secondaires**. Ceux-ci peuvent résulter des effets directs ou d'autres facteurs contextuels qui renforcent les effets directs. Les effets secondaires typiques sont la congestion et la pollution dues à l'utilisation de transports motorisés privés plutôt que de services de TPTF, la réduction de l'accessibilité interne dans la région transfrontalière ou les effets négatifs sur l'intégration économique et les demandeurs d'emploi de l'autre côté de la frontière. Des infrastructures insuffisantes, des barrières linguistiques ou d'autres facteurs contextuels peuvent également entraver le transport transfrontalier de passagers.
- des **impacts plus larges** sur le développement des régions transfrontalières. Ceux-ci concernent le développement socio-économique au sens large, comme les limites à l'utilisation complète du potentiel d'un marché du travail transfrontalier, l'intégration fonctionnelle et la qualité de vie des citoyens dans la zone frontalière.

La diversité des obstacles et des problèmes, ainsi que des effets et des impacts qu'ils induisent, montre qu'il n'existe pas de solution unique. Des **solutions sur mesure sont nécessaires pour différents obstacles et contextes spatiaux et institutionnels**. Avant de mettre en œuvre des solutions, il convient de prendre en compte trois aspects principaux :

- **Identifier la portée de la constellation de problèmes.** Qu'il y ait une relation directe entre la source d'un obstacle, les problèmes qu'il induit et leurs effets ou une relation complexe a une incidence sur le type de solutions sur mesure à mettre en oeuvre. Si les relations directes peuvent être résolues relativement facilement, ce n'est pas forcément le cas si l'action requise est complexe.
- **Identifier les actions possibles.** L'analyse distingue 15 types d'actions allant de différents niveaux de législation à des changements dans le cadre institutionnel des TPTF et à une coopération transfrontalière plus intense. Ces types d'actions ont été subdivisés en outils (voir la boîte à outils) qui peuvent être combinés de manière personnalisée. Le plus souvent, il est nécessaire de combiner plusieurs types d'actions.
- **Identifier les parties prenantes pour lancer l'action.** Dans la plupart des cas, les autorités régionales sont cruciales pour ce processus. Les autorités nationales entrent en jeu surtout si une action législative est nécessaire ou si elles ont autorité sur l'organisation des transport. Les autres initiateurs peuvent être des associations de transport, des autorités locales, des entités transfrontalières ou même des entreprises de transport privés. En règle générale, cependant, plusieurs de ces acteurs doivent être impliqués dans le processus.

Des **études de cas sur 31 services de TPTF** permettent de tirer des enseignements sur la variété des modèles d'entreprise de ces services. Le modèle commercial fait référence aux **dispositions prises par le service pour fonctionner et répondre à une demande de transport spécifique**. Un modèle commercial peut être spécifique à un service ou identique pour plusieurs services le long d'un même segment frontalier. Les études de cas couvrent quatre modes de transport : le train, le bus, le ferry et le tram.

Ces leçons tirées des études de cas montrent que les **structures de gouvernance pour les TPTF sont souvent complexes**, basées sur de multiples collaborations et contraints par la base normative des transports publics dans les pays concernés. Par conséquent, les **capacités à faciliter ces processus** sont cruciales, en particulier au niveau local et régional où l'expérience et les capacités à gérer les TPTF peuvent être rares. Cela peut être encore aggravé si les priorités définies au niveau national se concentrent exclusivement sur les transports intérieurs et le territoire national. Dans ce contexte,

l'expérience pratique montre que les **entités transfrontalières** peuvent être essentielles pour rassembler les acteurs concernés. Bien qu'elles ne disposent pas des compétences nécessaires pour les TPTF, leurs capacités et leurs réseaux ainsi que leur perspective transfrontalière aident à initier et à mettre en œuvre le développement de TPTF. Des **financement Interreg** aide à initier la collaboration et la mise en place de structures transfrontalières pour le développement de TPTF si la collaboration se poursuit après la fin du projet Interreg. La **coopération** à long terme **peut être formalisée par des accords** qui contribuent à établir la base normative de la fourniture de TPTF. Ces accords peuvent déboucher sur des modèles de gestion et de prestation de services bilatéraux ou unilatéraux, mais leur mise en place demande du temps et des efforts continus.

L'expérience pratique tirée des études de cas met en évidence **d'autres changements organisationnels** qui devraient être pris en compte pour une mise en place réussie de TPTF. Il s'agit, entre autres, de la prise de conscience de la valeur ajoutée des services de TPTF par la collecte de données et de la prise en compte de la dimension transfrontalière dans les plans et stratégies nationaux. Une fois qu'ils fonctionnent avec succès et qu'ils ont prouvé leur valeur ajoutée, les services de TPTF s'installent dans la durée. Des études de cas montrent que des services qui ont temporairement cessé de fonctionner en raison de la pandémie de COVID-19 et de ses restrictions frontalières ont été réactivés sur la base des accords de gouvernance précédents.

Outre les dispositions en matière de gouvernance, les **dispositions opérationnelles définissent les TPTF**. Elles décrivent certaines des caractéristiques les plus visibles pour les usagers, comme les horaires, les systèmes de tarification et la billetterie, mais aussi les normes de qualité, la maintenance des infrastructures et le financement du service.

Les **accords** mentionnés précédemment **sont également importants pour les dispositions opérationnelles**, car ils peuvent définir les caractéristiques de la prestation de services. Les services de bus doivent en outre respecter la directive européenne sur les règles de cabotage routier. Les dispositions opérationnelles peuvent être spécifiques à une connexion transfrontalière afin d'adapter au mieux le service de TPTF à la demande. En même temps, les dispositions sont généralement **intégrées dans les réseaux plus larges de liaisons transfrontalières** et peuvent également prendre en compte d'autres moyens de transport, tels que les voitures ou les vélos de location. Par conséquent, les études de cas montrent que les dispositions opérationnelles sont très diverses et définies par de nombreuses conditions contextuelles.

Les avantages des TPTF sont multidimensionnels, malgré leur rôle marginal dans les flux transfrontaliers. Des études de cas mettent en évidence plusieurs de ces avantages :

- améliorer la connectivité dans les régions frontalières ;
- permettre l'accès à – et l'utilisation – d'autres services transfrontaliers ;
- promouvoir le potentiel des marchés du travail transfrontaliers ;
- privilégier des options de transport respectueuses de l'environnement, qui peuvent aussi réduire les encombrements ;
- mettre en évidence les liens fonctionnels de part et d'autre de la frontière ;
- fournir un accès aux réseaux de transport nationaux des deux côtés d'une frontière.

En d'autres termes, ces avantages peuvent se matérialiser à une échelle beaucoup plus large si les services CBPT s'attaquent aux effets négatifs directs et secondaires existants des obstacles ainsi qu'à leur impact négatif plus large.

Pour faciliter cette tâche, une **boîte à outils a** été développée à partir des résultats des différentes tâches de l'étude. L'objectif est d'offrir des conseils et des informations aux parties prenantes des TPTF. Les outils sont décrits de manière standardisée et proposent des liens et des références croisées avec des études de cas, des obstacles, d'autres solutions et des sources d'information. La boîte à outils offre des "éléments de base" pour

le développement de TPTF plutôt qu'un guide étape par étape, afin d'en permettre une utilisation flexible.

Le rapport s'achève par des orientations politiques qui peuvent être résumées comme suit :

- Si aucun service de TPTF n'est fourni mais qu'il existe une demande potentielle, la priorité peut être de **développer des services de TPTF pour améliorer la perméabilité des frontières**. Ceci est particulièrement pertinent pour les frontières qui ont peu ou pas de services de bus transfrontaliers.
- L'**intégration des TPTF aux réseaux nationaux** peut contribuer à la réalisation d'objectifs politiques plus larges ("dé-carbonisation des transport"), notamment lorsqu'il existe des services nationaux et transfrontaliers mais que les avantages du des TPTF ne sont pas pleinement exploités. Pour d'autres régions, l'accent peut être mis en premier lieu sur le développement des TPTF.
- L'**intégration des TPTF revêt de nombreuses dimensions, en fonction de la** demande spécifique d'une région transfrontalière et de l'**absence d'intégration**. L'intégration peut faire référence à un manque de liaisons malgré des horaires coordonnés de part et d'autre d'une frontière. Elle peut également se référer à un manque de coordination des horaires entre un service transfrontalier et les services nationaux ou à des heures d'exploitation ou pour des destinations inadéquates.
- Bien que l'intégration puisse apporter plus de bénéfices, il peut être très utile de **commencer par un TPTF ciblé pour faciliter une demande spécifique** (par exemple, des étudiants ou des employés). Cela peut donner lieu à d'autres développements de TPTF à long terme.
- En gardant à l'esprit l'**objectif à long terme** de la fourniture de services TPTF, il convient de développer des **solutions adaptées à chaque contexte**.
- L'**expérience, la compréhension et la connaissance des TPTF** ne sont pas également développées dans toutes les régions transfrontalières européennes et pourrait bénéficier de nouvelles **connaissances**. Dans ce contexte et pour améliorer les solutions de gouvernance complexes, les **entités transfrontalières** telles que les Eurorégions peuvent jouer un rôle important.
- Les **acteurs de l'UE** peuvent contribuer à améliorer les connaissances et les compétences des parties prenantes locales et régionales. La mise en évidence des impacts plus larges des TPTF dans une région et une communication adéquate et visible peuvent être cruciales pour surmonter la focale nationale de nombreuses parties prenantes impliquées dans le développement des services de TPTF.
- D'autres solutions spécifiques pourraient être envisagées en termes de **recherche d'alliances stratégiques**, y compris l'**interaction avec des opérateurs privés** et l'examen des **ambivalences de la planification et du développement du RTE-T.**

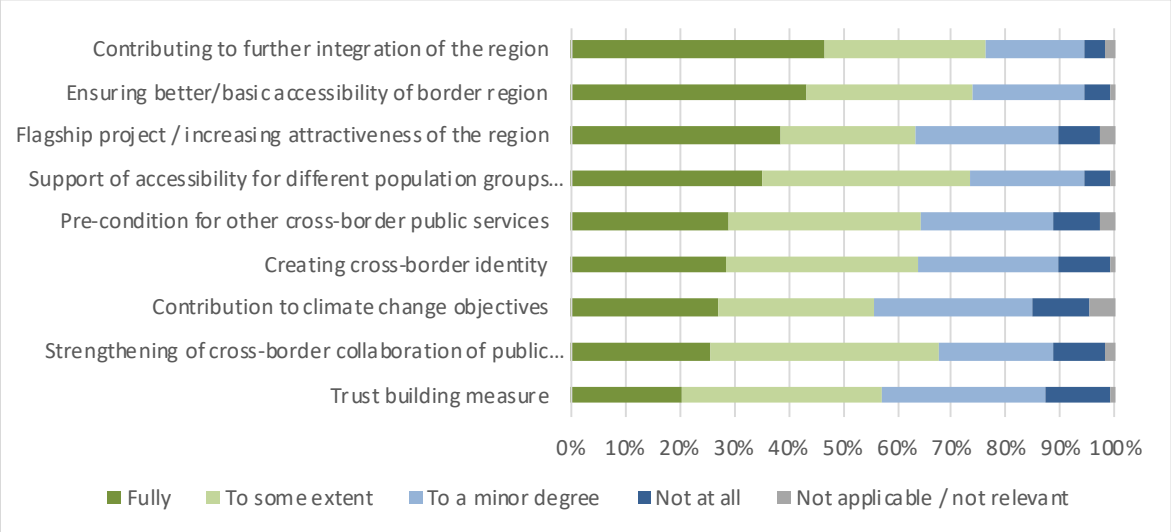
1 Introduction

About 30% of the EU population live in internal border regions (European Commission, 2017a, p. 2). Welfare in these regions depends inter alia on connectivity with other places that may be on both sides of a border. Against this background border and cross-border regions need particular attention. Cross-border transport is a central means to facilitate cross-border activities. This has been acknowledged by the European Commission, including in the Communication on 'Boosting growth and cohesion in EU border regions'. One of its ten outlined actions covers cross-border accessibility (European Commission, 2017a, pp. 12–13) and gave rise to the study of missing rail links in 2018 (Sippel et al., 2018). This importance of cross-border accessibility has been confirmed by the variety of passenger transport projects in the b-solutions initiative[1] and the recent European Commission report on 'EU Border Regions: Living labs of European integration' highlighting that 'difficulties in accessing reliable public transport [is] … the main obstacle to using cross-border public services' (European Commission, 2021b, p. 9).

In general, there are relatively few CBPT connections in comparison with domestic connections. This refers to the number of connections and the frequency of services. Survey analysis within this study illustrates the benefits of such services[2] and provides further evidence of the needs identified in the European Commission Communication and Report.

Enhancing integration and ensuring accessibility are key benefits of CBPT. These benefits were frequently mentioned by survey respondents. In general, respondents indicate multiple benefits of CBPT including helping to make the region attractive, providing an affordable option for certain types of travellers and a pre-condition for other cross-border services.

Figure 1-1: Main benefits of existing CBPT services



Source: Service provider, own elaboration based on survey findings (n=110)

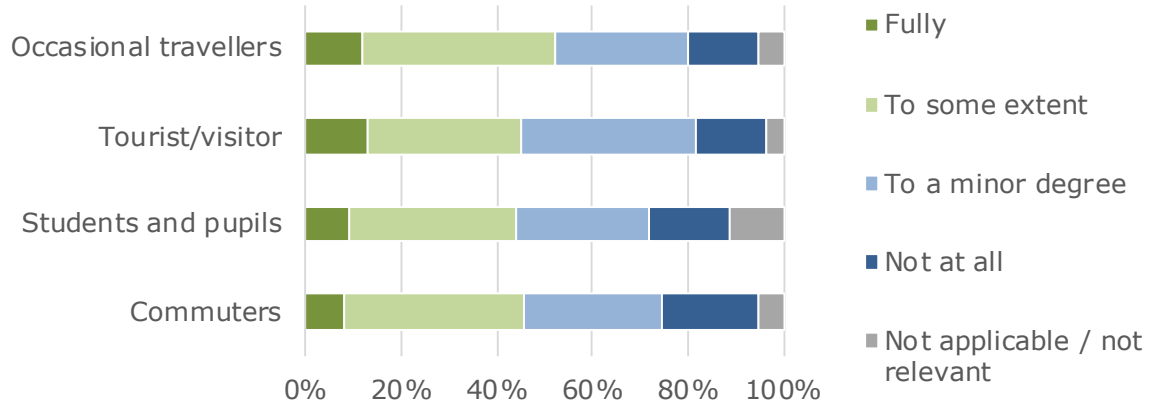
The survey also confirms the need and potential for more CBPT. About half the respondents acknowledge that CBPT services meet demand at least to some extent. However, only around 10% feel the demand of different user groups is fully met (Figure 1-2). Irregular or low frequency services may hinder the usefulness of cross-border transport especially for students and commuters.

[1] https://www.b-solutionsproject.com/
[2] For details on the purpose, dissemination and response rate of the survey see Annex Section 7.8.

According to survey responses, about 20% of border crossings are by public transport. Most of these crossings are either by train or bus. Thus, about four out of five journeys across borders is by car. Other means play a minor role, whether public (ferry and tram) or individual transport (foot, bike or scooter). In some cases, crossing the border on foot, bike or scooter is due to a lack of connecting public transport services. In these cases, public transport is used on either side of the border but requires changing services to overcome cross-border gaps.

The survey revealed a few other distinctions in the demand for CBPT services. Across Europe, demand tends to be the highest in the summer and at weekends. This implies that **tourists and visitors** are major users of CBPT. In a few cases demand is highest on weekdays, notably in the Greater Region, greater Geneva region and between Austria and Germany, Austria and Hungary, Germany and Czechia, and Hungary and Slovakia. This suggests the predominant use of CPBT services by **commuters or students**.

Figure 1-2: Perceived demand met by CBPT per user group



Source: Service provider, own elaboration based on survey findings (n=110)

Improving the lack of CBPT requires mitigating bottlenecks in infrastructure and services. In view of the analysis of cross-border transport infrastructure and missing railway links (Sippel et al., 2018), this study focuses on CBPT services. Missing infrastructure is a major reason for insufficient CBPT services.

In view of this role of CBPT, this study aims to **improve the tools available for public authorities and other stakeholders, to promote (new) CBPT services in border regions**. This study:

- provides a comprehensive inventory of existing CBPT along internal European Economic Area borders and a sound and profound analysis of these;
- develops an inventory of obstacles to CBPT and analyses obstacles and possible solutions;
- identifies best practices with case studies, and
- brings together the outcomes to support planners and implementers with a toolbox.

This report summarises the findings of the study. It presents features and a cross-analysis of the CBPT inventory (Chapter 2) and the inventory of obstacles for CBPT implementation (Chapter 3). These are also provided as separate files together with this report, namely:

- Excel-, Shape- and GTFS-files of CBPT routes;
- Excel-file and Word- and PDF-fiches with the inventory of obstacles.

The CBPT inventory is furthermore accessible via the web viewer www.crossbordertransport.eu.

For in-depth insights into the conditions under which CBPT services are provided in different parts of the EU and to give food for thought by detailing obstacles and solutions, there are 31 case studies. Each case study focuses on one CBPT service. Chapter 4 presents a cross-analysis of these case studies, focusing on lessons regarding the context, governance and operational provisions ('business model' of CBPT) of the case studies.

The toolbox developed by the study offers a comprehensive set of possible access points to address different types of obstacles when setting up and designing CBPT services. It brings together findings from the inventory of obstacles and case studies. The toolbox is a separate file and its structure and purpose are detailed in Chapter 5.

The report closes with conclusions and policy pointers.

The study process and methodology are outlined in more detail in the Annex. The box below provides a summary of the main steps of the study.

Study process and methodology

The study has three tasks that provide the input to all deliverables and achieve the study objectives. These tasks match the three sub-objectives of the study; developing a CBPT service inventory, an inventory of obstacles to CBPT services and an identification of best practices. The steps are summarised as follows:

- The CBPT inventory used different data sources, taking into account the different modes of transport. To visualise this inventory a web-viewer has been developed and made publicly available.
- A comprehensive cross-analysis of the CBPT inventory considered the different geography of CBPT services, such as modal distribution, relation to TEN-T corridors, border segments, target groups and the permeability of EU borders.
- A survey of border region stakeholders and other actors verified the CBPT inventory and obtained additional information on potential obstacles to CBPT provision.
- Document and survey analyses were used to compile the inventory of obstacles, which structures obstacle descriptions under eight themes.
- Case studies for 31 CBPT services are based on document analysis and interviews. Case studies cover train, bus and coach, tram and ferry services.
- The toolbox combines findings on obstacles and solutions and describes possible access points for CBPT developers and implementers.

2 CBPT inventory analysis

This chapter presents the CBPT inventory starting with the definition of CBPT. After that, typical cases of service provision are presented based on practical examples. We then explain how the inventory can be accessed. Finally, we analyse the distribution of CBPT services in Europe. This is first the general level, then by border sections, and finally by permeability. Details on the data sources are in the Annex.

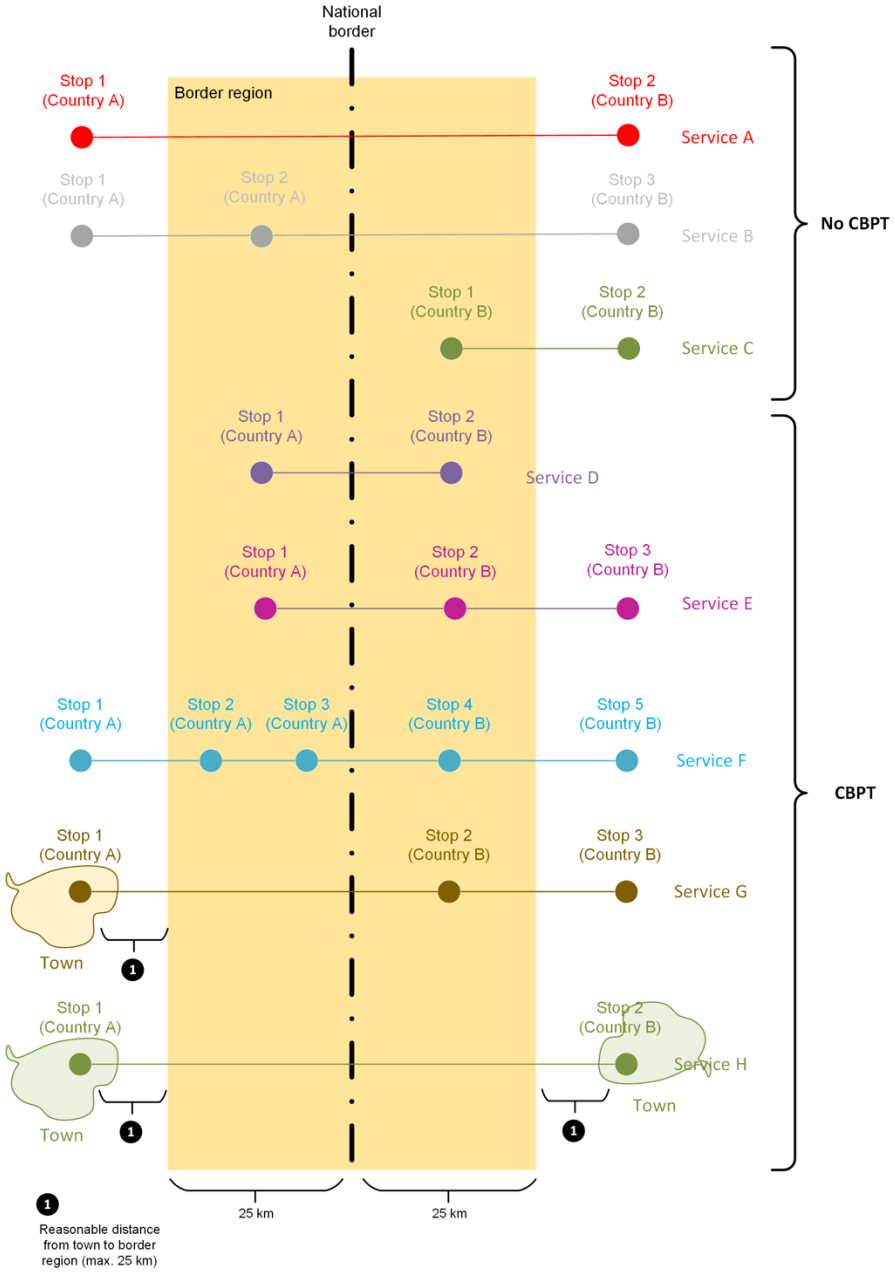
2.1 Definition of CBPT

This inventory is based on the following definition of a CBPT service:

> A CBPT is a regular, scheduled transport service in a border region with at least one stop in two contiguous border regions in two different countries (services D, E and F in Figure 2-1), that is accessible by the general public. A service that crosses a border but does not stop on both sides within the border region (services A and B in Figure 2-1), or a service that starts in the border area but does not cross the national border (service C in Figure 2-1) is not considered as a CBPT.
>
> Long-distance services that cross multiple borders need to fulfil this criterion at one border crossing at least.
>
> Services that start or stop in a town which is outside but close to the border region are also be considered a CBPT, if the distance from the town to the border region is under 25 km (services G and H in Figure 2-1) and no other city or town lies between the town and the national border.
>
> Ferries are only considered a CBPT if the one-way crossing time is under 60 minutes.
>
> The services may be operated by public or private service providers but need to be open for the general public as end users.

In Figure 2-1, services A to C are not considered as a CBPT, while services D to H are. The border region is defined as an area up to 25 km from the national border. Exceptional cases are G and H, where services are accepted as CBPT where towns outside the border area are up to 25 km from the border area provided there is no other town is between it and the border.

Figure 2-1: Definition of CBPT



Source: Service provider

2.2 Typical cases of service provision

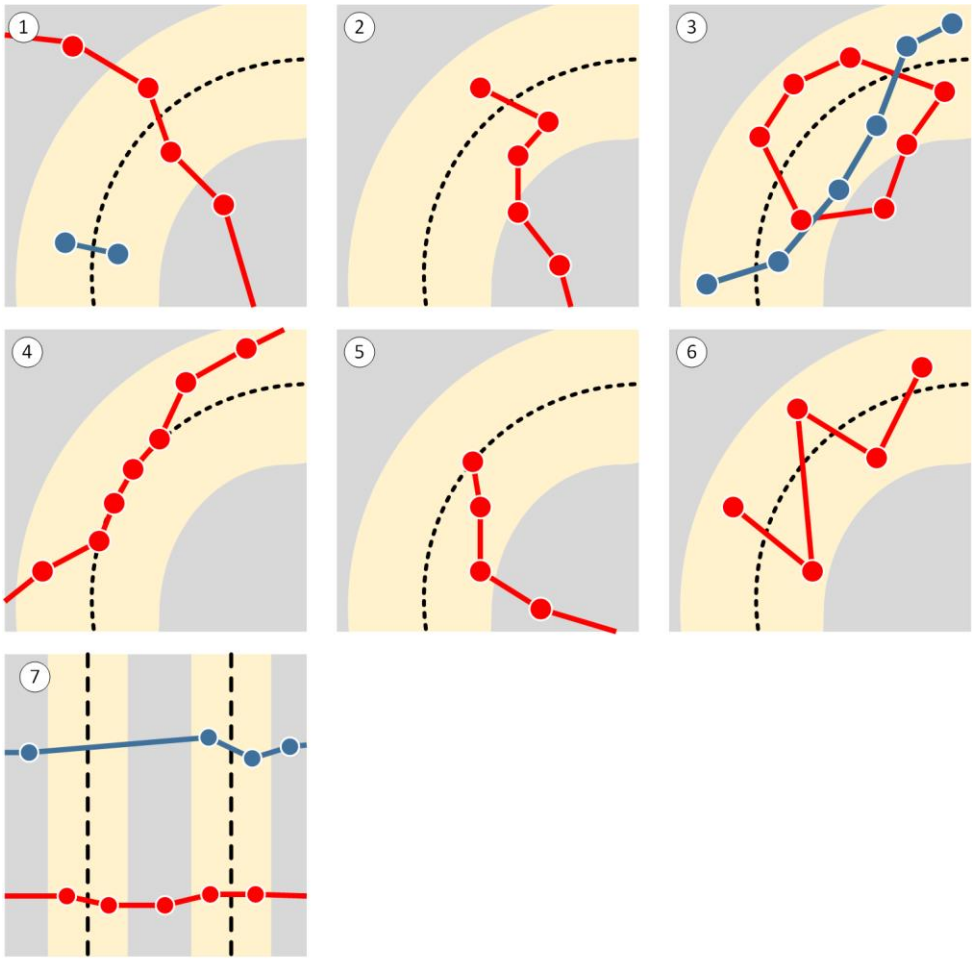
Analysis of the CBPT inventory shows a wide range of typical geographical arrangements (see Figure 2-2 for a schematic illustration).

1. The most typical cases for bus, train and tram services have several stops on both sides of the border (red line in Chart 1 of Figure 2 2). For ferries, there is normally only one stop on each side of the border (blue line in Chart 1 of Figure 2-2).
2. Some services widely found across Europe are services with several stops on one side of the border, but only one on the other side (Chart 2 in Figure 2-2). An example is tourist bus services between Waldkirchen (DE) and Nové Údolí (CZ).
3. In case of twin cities, we sometimes find circular bus lines with the same origin and terminus (red service in Chart 3). A prominent example of this is in Haparanda and Tornio on the Finnish-Swedish border. Another example of the origin and terminus being in the same country are regional bus or train services that pass a border two

times (blue service in Chart 3). Examples are in Ireland/Northern Ireland with bus services connecting Dublin with Londonderry and on towards Annagry and Moville.

4. Another interesting case is on the Dutch-German border where a section of a bus service runs directly on the national border, with the left kerbside belonging to one country and the other kerbside to the other country (Chart 4). Examples are in Dinxperlo (NL)/Suderwick (DE) and in Kerkrade (NL)/Herzogenrath (DE).

Figure 2-2: Typical spatial configurations of CBPT (schematic illustration)



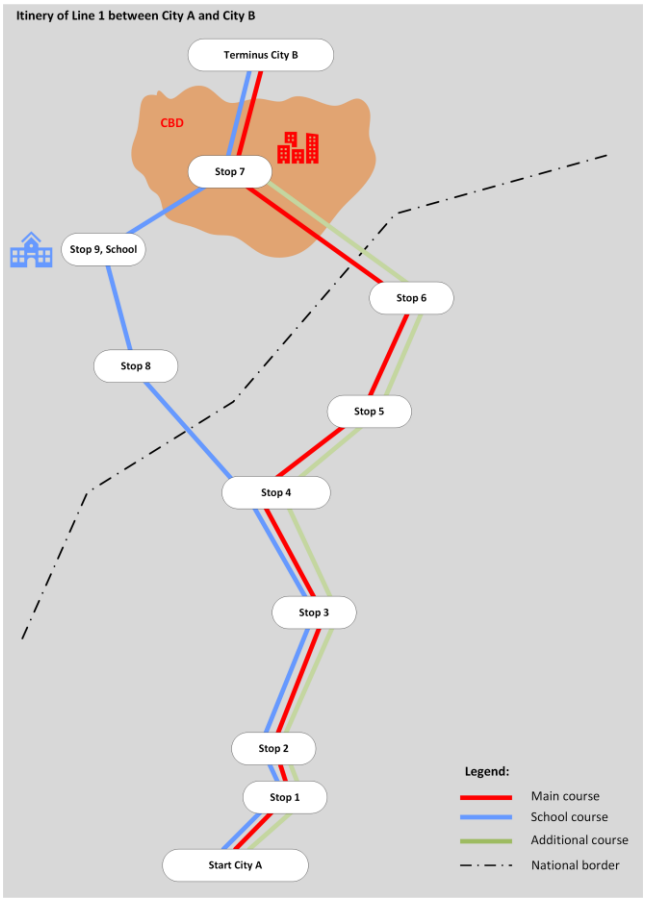
Source: Service provider

5. There are several cases of the terminus of a bus or train service at the border crossing (Chart 5). A prominent example is the terminus in Halluin in the Greater Lille area.
6. A specific situation for passenger tourist ferries is where a service crosses the national border multiple times, i.e. with alternating stops in both countries ('ping-pong situation', Chart 6). Such cases are found on Lake Constance and Lake Geneva.
7. Finally, long-distance bus and train services usually cross two or more national borders. CBPT criteria can be met in all border regions (red service in Chart 7), or only at one border crossing of the several these services cross (blue service in Chart 7).

The actual set up of CBPT in a border region depends on the urban structure, distribution of population and workplaces, the infrastructure network and domestic public transport services (hubs, stops, etc.), and on geographical and physical situations, but to a large degree also on the administrative organisation of the service.

As with domestic public transport services, CBPT often follow different itineraries during the day. Figure 2-3 exemplifies this for a virtual bus line 1 between Cities A and B. The main course of this bus line is indicated in red from Stop 1 to Stop 7 and finally to the terminus in City B. This runs often during the day (say, every 20 minutes). In the morning and at noon there is another 'school' course (blue) connecting the school (Stop 9) in City B. This route would typically have only two services during working days. During peak hours, Line 1 also offers additional courses (green) directly from City A to City B at Stop 7[3].

Figure 2-3: Example of different itineraries of one bus line



Source: Service provider

2.3 Accessing the CBPT inventory

The CBPT inventory can be accessed in four ways (data formats) via:

- a dedicated Web Viewer,
- shapefiles,
- GTFS feeds, and
- an Excel file.

Each option serves different purposes: With the Web Viewer application, the CBPT are available to a wide circle of interested experts and users. The shapefiles can be used for

[3] In this example, the CBPT inventory includes three entries for Line 1 between the same origin and terminus, representing the red, blue and green courses. This increases the number of services (particularly for bus services) in the inventory.

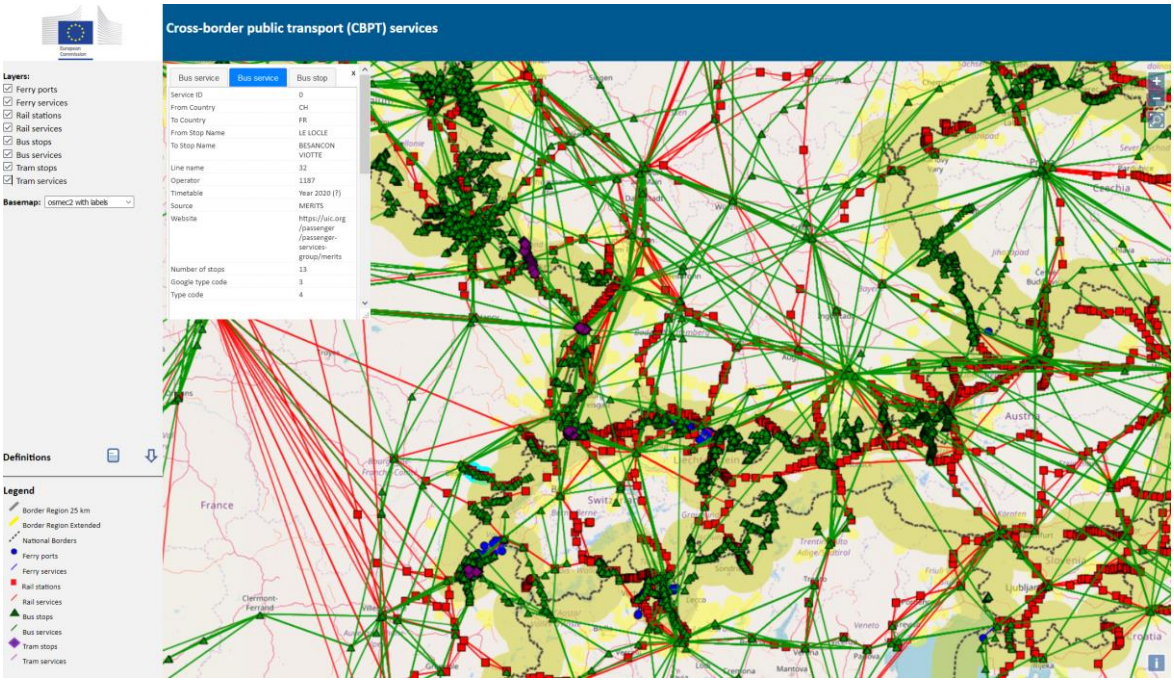
further geographical analyses or to create maps and other types of visualisation[4], but require GIS systems. With GTFS files, the CBPT can be used in transport and accessibility models, or other public transport applications. The Excel file allows easy access to the inventory for any user even without an internet connection and GIS, enabling statistical analyses for all CBPT and all border areas, or for defined subsets of these.

Web Viewer

This interactive online application visualises the CBPT services[5]. Each mode shows stops and routes, along with attributive information. The user can turn on/off visibility of the different modes and can change the background map from a list of options. The application also presents selected analyses results, i.e., the user can visually overlay CBPT provision with the analyses.

Figure 2-4 shows a screenshot of the application, highlighting a bus service between Le Locle (Switzerland) and Besancon (France). The Annex provides a brief manual for using the application.

Figure 2-4: Screenshot of the web viewer



Source: Service provider

Shapefiles

For each mode, two shapefiles provide the geometries of the services, where a point shapefile represents the stops, stations or ports, and a line shapefile represents the routes, respectively. With four modes of transport, eight Shapefiles were generated (Table 2-1).

Each shapefile includes fields with attributive information. As far as possible, field names and field contents are harmonised across all shapefiles. The Annex presents an overview of the attributes.

[4] The analyses below were generated using the shapefiles.
[5] The web viewer is accessible via: www.crossbordertransport.eu.

Table 2-1: Name of the shapefiles

Mode	Line shapefiles	Point shapefiles
Trains	Rail_Routes.shp	Rail_Stations.shp
Buses	Bus_Routes.shp	Bus_Stops.shp
Trams	Tram_Routes.shp	Tram_Stations.shp
Ferries	Ferry_Routes.shp	Ferry_Ports.shp

Source: Service provider

GTFS feeds

The CBPT Inventory is also available as a collection of four GTFS feeds, with one feed per mode (Table 2-2). The four feeds were generated following the GTFS specifications[6] and validated using the free FeedValidator tool[7].

Table 2-2: Name of GTFS feeds

Mode	Name of GTFS feed
Trains	RAIL_GTFS.zip
Buses	BUS_GTFS.zip
Trams	TRAMS_GTFS.zip
Ferries	FERRIS_GTFS.zip

Source: Service provider

Excel file

Finally, the inventory can also be accessed via an Excel file. This combines information on all four modes within one table (Figure 2-5). By using Excel standard functionalities, the reader can filter, group, sort, hide or query the CBPT inventory. For example, it would be possible to select all CBPT that cross a border at a specific border section, or select all CBPT in mountain or rural regions, or to hide all services between two specific countries.

Figure 2-5: Screenshot of the CBPT inventory in Excel file format

Source: Service provider

[6] Google Transit APIs, Static Transit. Available at https://developers.google.com/transit/gtfs/
[7] See https://github.com/google/transitfeed/wiki/FeedValidator

2.4 The geography of CBPT in Europe

With a Europe-wide CBPT inventory available for the first time, a comprehensive analysis of spatial and modal distribution is now possible. The question is whether geographical or other patterns emerge.

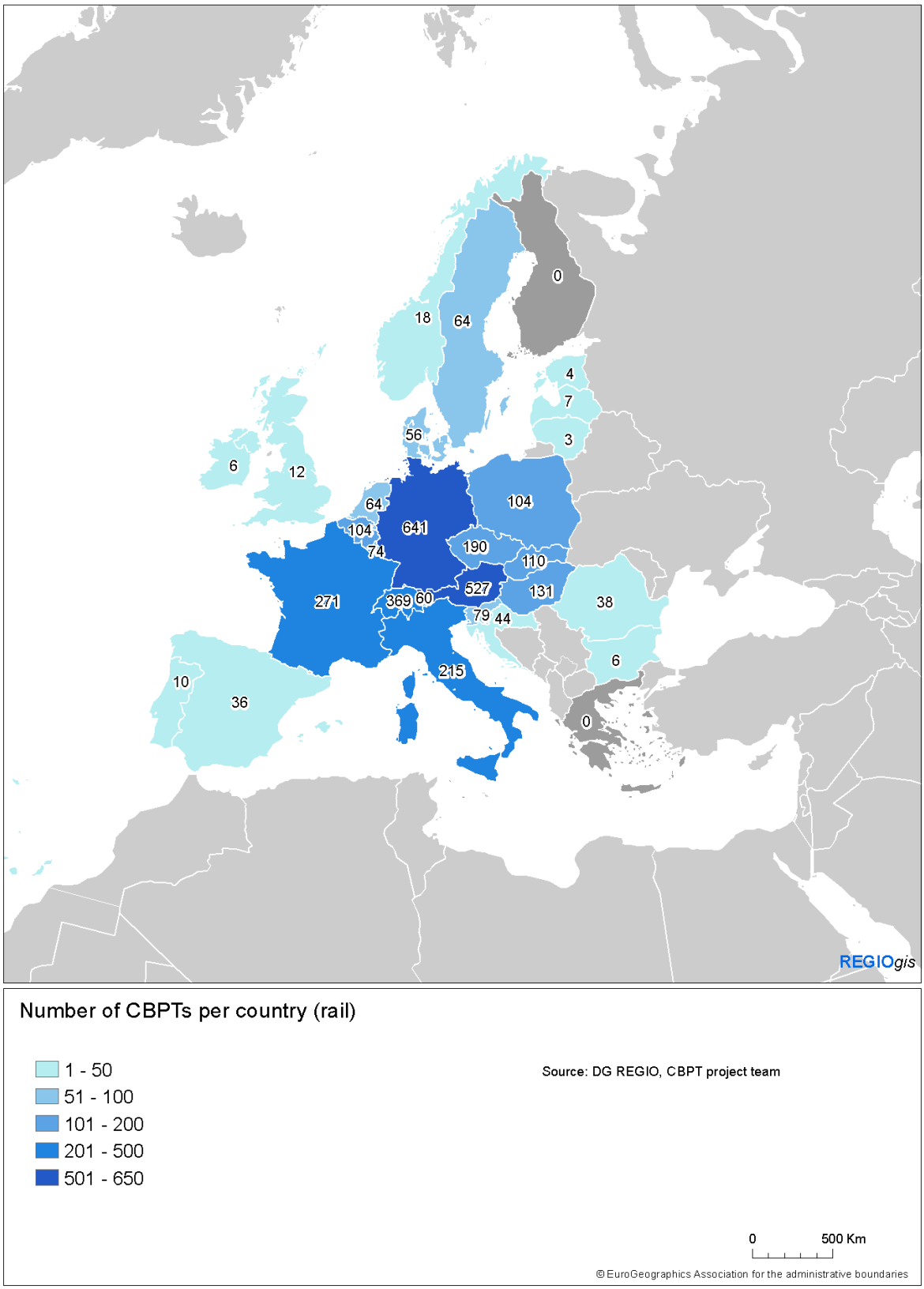
2.4.1 Modal and spatial distribution

The analysis shows clear differences in the geographical distribution of CBPT as well as by means of transport.

Rail services

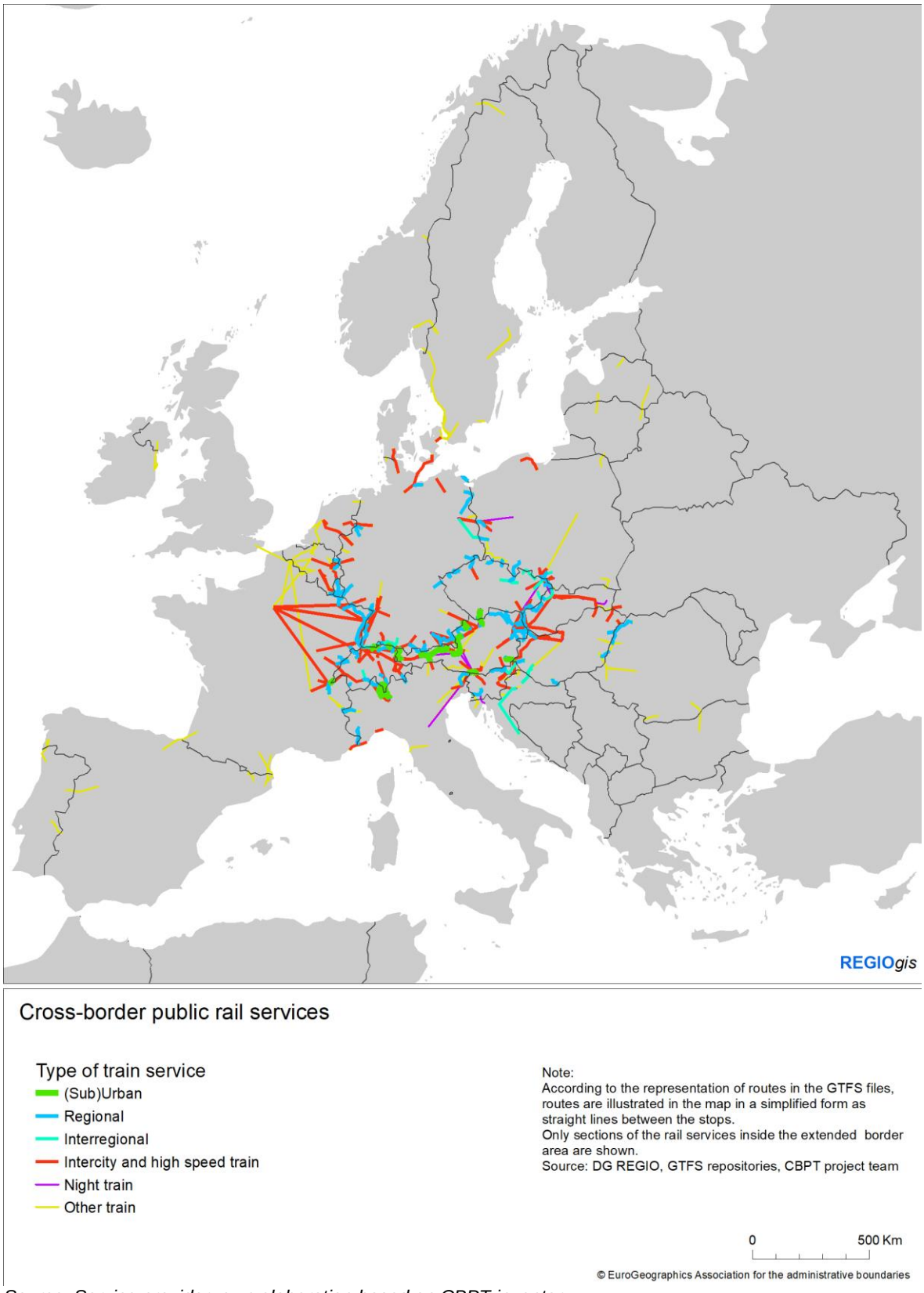
The inventory counts 1,414 cross-border rail services and several of them cross more than one border (Figure 2-7). Not surprisingly, central European countries have the most cross-border services whilst peripheral countries have the fewest (Figure 2-6). Germany (641), Austria (527) and Switzerland (369) have the most, while at the other end the Baltic countries, Bulgaria and Ireland have the fewest.

Figure 2-6: CBPT rail services by country



Source: Service provider, own elaboration based on CBPT inventory

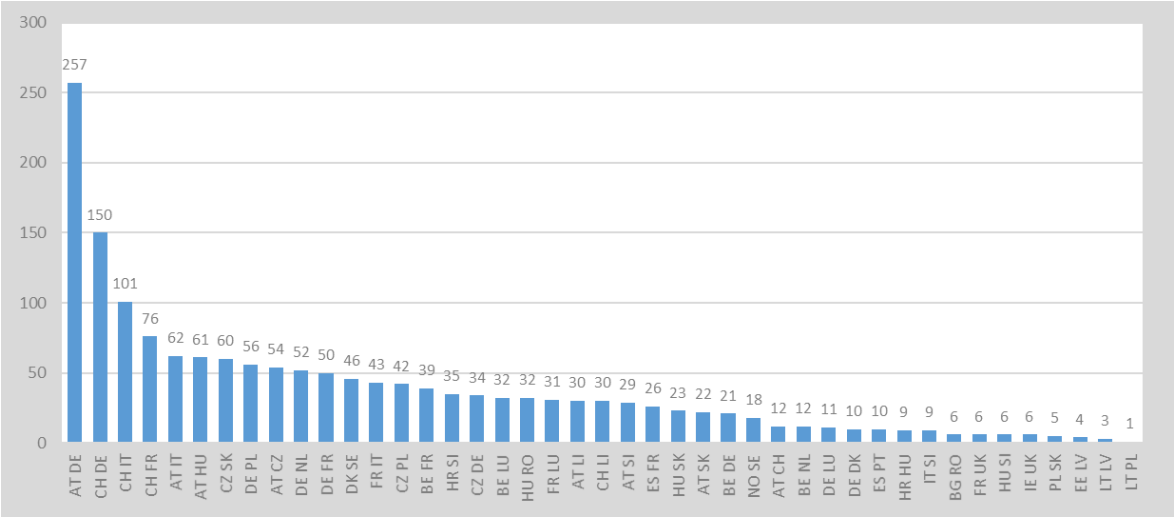
Figure 2-7: Cross-border public rail services



Source: Service provider, own elaboration based on CBPT inventory

The highest number of rail services crosses the borders[8] between Austria and Germany (257), Germany and Switzerland (150), Italy and Switzerland (101), as well as France and Switzerland (76) (Figure 2-8). This finding is confirmed when looking at the matrix of origin and destination countries (Figure 2-9).

Figure 2-8: Number of CBPT rail services at national borders



Source: Service provider, own elaboration based on CBPT inventory

Figure 2-9: Number of CBPT rail services between countries

	AT	BE	BG	CH	CZ	DE	DK	EE	ES	FR	HR	HU	IE	IT	LI	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UA	UK	
AT	X			12	54	257						61		62	30										29	22			527
BE		X				21				39							32		12										104
BG			X																				6						6
CH	12			X		150				76				101	30														369
CZ	54				X	34															42					60			190
DE	257	21		150	34	X	10			50							11		52		56								641
DK						10	X																	46					56
EE								X										4											4
ES									X	26												10							36
FR		39		76		50			26	X				43			31											6	271
HR											X	9													35				44
HU	61										9	X											32		6	23			131
IE													X															6	6
IT	62			101						43				X											9				215
LI	30			30											X														60
LT																X		2			1								3
LU		32				11				31							X												74
LV								4								2		X									1		7
NL		12				52													X										64
NO																				X				18					18
PL					42	56										1					X					5			104
PT									10													X							10
RO			6									32											X						38
SE							46													18				X					64
SI	29										35	6		9											X				79
SK	22				60							23									5					X			110
UA																		1									X		1
UK										6			6															X	12
	527	104	6	369	190	641	56	4	36	271	44	131	6	215	60	3	74	7	64	18	104	10	38	64	79	110	1	12	3232

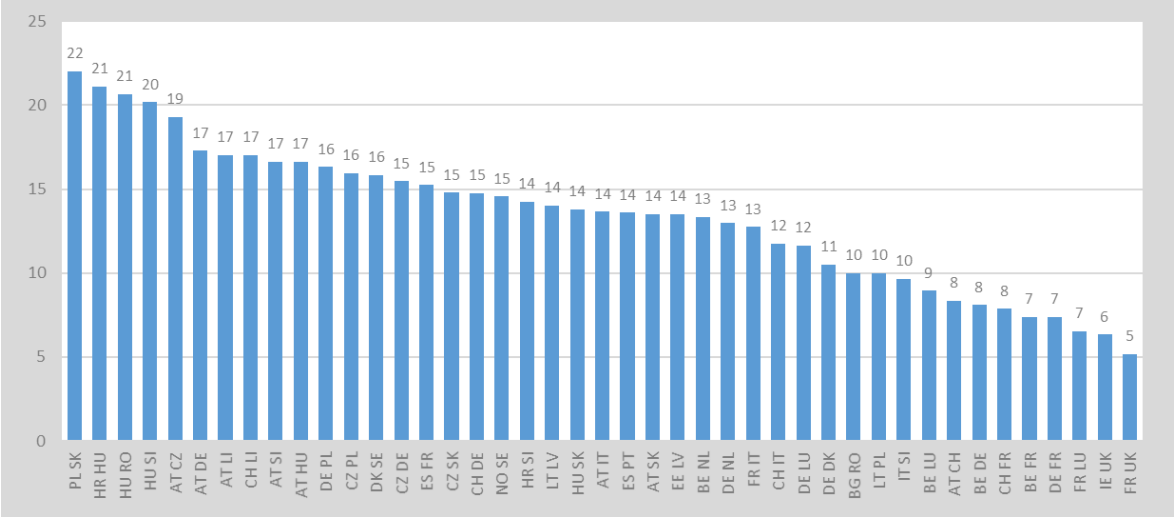
Source: Service provider, own elaboration based on CBPT inventory

[8] It is worth noting that the allocation of a rail service to a specific border segment is derived from a geospatial analysis considering the intersection between the shapefile of the rail services and the shapefile of the border segment. In some cases there may be an imprecise allocation of crossed borders due to the representation of rail services in the shapefile that does not follow the real alignment of railways.

Another interesting point is the number of destinations served. Can cross-border services be characterised as short or long connections? Indirectly, this indicates the size of the transport service area.

Looking at the average number of destinations served (Figure 2-10), highlights that services connect at least five destinations (France-UK). There are more than twenty stops on average between Poland and Slovak Republic (22), Croatia and Hungary (21), Hungary and Romania (21), and Hungary and Slovenia (20), i.e., all between or towards East European countries. In other words, while the number of CBPT rail services in East Europe is lower compared to Benelux countries and Western Europe, but the number of stops tends to be significantly higher.

Figure 2-10: Average number stops of rail services by border



Source: Service provider, own elaboration based on CBPT inventory

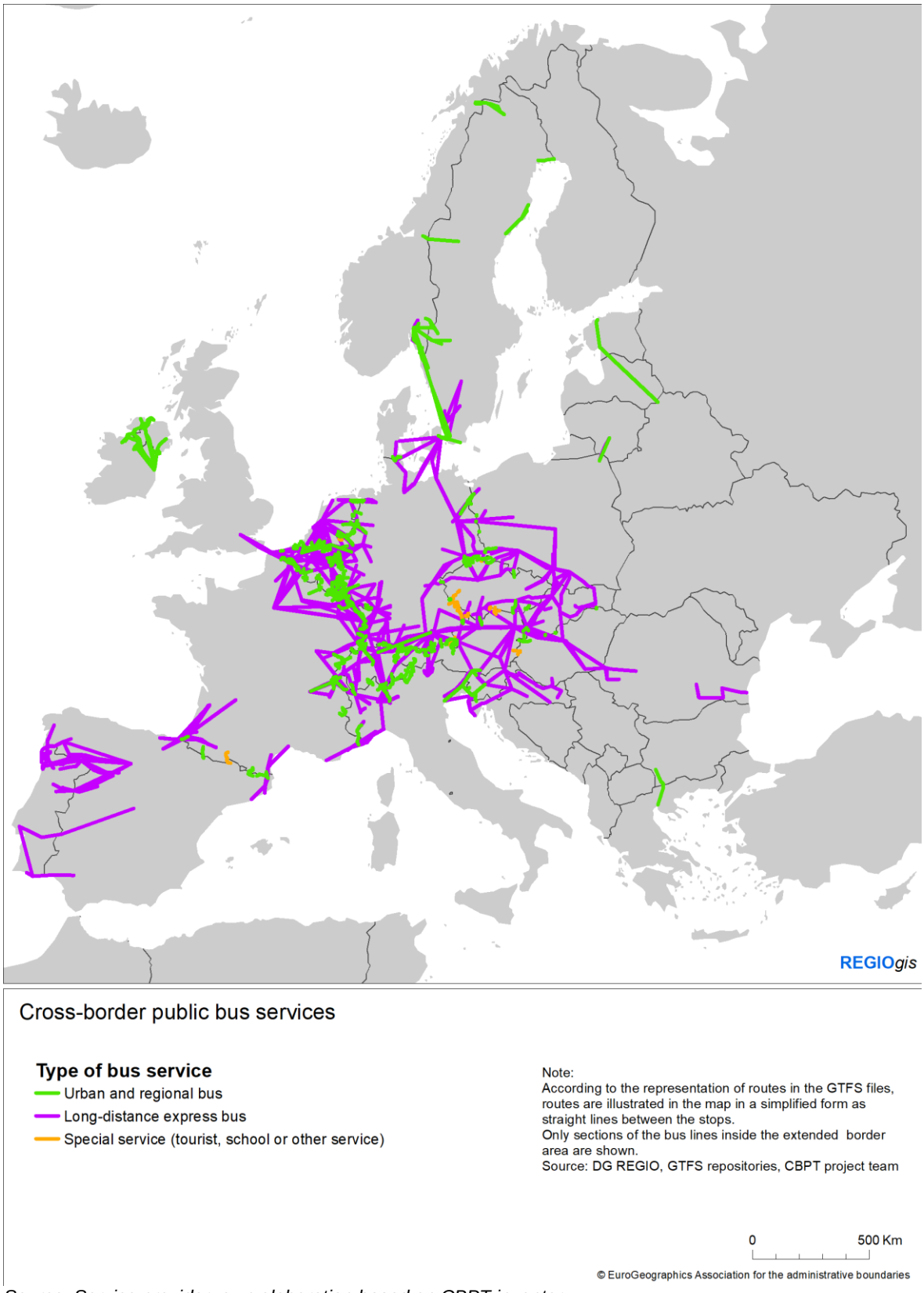
The analysis of **rail service seasonality** shows that out of the 1,414 services:

- 85 CBPT rail services operate only in summer. Of these, 37 run once every day; 28 once a day only on weekends (Saturdays or Sundays) and 14 have some runs per week (but not every day);
- 7 CBPT rail services operate only in winter and the most of these (5) have one run a day only on weekends (Saturdays or Sundays);
- 11 CBPT rail services operate only in spring, of which 5 run once every day; 3 once a day only on weekends (Saturdays or Sundays); 3 have some runs per week (but not every day);
- 12 CBPT rail services operate only in autumn, of which 4 run once every day and 4 run once a day on weekdays.

Bus services

There are cross-border bus services along all European borders, with less the farther East and North the borders are (Figure 2-11). Of 5,312 services in the inventory, 62% are urban and regional (3,277), 37% are long-distance express services and less than 1% are specialised services for tourists or pupils.

Figure 2-11: Cross-border public bus services



Source: Service provider, own elaboration based on CBPT inventory

Excursus: Synthesis of a study on importance of cross-border bus services in the Netherlands by Savelberg and Kansen, 2019:

Usually, the number of CBPT connections is relatively low in comparison with domestic connections. There are for example about 1,800 bus connections within the Netherlands with 50 cross-border connections to Germany and Belgium. CBPT are thus a niche public transport service, even along borders with many CBPT such as the Dutch borders.

75% of all cross-border bus connections in the Netherlands run once per hour or less. 14% of the connections runs twice per hour and only the bus from Maastricht (NL) to Aachen (DE) runs 4 times per hour.

In 80% of the cases, cross-border bus services in the Netherlands carry 200 passengers or less per working day. Only three (6%) services carry between 500 and 1,000 passengers per working day, namely Maastricht-Aachen, Nijmegen-Kleve, and Tilburg-Turnhout. The remaining services carry between 200 and 500 passengers on an average working day. Many lines thus serve a relatively small part of the population in the border region. No further lines in these areas is expected.

A majority of cross-border bus services in the Netherlands have connections to train stations, 32% serve a train station on both sides of the border. 52% serve a train station on one side of the border and 16% do not connect to a train station.

Several places within 25 km of the border are not connected by bus. The study identified 9 missing links, where a direct bus service could replace connecting bus-bus or bus-train options. Bus services are often good alternatives as they do not require specific infrastructure and are cheaper than train services. With little traffic (outside rush hours) buses can also be as fast as trains.

It should be noted that Savelberg and Kansen only count 'lines' in their study and do not differentiate different itineraries or routes of a line. This is why the number of CBPT in their study is significantly lower than the number of services in the CBPT inventory.

Analysing the countries of origin and destination (O-D) of a bus service (Figure 2-12), 312 bus services start in Germany and terminate in the Netherlands, with 241 in the opposite direction. These are the two highest ranked pairs of countries according to O-D-relations. The other top O-D-relations are Germany-Austria (3rd with 220), Austria-Germany (4th, 211), and Germany-France (5th, 189). In sixth place is Belgium-Netherlands, the first with no German connection (181 services), followed by France-Switzerland with 147. Germany-Luxembourg takes 8th place with 145 services, followed by France-Germany (140) and the Netherlands-Belgium (133).

This general picture is confirmed by looking at the border crossings (Figure 2-13 and Figure 2-14). Here, too, the German-Dutch border leads with 632 border crossings, clearly ahead of the German-Austrian border (473). The Dutch-Belgian border follows close behind with 471 crossings, then the German-French border (380) and the French-Swiss border (344). The ranking is illustrated in Figure 2-14. The numbers here are higher than in Figure 2-12 because many bus services cross several different borders or the same border multiple times.

Figure 2-12: Number of CBPT bus services: by country of origin and terminus

	AT	BA	BE	BG	CH	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LI	LT	LU	LV	NL	NO	PL	PT	RO	RS	SE	SI	SK	UA	UK	
AT	X	3	4		10	20	211						6	8	11		10	14						13		2			4	24		1	341
BA	7	X																				12											19
BE		6	X		3	7	68				1		74				1			42		181		3	2	6				4		9	407
BG				X						1																							1
CH	15		2		X		99				4		128	4			77	16				4			8								357
CZ	11		3			X	109						7	7	2		5					2		24		4				11			185
DE	220		94		121	80	X	13			8		189	27	4		46			145		312	3	71	8	7		19		13		14	1394
DK							11	X														22						25					58
EE									X																						1		1
EL				1						X																							1
ES			1		3		8				X		61							2					50								125
FI												X																1					1
FR	2		113	1	147	11	140				78		X	4	5		15			87		26		5	47	4							685
HR	3				6		30						2	X			1			7				8					2	1			60
HU	32					1	3						3	10	X									6		8				6		1	70
IE																X																39	39
IT	11		1		91	7	55						39	3			X					1		3					3				214
LI	17				18													X															35
LT																			X					4									4
LU			40				130						88	1						X		3			6	1				1			270
LV																					X												0
NL		10	133		4		241				2		21				3			2		X		1		10	4					7	438
NO							6	25															X					73					104
PL	11		3			17	50						5	4	7		1		3			8		X						1	2			112
PT					10		20				18		19							8					X									75
RO			11			2	2						2									10				X							11	38
RS																						2					X						2
SE							17	25				9											72						X					123
SI	5				1		9						1	6			4			1				1						X				28
SK	26		3			6	1							3	6									4		1				1	X			51
UA																																X		0
UK							8									29						6				2							X	45
	360	19	408	2	414	151	1218	63	0	1	111	9	645	77	35	29	163	30	3	294	0	589	75	143	121	45	4	118	11	62	1	82	5283

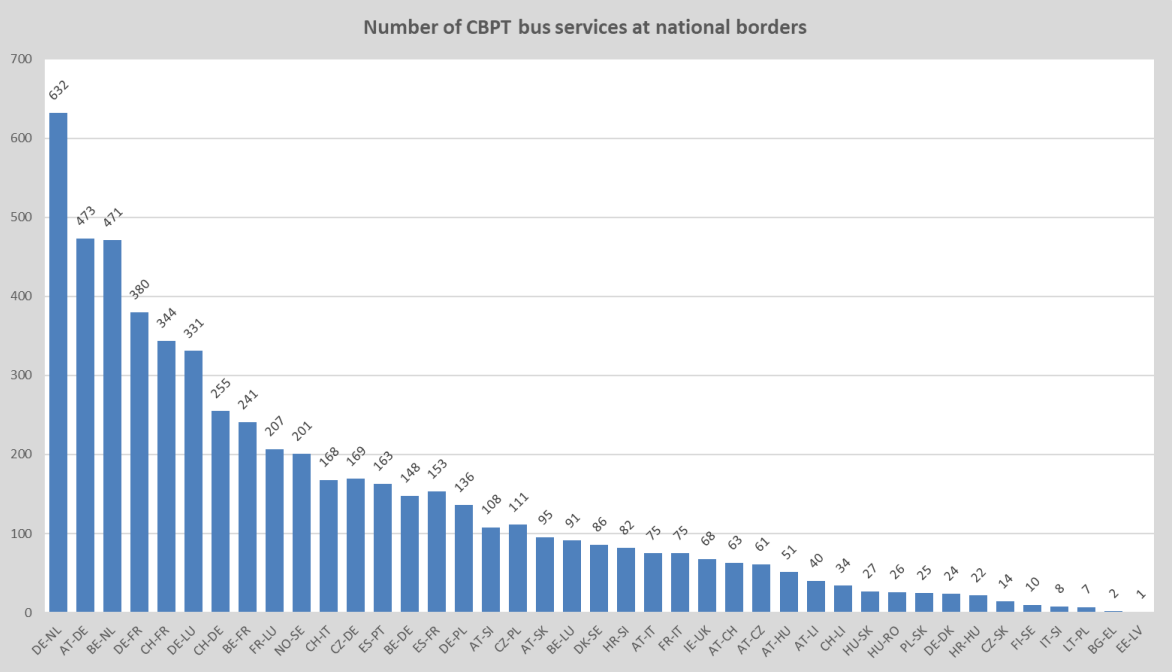
Source: Service provider, own elaboration based on CBPT inventory

Figure 2-13: Number of CBPT bus services: countries of border crossing

	AT	BE	BG	CH	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LI	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK	
AT	X			63	61	473								51		75	40										108	95		966
BE		X				148						241							91		471									951
BG			X						2																					2
CH	63			X		255						344				168	34													864
CZ	61				X	169																	111					14		355
DE	473	148		255	169	X	24					380							331		632		136							2548
DK						24	X																			86				110
EE								X												1										1
EL			2						X																					2
ES										X		153											163							316
FI											X														10					10
FR		241		344		380				153		X				75			207											1400
HR													X	22													82			104
HU	51												22	X											26			27		126
IE															X														68	68
IT	75			168								75				X											8			326
LI	40			34													X													74
LT																		X					7							7
LU		91				331						207							X											629
LV								1												X										1
NL		471				632															X									1103
NO																						X				201				201
PL					111	136												7					X					25		279
PT										163														X						163
RO														26											X					26
SE							86				10												201			X				297
SI	108												82			8											X			198
SK	95				14									27										25				X		161
UK															68														X	68
	966	951	2	864	355	2548	110	1	2	316	10	1400	104	126	68	326	74	7	629	1	1103	201	279	163	26	297	198	161	68	11356

Source: Service provider, own elaboration based on CBPT inventory

Figure 2-14: Number of CBPT bus services at national borders



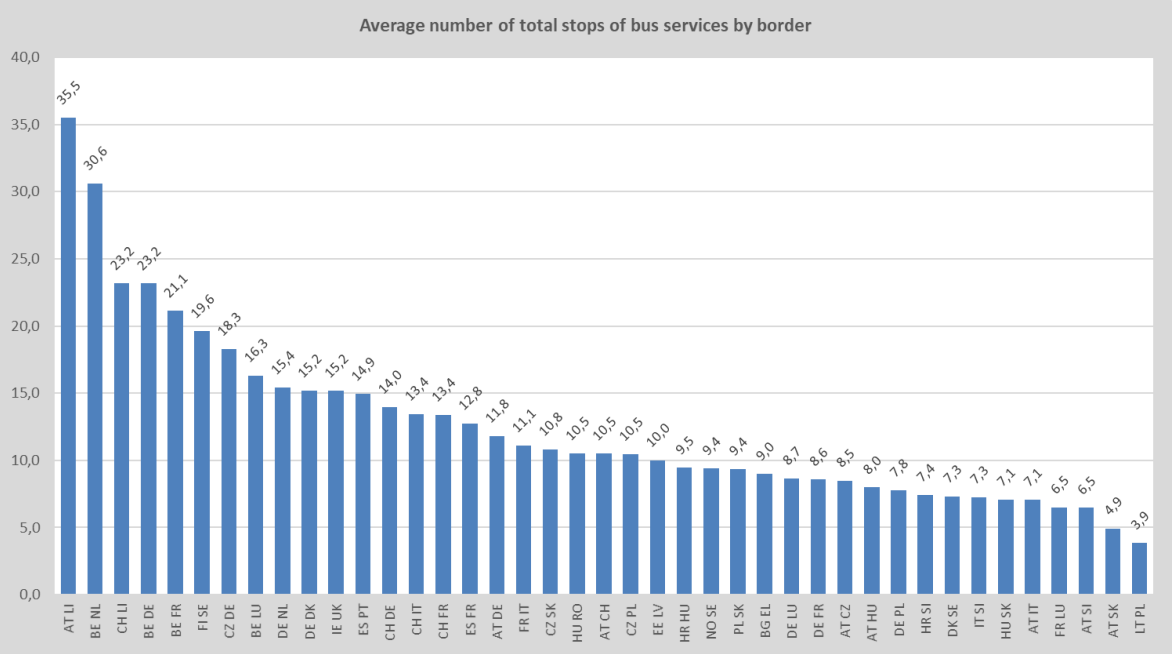
Source: Service provider, own elaboration based on CBPT inventory

Most of the EU cross-border bus services thus operate between Germany, France, Austria and the Benelux countries. However, Figure 2-12 also illustrates bus services that originate or terminate in non-EU countries such as Bosnia-Herzegovina, Switzerland, Liechtenstein, Serbia, Ukraine or the UK, but which nevertheless serve important border relations within the EU.

The average number of bus stops (Figure 2-15) is generally higher than for rail services (Figure 2-10) as many urban and regional bus lines have many stops, compared to rail systems[9]. Cross-border bus lines between Austria and Liechtenstein or Belgium and the Netherlands on average serve more than 30 stops, followed by bus lines between Switzerland and Liechtenstein, Belgium and Germany and Belgium and France, with more than 20 stops. However, these vary widely. At the other end of the ranking are connections between Austria and Slovenia, Austria and Slovakia, and between Lithuania and Poland, with an average of less than seven stops. These tend to be point-to-point connections with little accessibility within the border area.

[9] Figure 2-15 does not include bus services crossing multiple borders.

Figure 2-15: Average bus service stops by border



Source: Service provider, own elaboration based on CBPT inventory

Tram services

Cross-border tram services are in four border agglomerations between Germany, France and Switzerland (Table 2-3).

Table 2-3: Cross-border tram services in Europe

No	Agglomeration	Countries	Opening of first service	Number of services
1	Basel-Weil am Rhein-Saint-Louis	CH-DE-FR	1919 (Basel-Lörrach, closed 1967) 14 Dec 2014 (Basel-Weil am Rhein) 9 Dec 2017 (Basel-Saint-Louis)	10
2	Strasbourg-Kehl	FR-DE	29 April 2017	3
3	Saarbrücken-Sarreguemines	DE-FR	1997	7
4	Geneva-Annemasse	CH-FR	Dec 2020	3
	Sum			*23*

Source: Service provider, own elaboration based on CBPT inventory

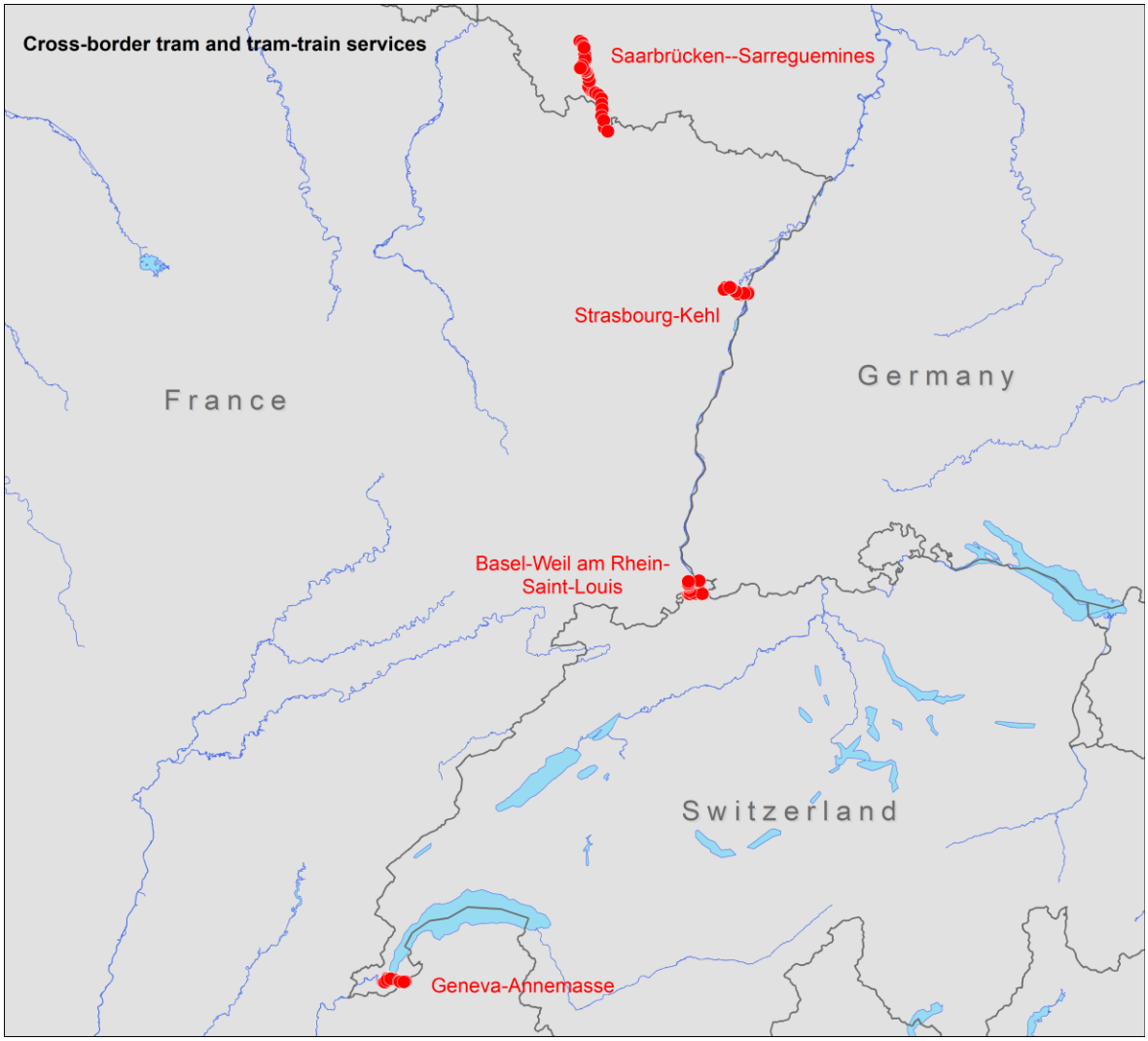
While the systems in Basel, Strasbourg and Geneva are pure tram systems, the services between Saarbrücken and Sarreguemines are 'tram-train' systems, as they operate as a traditional tram in the city centre of Saarbrücken and on rail tracks in suburbia including the cross-border section towards Sarreguemines.

Altogether, 23 cross-border services operate in the four border agglomerations, with ten in Basel, seven in Saarbrücken und three each in Geneva and Strasbourg. Figure 2-16 shows the location of these services.

Only three borders have tram systems, the German-French, French-Swiss, and German-Swiss borders, with ten, eight and five services respectively (Figure 2-17). There is an

average of 23.3 stops for the German-French border, 21.4 on the Swiss-French border and 15.6 on the German-Swiss border for a total average of 22.4.

Figure 2-16: Cross-border tram services in Europe



Source: Service provider, own elaboration based on CBPT inventory

Figure 2-17: Number of cross-border tram services

Source: Service provider, own elaboration based on CBPT inventory

Ferry services

Altogether, 200 services have been identified. Most of them (150 or 75%) are passenger services with 50 car ferries. A concentration of ferry services is on Lake Constance (AT-CH-DE), Lake Geneva (CH-FR) and Lake Maggiore (CH-IT), most of which are passenger ferries.

Car ferries are found along important freight routes. Examples e are the Danube ferries between Bulgaria and Romania, the Puttgarden-Rødby (DE-DK) or the Helsinkør-Helsingborg (DK-SE) ferries, or are a means to ensure accessibility to islands (e.g., Diélette-St Ann ferry, FR-UK) or between islands (e.g., List-Havnet (DE-DK) or Bonifacio-Santa Teresa Gullara (FR-IT)).

Car and passenger ferries differ not only by the cargo they carry, but also the number of stops they make. The former have only two stops, the origin and destination ports, while the latter usually operate along a series of stops in scenic locations.

Figure 2-18 illustrates the location of the ferries. A special feature of some tourist ferry services on lakes is that they cross the border several times with stops on both sides, resulting in a criss-cross route. Often, there are several different providers of touristic ferries on the lakes, resulting in many different lines, in contrast to car ferries, where there is usually only one provider offering a service between two ports.

As a result of the concentration of scenic passenger ferries on Lake Constance, Lake Geneva and Lake Maggiore, the Swiss-German, Swiss-Italian and Swiss-French borders dominate the number of services per border (Figure 2-19 and Figure 2-20).

Figure 2-18: Cross-border public ferry services

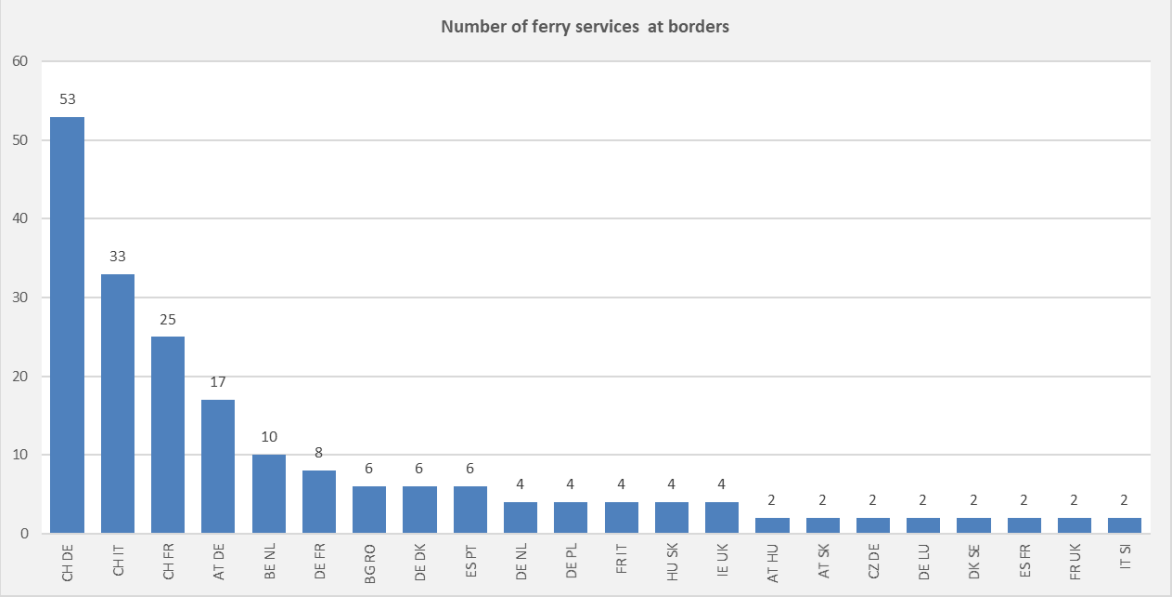
Source: Service provider, own elaboration based on CBPT inventory

Figure 2-19: Number of CBPT ferry services: countries of border crossing

	AT	BE	BG	CH	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LI	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UA	UK	
AT	X					17								2														2			21
BE		X																			10									10
BG			X																						6						6
CH				X		53						25				33															111
CZ					X	2																									2
DE	17			53	2	X	6					8							2		4		4								96
DK						6	X																			2					8
EE								X																							0
EL									X																						0
ES										X		2												6							8
FI											X																				0
FR				25		8				2		X				4														2	41
HR													X																		0
HU	2													X														4			6
IE															X															4	4
IT				33								4				X											2				39
LI																	X														0
LT																		X													0
LU						2													X												2
LV																				X											0
NL		10				4															X										14
NO																						X									0
PL						4																	X								4
PT										6														X							6
RO			6																						X						6
SE							2																			X					2
SI																2											X				2
SK	2													4														X			6
UA																													X		0
UK												2			4															X	6
	21	10	6	111	2	96	8	0	0	8	0	41	0	6	4	39	0	0	2	0	14	0	4	6	6	2	2	6	0	6	400

Source: Service provider, own elaboration based on CBPT inventory

Figure 2-20: Number of ferry services at borders



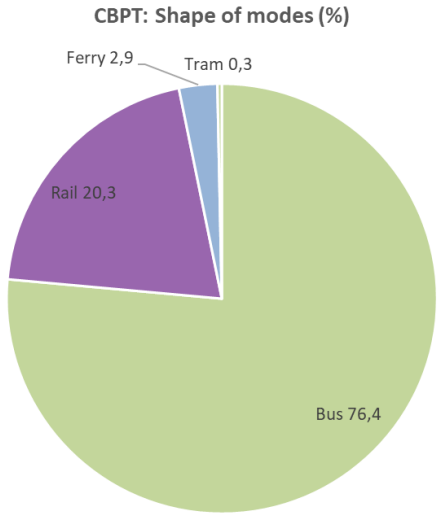
Source: Service provider, own elaboration based on CBPT inventory

Aggregated results for all four modes

What is the significance of the results for the individual transport modest for the overall distribution of CBPT?

Altogether, the CBPT inventory currently includes 6,949 CBPT services, of which 76% are buses (5,312), 20% rail (1,414), 3% ferries (200) and 0.3% trams (23) (Figure 2-21).

Figure 2-21: CBPT in Europe: share of modes



Source: Service provider, own elaboration based on CBPT inventory

Usually, a CBPT crosses just one border; however, long-distance bus or rail services may cross two or even more borders that satisfy the definition (Section 2.1). For circular lines, the country of origin and destination may be the same, although the service crosses a border two or more times. This has consequences for the following analyses:

1. The country of origin and country of destination does not always correspond with the country codes of the border crossing.
2. The number of CBPT per country or per border segment does not correspond to the total number of 6,949 CBPT in the inventory, since many services are counted two or more times, depending how often they cross a border.

These particularities must be taken into account when interpreting the following results.

The German-Austrian border is crossed most frequently by 747 services (Figure 2-22 and Figure 2-23), followed by the German-Dutch border (688 services) and the Belgian-Dutch border (493) (both directions combined). The Swiss-German, Swiss-French and German-French borders are also crossed by more than 400 CBPT.

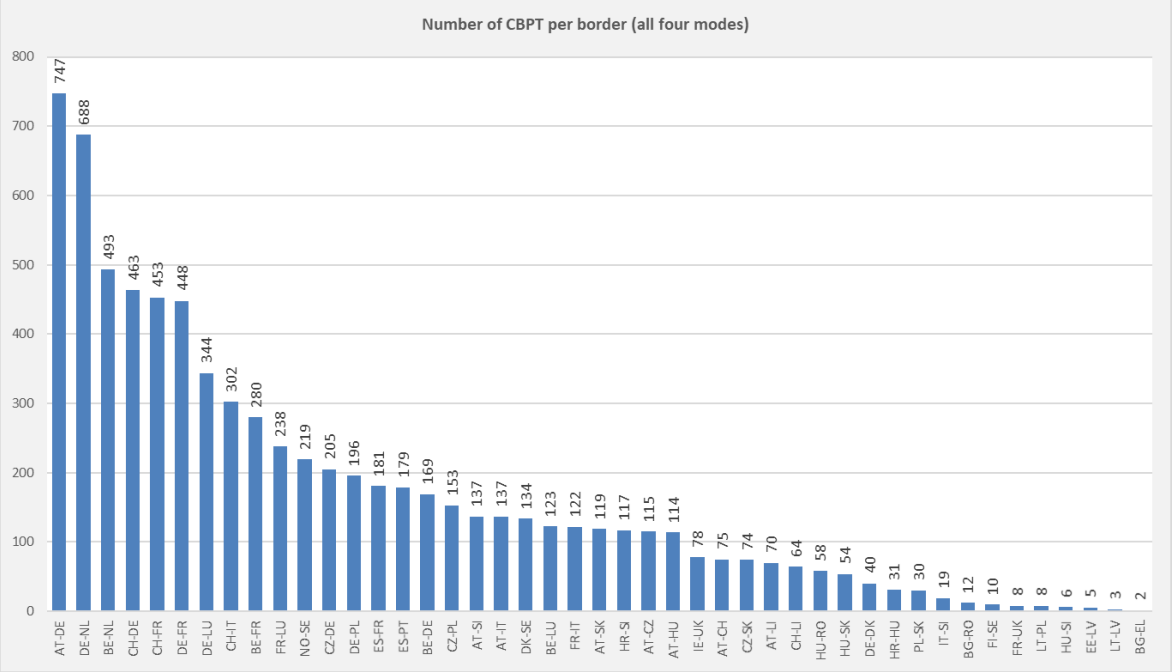
The fewest CBPT services are in the Baltic States (between Estonia and Latvia only five, between Latvia and Lithuania only three) and in South-Eastern Europe (Bulgaria-Greece only two services).

Figure 2-22: Total CBPT services for all four modes: countries of border crossing

	AT	BE	BG	CH	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LI	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UA	UK	
AT	X			75	115	747								114		137	70										137	117			1512
BE		X				169						280							123		493										1065
BG			X						2																12						14
CH	75			X		463						453				302	64														1357
CZ	115				X	205																	153					74			547
DE	747	169		463	205	X	40					448							344		688		196								3300
DK						40	X																			134					174
EE								X												5											5
EL			2						X																						2
ES										X		181												179							360
FI											X															10					10
FR		280		453		448				181		X				122			238											8	1730
HR													X	31													117				148
HU	114												31	X											58		6	54			263
IE															X															78	78
IT	137			302								122				X											19				580
LI	70			64													X														134
LT																		X		2			8								10
LU		123				344						238							X												705
LV								5										2		X									1		8
NL		493				688															X										1181
NO																						X				219					219
PL					153	196												8					X				30				387
PT										179														X							179
RO			12											58											X						70
SE							134				10											219				X					363
SI	137												117	6		19											X				279
SK	117				74									54									30					X			275
UA																				1									X		1
UK												8			78															X	86
	1512	1065	14	1357	547	3300	174	5	2	360	10	1730	148	263	78	580	134	10	705	8	1181	219	387	179	70	363	279	275	1	86	15042

Source: Service provider, own elaboration based on CBPT inventory

Figure 2-23: CBPT services per border (all four modes)



Source: Service provider, own elaboration based on CBPT inventory

A further aggregation of CBPT services by country shows that 3,300 services cross a German border, followed by 1,730 crossing a French border (columns 1 and 2 in Table 2-4; Figure 2-24). Four other countries (Austria, Switzerland, Netherlands, Belgium) have more than 1,000 CBPT services crossing their borders. At the other end of the spectrum countries like Latvia, Estonia or Greece have less than 10 CBPT services crossing their borders.

A correlation between the number of neighbouring states and the number of CBPT can be assumed, so column 3 in Table relates the number of CBPT to the number of neighbouring

states or the number of borders, giving an average per border. This results in shifts in the ranking, as column 5 shows. In the relative ranking, Germany, France and Austria lose one and four ranks respectively, while Switzerland maintains its fourth position, and Belgium and Luxembourg each move up one rank; the Netherlands improves by four ranks and takes the leading position in the relative ranking ahead of Germany.

Table 2-4: Ranking of countries by number of CBPT

Country	Number of CBPTs		Number of CBPTs per relevant border[10]		Change Rank 1 and Rank 2
	Number	Rank	Number per border	Rank	
	1	*2*	*3*	*4*	*5*
Germany	3,300	1	366.7	2	↘
France	1,730	2	288.3	3	↘
Austria	1,512	3	189.0	7	↘
Switzerland	1,357	4	271.4	4	-
Netherlands	1,181	5	590.5	1	↗
Belgium	1,065	6	266.3	5	↗
Luxembourg	705	7	235.0	6	↗
Italy	580	8	116.0	11	↘
Czech Republic	547	9	136.8	10	↘
Poland	387	10	96.8	13	↘
Spain	360	11	180.0	8	↗
Slovenia	279	12	69.8	17	↘
Slovakia	275	13	68.8	18	↘
Hungary	263	14	65.8	20	↘
Sweden	229	15	76.3	16	↘
Norway	219	16	109.5	12	↗
Portugal	179	17	179.0	9	↗
Denmark	174	18	87.0	14	↗
Croatia	148	19	49.3	21	↘
Liechtenstein	134	20	67.0	19	↗
United Kingdom	86	21	43.0	22	↘
Ireland	78	22	78.0	15	↗
Romania	70	23	35.0	23	-
Bulgaria	14	24	7.0	24	-
Lithuania, Finland*	10	25	5.0	25	-
Latvia	8	27	4.0	28	↘
Estonia	5	28	5.0	27	↗
Greece	2	29	2.0	29	-
Ukraine	1	30	0.3	30	-

** Same values for both countries*

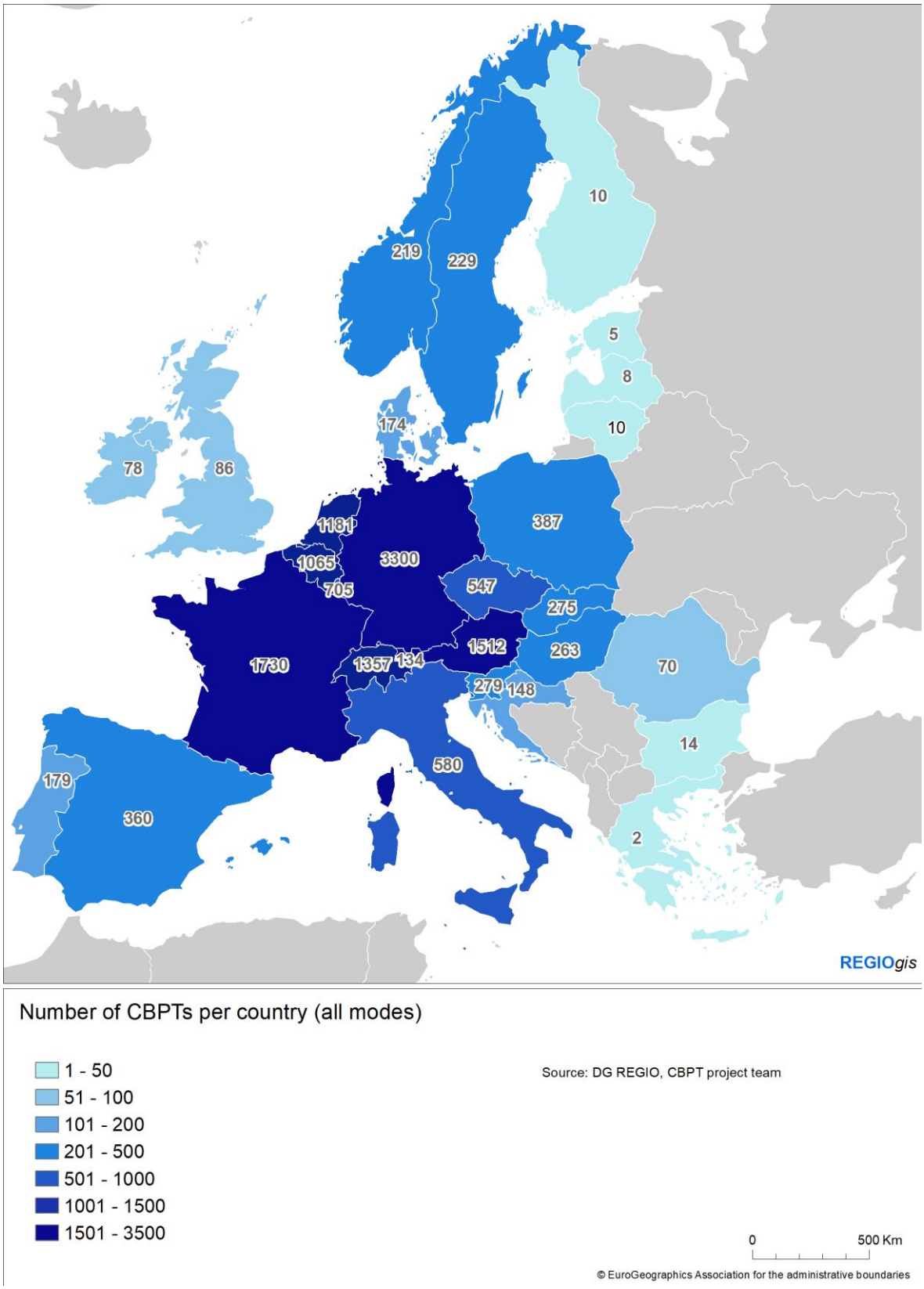
Source: Service provider, own elaboration based on CBPT inventory

[10] Relevant in this context means that only borders are counted which are analysed in this study, i.e., borders to countries not covered by this study were not counted.

The Annex provides seven zoom-in maps illustrating CBPT for all four modes in the following macro regions:

- Alpine Space
- Baltic countries
- Benelux countries
- Eastern Europe
- Iberian Peninsula
- Ireland and Northern Ireland
- Nordic countries

Figure 2-24: Number of CBPT per country (sum of all modes)



Source: Service provider, own elaboration based on CBPT inventory

2.4.2 CBPT and TEN-T corridors

From the point of view of the European Union's transport policy, the question arises to what extent CBPT use TEN-T corridors or not. This is particularly interesting for rail and bus services, so the latter have been overlaid with the TEN-T corridors.

Almost 43 % of all bus services (2,263 of 5,312) operate along TEN-T road corridors[11]. The majority of these are long-distance buses (67%), and only 33% are city or regional buses (Figure 2-25). While only 23 % of urban and regional bus services operate along a TEN-T road corridor, 77 % of long-distance express services do (Table 2-5). The share of rail services operating along a TEN-T corridor is more than 87%, i.e., more than double the share of bus services. In other words, the vast majority of the rail services run mainly along TEN-T corridors.

The reason for this divergence is that there is a broad cross-border road network with many roads outside the TEN-T corridors, but the cross-border rail network is more concentrated. Many of the few railway lines therefore run on TEN-T corridors.

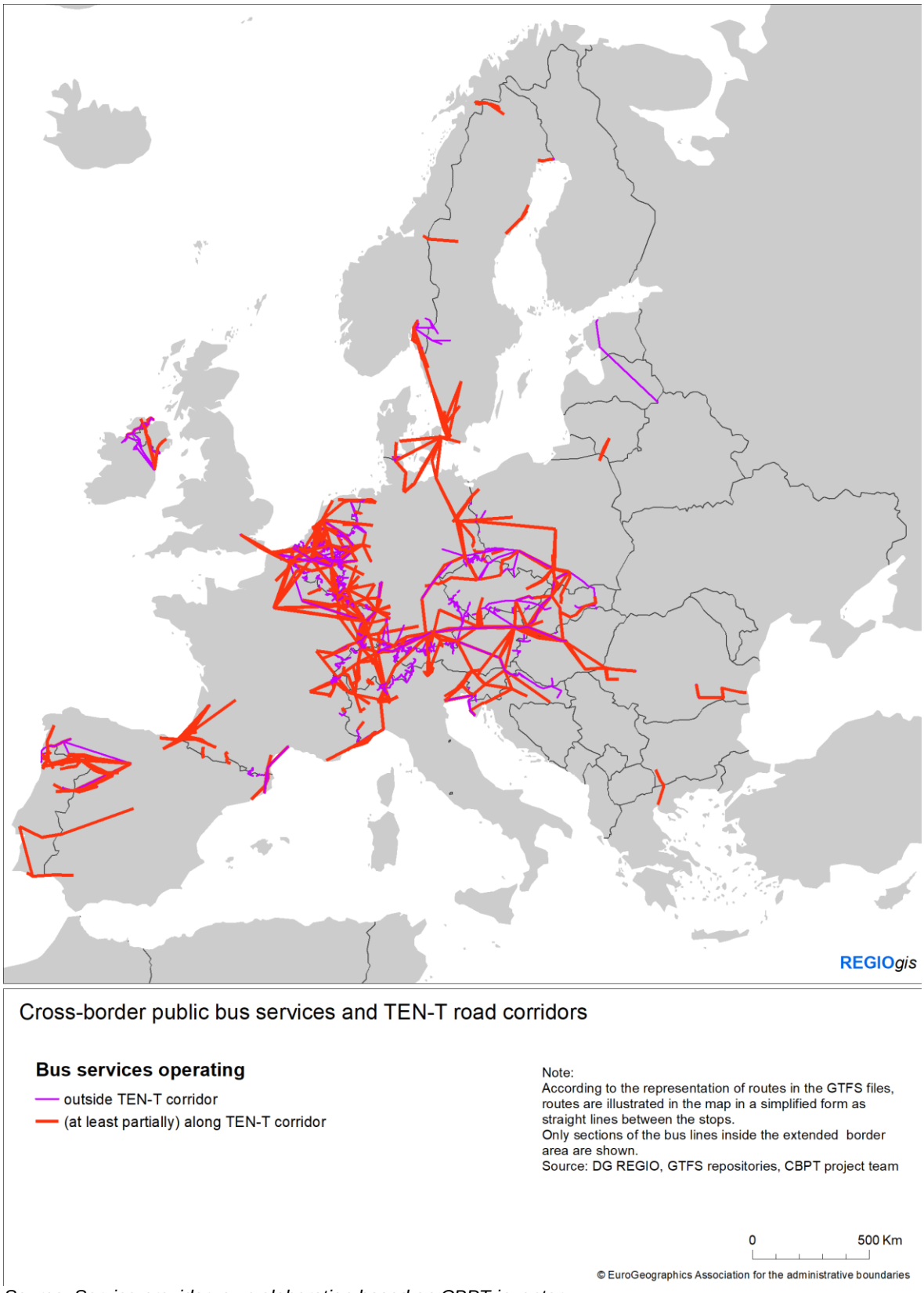
Table 2-5: Bus and rail services and TEN-T corridors

Type of service	Number of services			Share TEN-T services (%)
	Total	non-TEN-T	TEN-T	
Bus services	**5,312**	**3,049**	**2,263**	**42.6**
… of which				
Urban/regional bus line	*3,277*	*2,537*	*740*	*22.6*
Long-distance bus line	*1,980*	*461*	*1,519*	*76.7*
Specialised bus line	*55*	*51*	*4*	*7.3*
Rail services	**1,411**	**178**	**1,233**	**87.4**
Sum bus and rail	**6,723**	**3,227**	**3,496**	**52.0**

Source: Service provider, own elaboration based on CBPT inventory

[11] Based on the assumption that in no case a bus or rail service follows a TEN-T corridor during its entire course, an approach was applied in which border crossings were used as a decisive criterion: if the CBPT passes (at least) one border crossing located on a TEN-T road corridor, the CBPT was designated as a TEN-T corridor service.

Figure 2-25: CBPT bus services and TEN-T road corridors



Source: Service provider, own elaboration based on CBPT inventory

2.4.3 CBPT by border segments

Although there are many CBPT in countries such as Germany, the Netherlands or France, this does not mean that CBPT are equally distributed across all their border sections. Some European border sections have few CBPT (< 10) or even none at all, while some have a lot (> 100). This is true for all countries (Figure 2-26).

Border segments with the most CBPT are Basel-Weil am Rhein (CH-DE, 213) (Table 2-6), the southern border of Luxembourg as well as Trier-Wasserbillig (DE-LU) with > 180 CBPT each. The two borders between Aachen and Maastricht and Hasselt-Maastricht (DE-NL and BE-NL, respectively) have more than 125 CBPT each, as do the border segments Salzburg-Freilassing (AT-DE), Copenhagen-Malmö (DK-SE) and Kufstein-Kiefersfelden (AT-DE). Altogether, twelve border segments have more than 100 CBPT each.

Table 2-6: CBPT per border segment: all segments >100 CBPT (all modes, both directions)

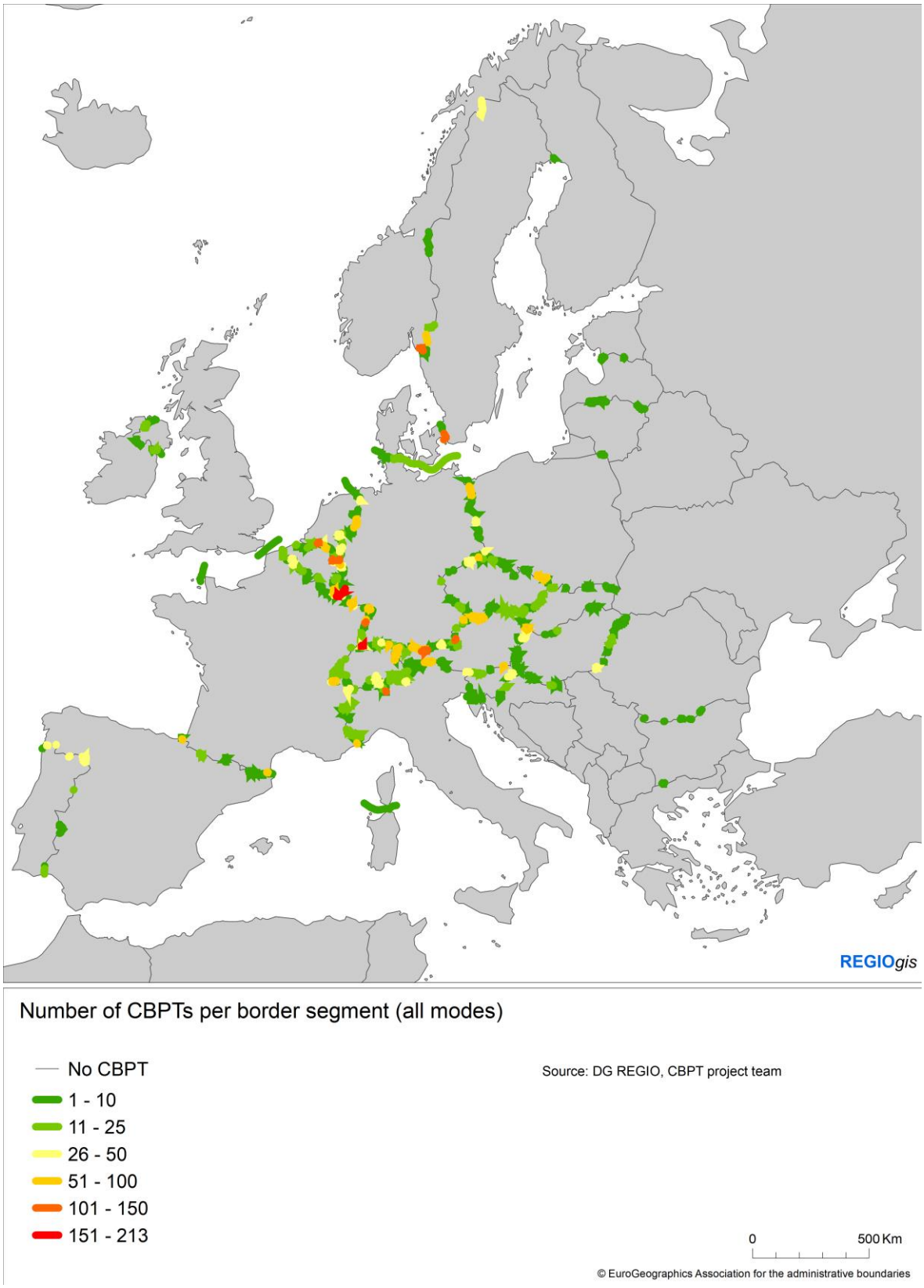
Rank	Border segment	Countries	Number of CBPT	TEN-T corridor
1	Basel – Weil am Rhein	CH-DE	213	Rhine - Alpine
2	Trier – Wasserbillig	DE-LU	190	./.
3	France – Luxembourg	FR-LU	181	North Sea - Mediterranean
4	Aachen – Maastricht	DE-NL	147	./.
5	Salzburg – Freilassing	AT-DE	135	Rhine - Danube
6	Hasselt – Maastricht	BE-NL	134	./.
7	Copenhagen – Malmö	DK-SE	132	Scandinavian - Mediterranean
8	Kufstein – Kiefersfelden	AT-DE	123	Scandinavian - Mediterranean
9	Kehl – Strasbourg	DE-FR	114	Rhine – Danube
10	Chiasso – Como	CH-IT	111	Rhine - Alpine
11	Halden – Stromstad	NO-SE	105	Scandinavian - Mediterranean
12	Antwerp – Breda	BE-NL	104	North Sea - Baltic

Source: Service provider, own elaboration based on CBPT inventory

Interestingly, these twelve cases include border segments in rural areas (for instance, Kufstein-Kiefersfelden, Halden-Stromstad) but are on important transport axes (TEN-T corridors). Opposite, other border segments represent seamless cross-border agglomerations such as Basel-Weil am Rhein, Aachen-Maastricht or Copenhagen-Malmö.

Table 2-7 and Table 2-8 consider bus and rail services separately. The results for buses are very consistent with all modes when comparing Table 2-6 with Table 2-7. For rail (Table 2-8), the numbers are generally lower. Schaan (Liechtenstein) is a specific case since the Principality of Liechtenstein is fully integrated into the regional train systems between Feldkirchen (Austria) and Buchs (Switzerland), leading to a high number of rail CPBT.

Figure 2-26: Number of CBPT per border segment (all modes)



Source: Service provider, own elaboration based on CBPT inventory

Table 2-7: CBPT per border segment: all segments with more than100 bus services (both directions)

Rank	Border segment	Countries	Number of CBPT	TEN-T corridor
1	Trier – Wasserbillig	DE-LU	190	./.
2	France – Luxembourg	FR-LU	156	North Sea - Mediterranean
3	Aachen – Maastricht	DE-NL	145	./.
4	Hasselt – Maastricht	BE-NL	134	./.
5	Basel – Weil am Rhein	CH-DE	131	Rhine - Alpine
6	Kehl – Strasbourg	DE-FR	114	Rhine - Danube
7	Kufstein – Kiefersfelden	AT-DE	107	Scandinavian - Mediterranean
8	Halden – Stromstad	NO-SE	105	Scandinavian - Mediterranean

Source: Service provider, own elaboration based on CBPT inventory

Table 2-8: CBPT per border segment: rail services, both directions

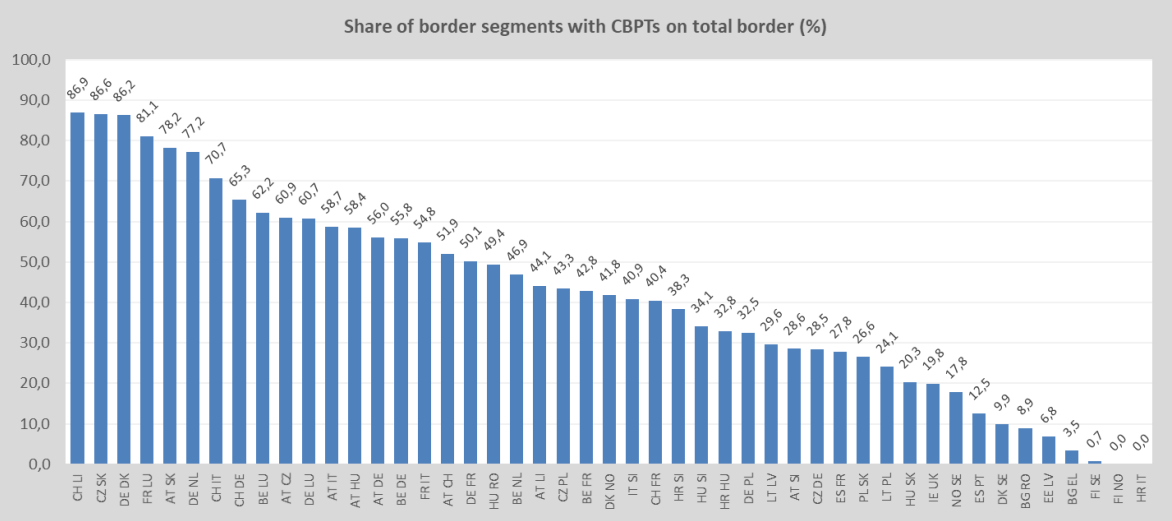
Rank	Border segment	Countries	Number of CBPT	TEN-T corridor
1	Salzburg – Freilassing	AT-DE	107	Rhine - Danube
2	Basel – Weil am Rhein	CH-DE	75	Rhine - Alpine
3	Copenhagen – Malmö	DK-SE	46	Scandinavian - Mediterranean
4	Linz – Passau	AT-DE	42	Rhine - Danube
5	Vienna – Bratislava	AT-SK	38	Baltic – Adriatic, Rhine - Danube
6	Kufstein – Kiefersfelden	AT-DE	37	Scandinavian - Mediterranean
7	Chiasso – Como	CH-IT	35	Rhine - Alpine
8	Buchs – Schaan	CH-LI	30	./.
	Feldkirch – Schaan	AT-LI		./.
10	Brenner/Brennero	AT-IT	28	Scandinavian - Mediterranean
11	Geneva – Valserhone	CH-FR	26	./.
12	Terville – Dudelange	FR-LU	25	North Sea - Mediterranean
	Breclav – Malacky	CZ-SK		Orient/East - Med
	Arnoldstein – Coccau	AT-IT		Baltic-Adriatic

Source: Service provider, own elaboration based on CBPT inventory

Apart from these border segments with many cross-border services, most border segments do not have any CBPT, while only small spots have some services. This is not only in peripheral regions (e.g. the border between Portugal and Spain, Scandinavia, the Baltic States), but also in central regions such as the eastern borders of Germany with Poland and Czechia or the border of Austria with Italy and Slovenia. Even in the densely populated Benelux countries there are border sections with no CBPT.

Figure 2-27 illustrates the share of border segments with CBPT (all modes) on the entire border stretch, by national border. The borders with the greatest coverage are the Liechtenstein-Switzerland border, the Czech-Slovak border and the Danish-German border with more than 86%, followed by the French-Luxembourg border with more than 80%. At the lower end, several borders have less than 10%, which are the Danish-Swedish, Bulgarian-Romanian, Estonian-Latvian, Bulgarian-Greece, and Finnish-Swedish borders. There are even two borders with no CBPT found, which are the Finnish-Norwegian and Croatian-Italian borders.

Figure 2-27: Share of border segments with CBPT on total border (%)



Source: Service provider, own elaboration based on CBPT inventory

CBPT and border specificities

National borders are often characterized by geographical factors (e.g., mountain ranges, rivers and lakes) and can have varied spatial characteristics (e.g., sparsely or very densely populated areas) or urban structures (twin cities, agglomerations). These specificities may impact the availability, number, frequency and design of CBPT – either as obstacles (mountains, rivers, lakes) or as positive (push) factors (agglomerations) that increase the demand for such services. In this study, the following specificities have been analysed:

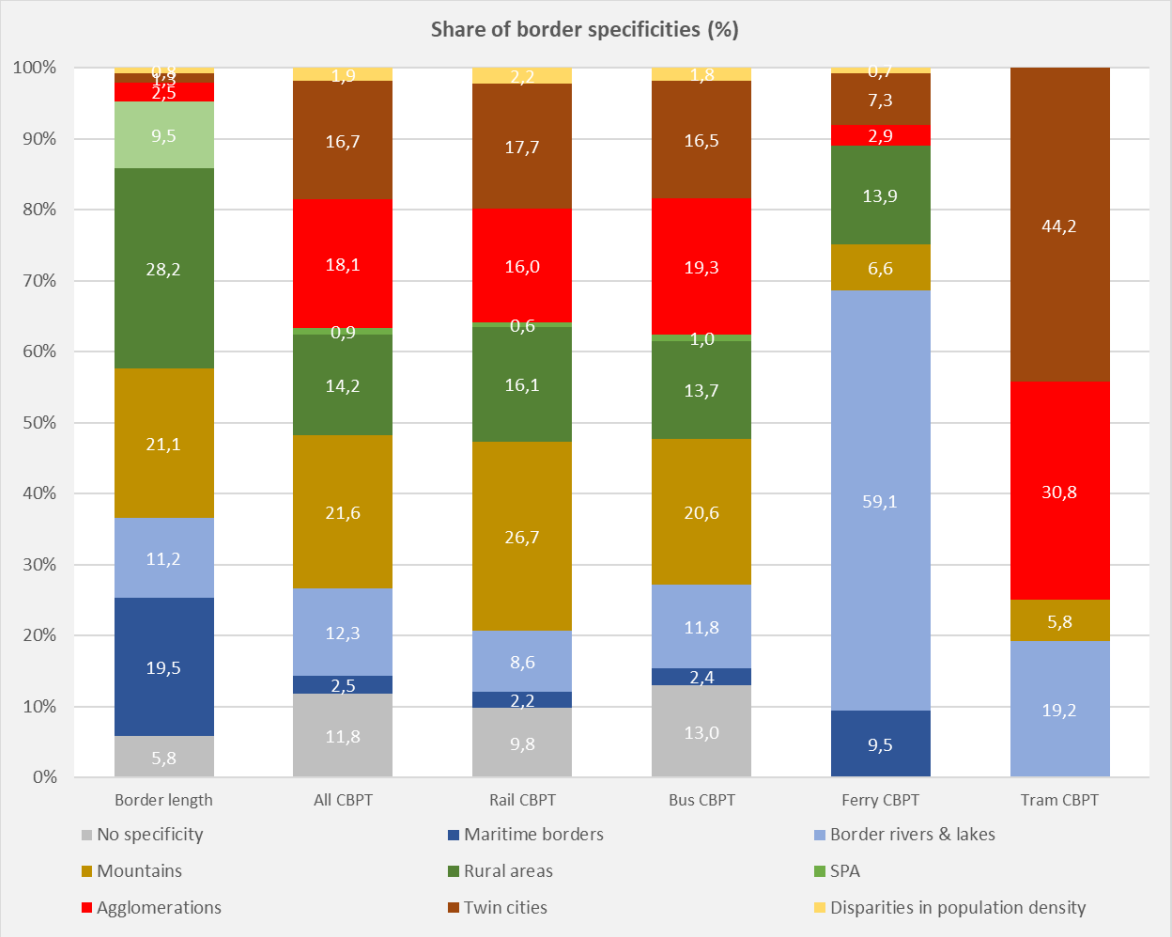
- Maritime borders
- Border rivers and border lakes
- Mountains
- Rural areas
- Sparsely populated areas (SPA)
- Agglomerated areas
- Twin cities
- Disparities in population density

Annex 7.2 presents these specificities and assigns them to border segments. A border segment may have one or more of these features – or none at all.

Across all modes (2nd column in Figure 2-28), 11.8 % of all CBPT cross a border without any specificity. This is double their share of the total border length (1st column in Figure 2-28). 2.5 % of CBPT cross maritime borders, and another 12.3 % cross border rivers or lakes, similar to the border river share of some 11% of total border length. CBPT crossing mountain borders account for 21.6 %, the same as their share of total border length. This is the highest share, so more than one fifth of all CBPT are in mountain areas. This is consistent with the evidence above, with most services at the Austrian-German (Rank 1; Figure 2-22), Swiss-German (Rank 3) and Swiss-French borders (Rank 5), which are mainly

mountainous. CBPT in rural border areas account for almost 14.2%, which is only half their share of total border length. Similarly, there are few CBPT in SPA, making up less than 1%. The low share of CBPT in rural and SPA probably reflects the lack of demand for CBPT in these border areas. The share of CBPT in agglomerations and twin cities is 18.1% and 16.7%, respectively, which is considerably higher than their shares of border length, illustrating the high demand for services along these border types. Finally, the share of CBPT in border areas with disparities in population density is little less than 2%, which is still more than double the share of border length.

Figure 2-28: Share of border specificities



Source: Service provider, own elaboration based on CBPT inventory

When differentiating by modes, the shares for rail and bus are in the same range for maritime, river, rural and SPA borders. Both rail and bus differ in their shares for mountains and agglomerations. While rail services have a lower share in agglomerations compared to bus services (16% vs. 19.3%), they have a significantly higher share in mountains (26.7% vs. 20.6%).

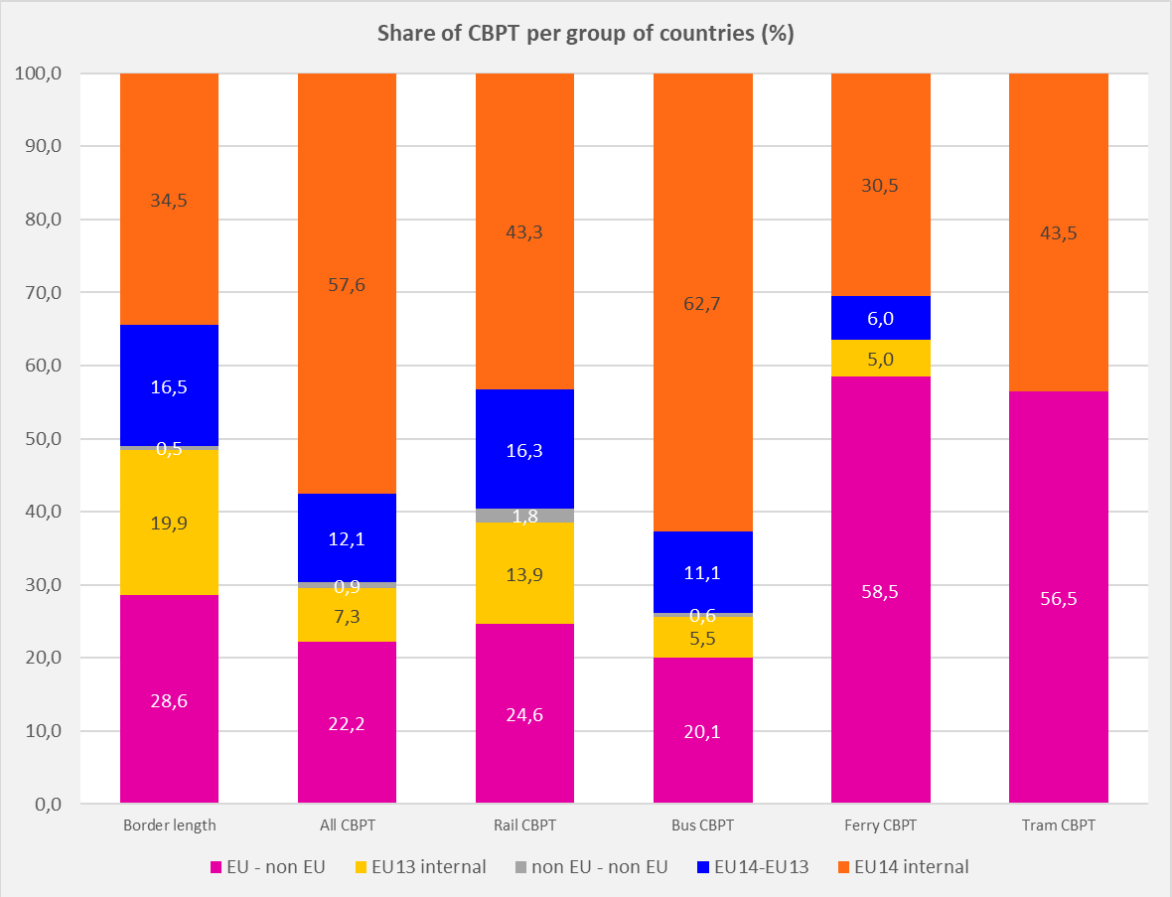
For ferry and tram services, the situation is different. Not surprisingly, for ferries the shares of maritime and river borders are much higher (9.5% and 59.1%, respectively). Most tram services are in twin cities and agglomerations (44.2% and 30.8%, respectively).

CBPT and EU accession

A similar analysis can be carried out regarding accession status, i.e., whether a border segment is between EU and non-EU countries (EU – non-EU), between EU14 or EU13 countries (EU14 internal or EU13 internal), a border between non-EU states (non-EU – non-EU), or a between EU14 and EU13 countries (EU14-EU13).

Across all CBPT, nearly 58% operate between EU14 countries, a significant share of 22% between EU and non-EU Member States, only 12% between EU14 and EU13 countries and only some 7% between EU13 countries (Figure 2-29). These figures are mainly driven by bus services. Here, 63% of all CBPT operate between EU14 countries reflecting the long tradition of such services. In contrast, ferries and trams operate mainly between EU and non-EU countries, with more than 56% each.

Figure 2-29: Share of CBPT by group of countries



Source: Service provider, own elaboration based on CBPT inventory

These figures indicate a correlation between a state's accession to the EU and the level of CBPT. While the share of CBPT is very high in countries that have been part of the EU for a long time, it is lowest between countries that joined the EU more recently. The share of CBPT between EU13 and EU14 countries is in the middle. This does not imply, however, that legal and administrative obstacles to CBPT service provision are more frequent between EU13 than EU14 countries (Section 3.3).

2.4.4 Target groups

CBPT usually address different target groups. Services are often tailored directly to the target group though needs differ between target groups. Most of the time, a service targets two or three groups, however some services clearly specialise in one group (e.g., tourists or school transport)[12].

Table 2-9 indicates which mode of transport primarily targets which group. The number of possible target groups is greatest for buses. These address all target groups except for trucks (cargo transport). The situation is similar for railways. However, here, target groups

[12] A comprehensive quantitative analysis of CBPT target groups cannot be made because comprehensive information on target groups was not available in the data sources. Instead, the project team tried to derive the target group(s) of a service, based on the characterisation of the CBPT (origin and destination, timetables, frequencies, operating hours, prices, etc.).

such as pupils and students, shoppers or leisure travellers tend to be rare. Apart from commuters, the general public, and overall local/regional transport, ferries often address tourists and, as a unique selling point, also trucks (cargo transport). By contrast, trams focus on local transport for the general public (especially commuters and shoppers).

Some target groups are interchangeable, for example a bus aimed at the general public can also be used by tourists. A school bus, on the other hand, with specific origins, destinations and timetables, is unlikely to be used by tourists or commuters.

For a service to achieve the greatest possible success with a target group, all its components should be tailored as closely as possible to the needs of this target group.

Table 2-9: Target groups addressed by the CBPT

Target group	Mode of transport			
	Bus	Rail	Ferry	Tram
Business	✓	✓		
Commuters	✓	✓	✓	✓
General public	✓	✓	✓	✓
Leisure[13]	✓			
Local/regional transport	✓	✓	✓	✓
Long-distance traveller	✓	✓		
Pupils	✓			
Shoppers	✓			✓
Students	✓			
Tourists	✓	✓	✓	
Trucks (cargo transport)			✓	

Source: Service provider, own elaboration based on CBPT inventory

2.4.5 Permeability of European borders

The previous chapters focused on analyses of the spatial distribution of CBPT. However, in addition to geographical factors, the demand for such services also plays an important role. Combining geographical and demand aspects enables an analysis of permeability of border segments for public transport, which is the relation between supply and demand in a border segment[14].

Demand for CBPT

The potential demand for CBPT services in European border regions is very unevenly distributed and, with exceptions, sporadic (Figure 2-30).

Two-sided high demand for CBPT can be found along the Dutch borders with Germany and Belgium, along the French-German and German-Swiss borders, as well as the Belgium-French and French-Luxembourg borders, along some segments of the Czech-Polish, Czech-Slovak and Italian-Swiss borders and in the Øresund region (border between Copenhagen (DK) and Malmö (SE)). Unbalanced demand occurs to different degrees along all borders, mostly in small border segments. Prominent examples are the northern

[13] There are public transport services to theme/recreational parks, sports facilities and other leisure destinations.
[14] Refer to Annex 7.6 for methodological remarks of this analysis.

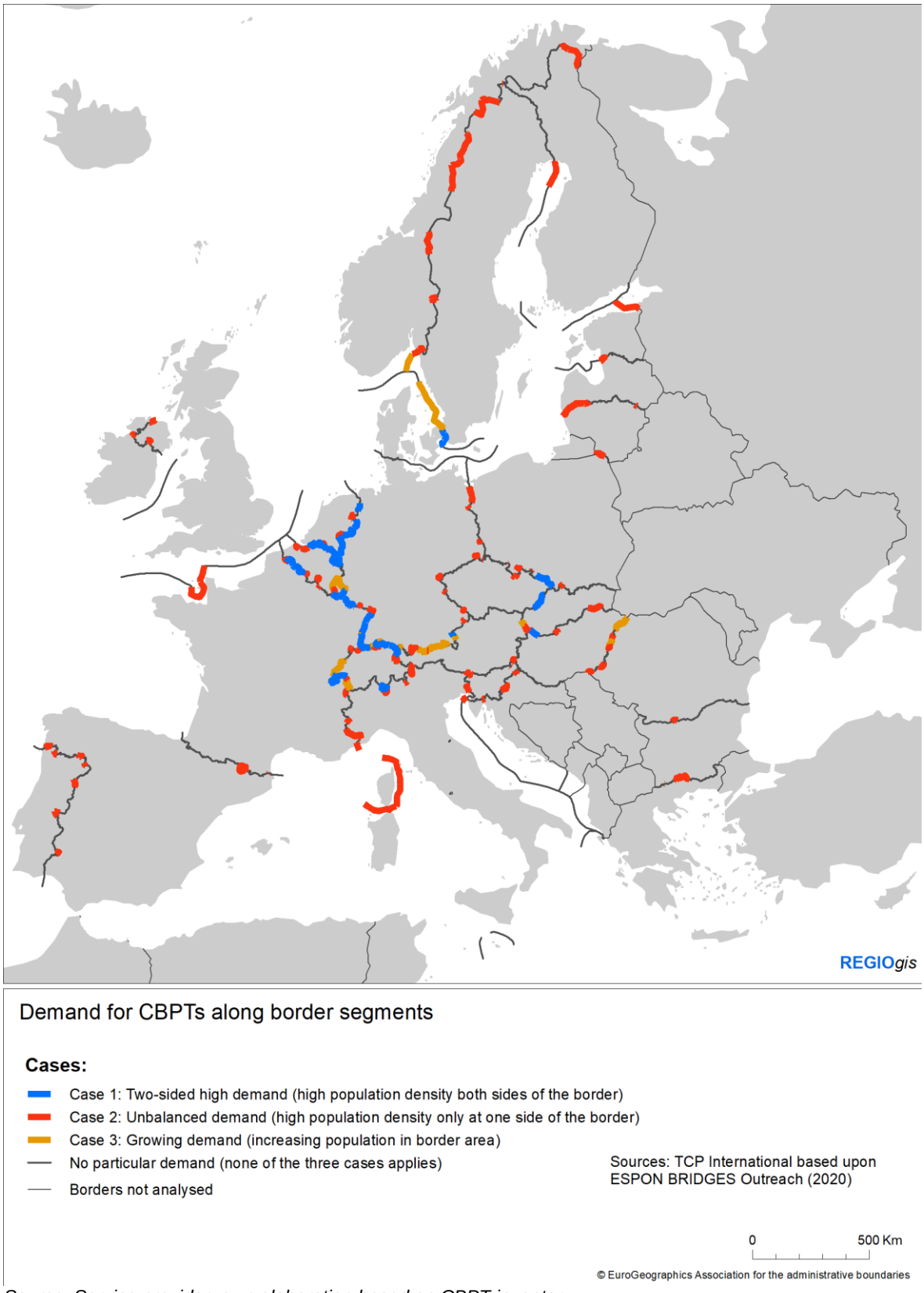
German-Polish border (with Szczecin city agglomeration) and the southern French-Italian border (with larger agglomerations on the French side). There is a growing demand for CBPT due to population increases along the remaining Luxembourg borders, between Bavaria and Austria, in parts of the French-Swiss, Austrian-Slovak, and Hungarian-Romanian borders. Almost all Benelux border segments, and along the French-German, French-Swiss and Austrian-German borders have high demand for CBPT. For the remaining borders, high demand occurs only occasionally for small border segments.

Permeability of European borders

Like demand, border permeability shows a very diverse picture in Europe (Figure 2-31). Several borders show no permeability at all along very long stretches (Scandinavia, Baltic States, East European countries, Pyrenees, Portuguese-Spanish border), or with occasionally very low permeabilities (Hungarian-Romanian, Slovak-Polish, Bavarian-Czech borders). Other borders have a surprisingly high permeability. In this respect, border sections in the Alps or maritime borders such as between Germany and Denmark, Denmark and Sweden or Italy and France are particularly worth mentioning. Although borders between Benelux countries, France and Germany or Germany and Switzerland have generally high permeability, they all have border segments with low permeability which are often away from the agglomerations. In Eastern Europe, borders between Austria and Slovakia, Czechia and Slovakia as well as parts of the Austrian-Hungarian border have high permeability, while others such as the Austria-Slovenian, Croatian-Slovenian and Czech-Polish borders seem non-permeable with some local exceptions.

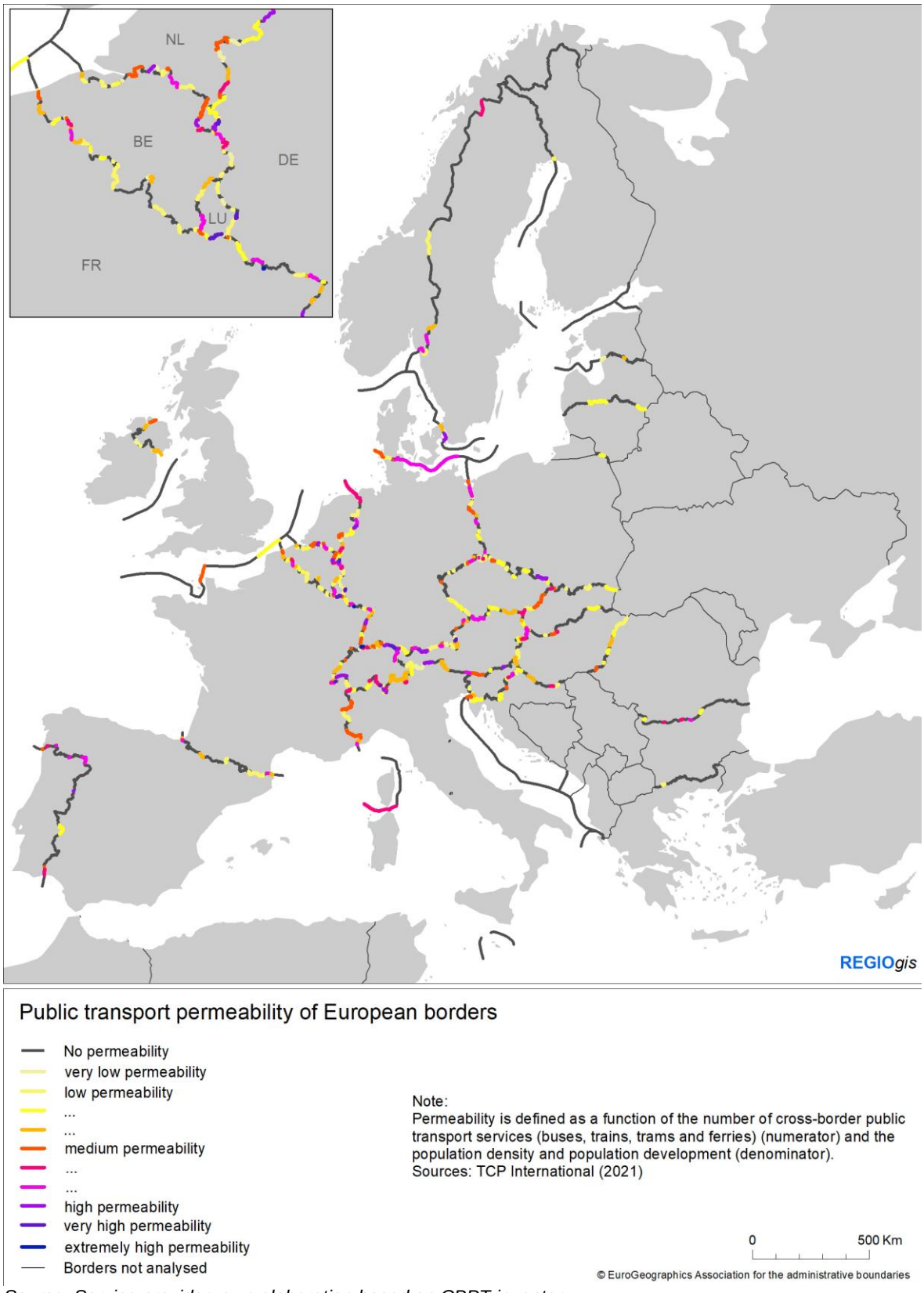
Borders with less than 20% non-permeable segments are between Switzerland and Liechtenstein, Germany and Denmark, and France and Luxembourg (Figure 2-32). At the other end of the spectrum, more than 90% of the borders between Bulgaria and Romania, Estonia and Latvia, Bulgaria and Greece, Finland and Sweden and Finland and Norway are non-permeable.

Figure 2-30: Demand for CBPT along border segments



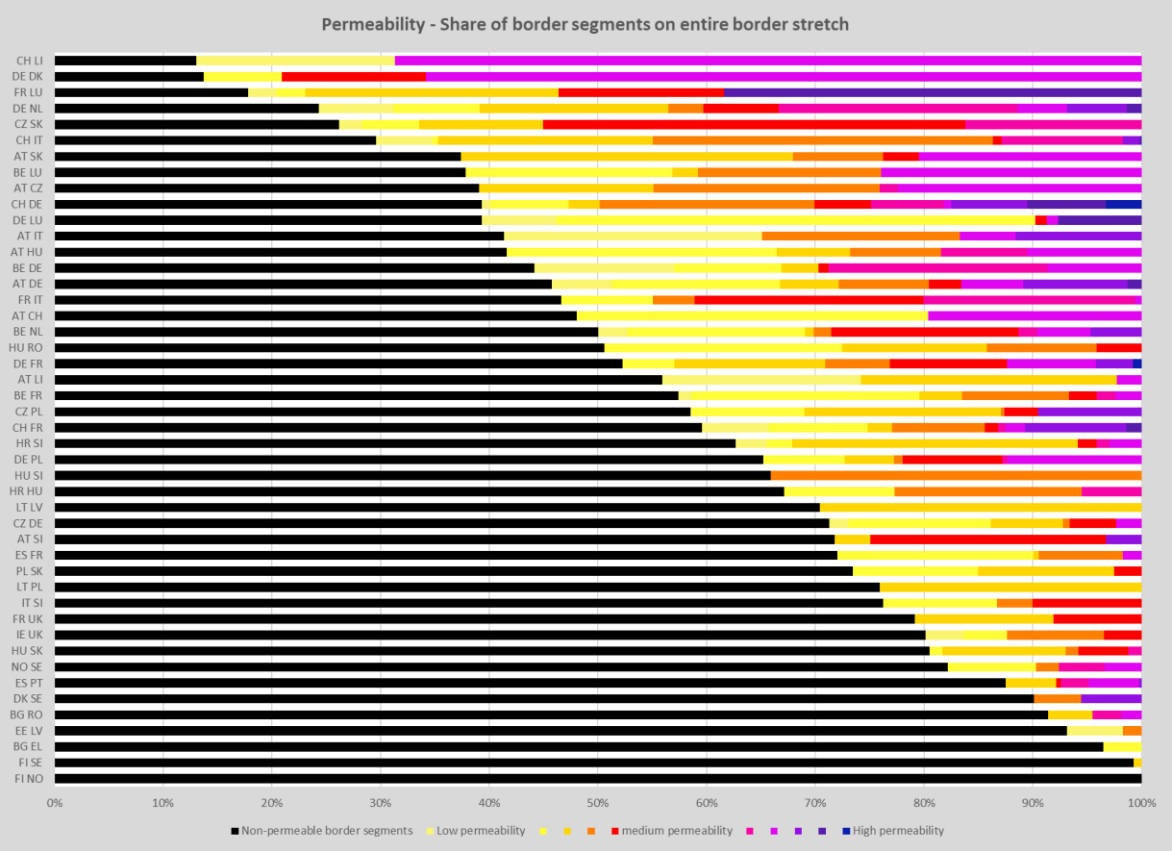
Source: Service provider, own elaboration based on CBPT inventory

Figure 2-31: Public transport permeability of European borders



Source: Service provider, own elaboration based on CBPT inventory

Figure 2-32: Permeability levels: Share of border segments on entire border stretch

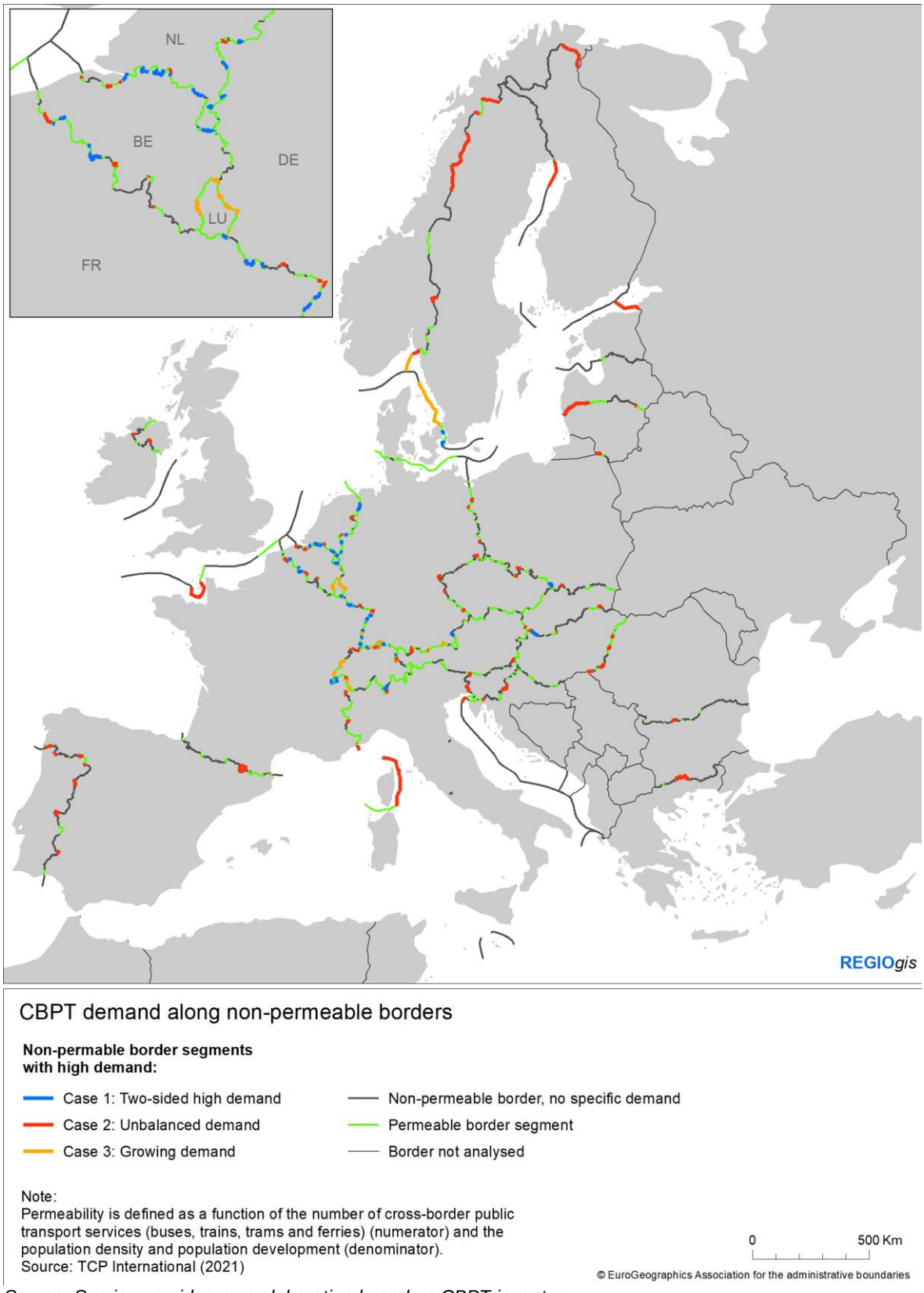


Source: Service provider, own elaboration based on CBPT inventory

However, not all non-permeable border segments have high demand for CBPT (Figure 2-33). Many non-permeable border segments in Scandinavia, between the Baltic States, in Eastern Europe and on the Iberian Peninsula appear to have no specific demand for CBPT. For these segments, the lack of transport services corresponds with non-existent demand. But contrary examples can also be found along all borders – with demand for CBPT but no services in place. In many of these cases there is high, two-sided demand for CBPT (for example, Benelux countries, French-German border, or along the German-Swiss border), sometimes there is also growing demand (for example, Luxembourg borders or along the French-Swiss border). However, in most cases there is unbalanced demand, such as along the Portuguese-Spanish, Bulgarian-Greek, or Hungarian-Romanian borders. From a planning perspective, unbalanced demand is quite tricky, since stakeholders in these border regions often struggle to have a common understanding of the problems.

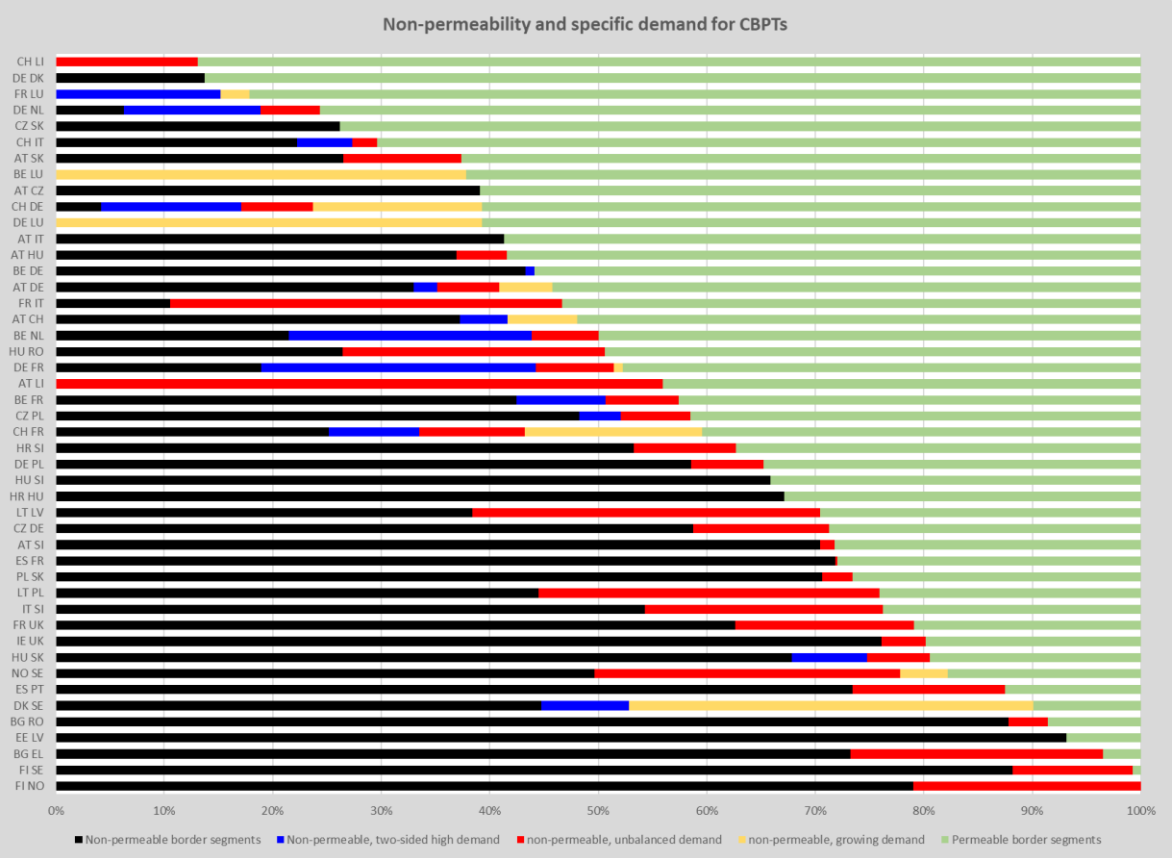
If transport services were established along these border segments, some national borders would then have more or less complete permeability (for instance, between Hungary and Romania, Austria-Germany, Belgium-Netherlands, France-Germany) (Figure 2-34). If all CBPT demand were met the proportions of non-permeable borders could be significantly reduced, in some cases to zero and in many cases to less than 30% or even 20%.

Figure 2-33: CBPT demand along non-permeable borders



Source: Service provider, own elaboration based on CBPT inventory

Figure 2-34: Non-permeability and specific demand for CBPT by national borders



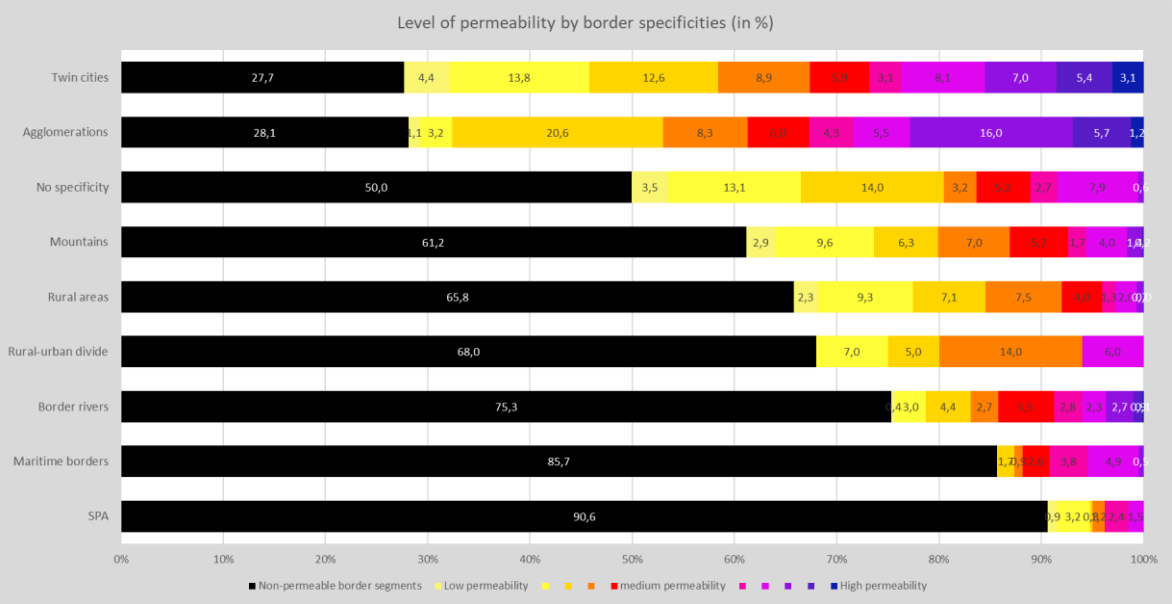
Source: Service provider, own elaboration based on CBPT inventory

Permeability and border specificities

Contrasting the level of permeability with border specificities, confirms expectations (Figure 2-35). While the share of non-permeable segments is highest for river, maritime and SPA borders (each with more than 70%), it is lowest for twin cities and agglomerations (<30%). The latter have mainly high and very high permeability. The other border types however also yield interesting findings. Although more than 61% of mountain borders are non-permeable, more than 5% are highly or very highly permeable, i.e., mountain borders cover the full spectrum of permeability. It is similar for rural areas and river borders.

In other words, difficult physical border conditions such as mountains, rivers or seas do not automatically lead to non or poor permeability. If there is sufficient demand, (technical) solutions can be found to establish CBPT even in border areas with difficult physical or geographical conditions. This conclusion is supported by SPAs. Many of these have no particular physical challenges; yet, in many cases, permeability is non-existent or extremely poor simply because of a lack of demand.

Figure 2-35: Level of permeability by border specificities

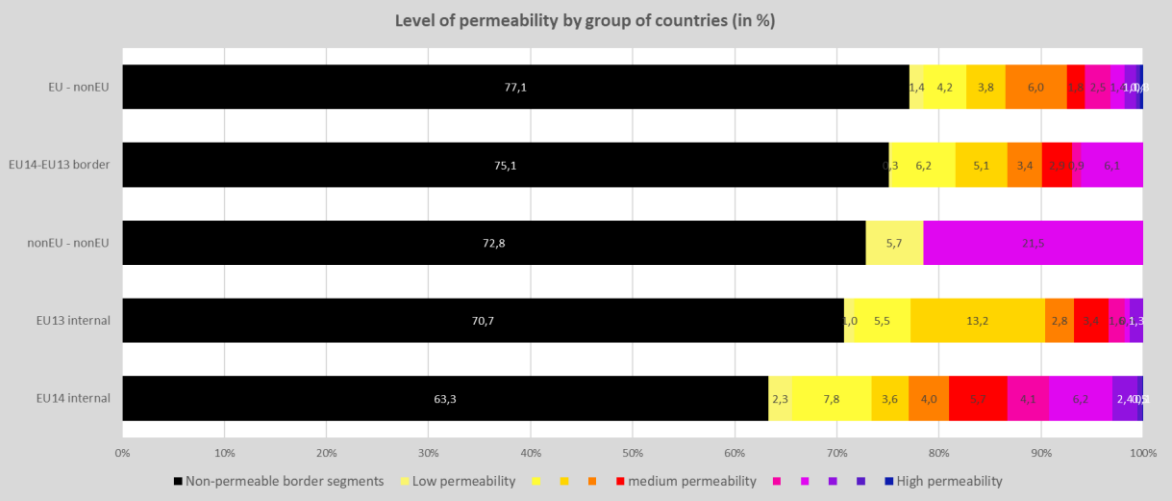


Source: Service provider, own elaboration based on CBPT inventory

Permeability by group of countries

The share of non-permeable border segments is lowest between EU14 countries (63%), and highest between EU and non-EU countries (77%) (Figure 2-36). Generally, permeability is higher between EU14 countries compared to EU13 countries, and generally higher between EU14 and EU13 countries. Interestingly, thanks to the large numbers of CBPT along the Swiss and Norwegian borders, the share of border segments with high permeability is also high between EU and non-EU countries. So, some non-EU countries like Switzerland, Norway and Liechtenstein are well embedded into CBPT, while the remaining non-EU countries are less integrated.

Figure 2-36: Levels of permeability by group of countries



Source: Service provider, own elaboration based on CBPT inventory

2.4.6 Summary of findings

The results of the analyses can be summarised as follows:

- Today, several thousand CBPT operate on Europe's borders. These are mainly bus services, followed by railways and ferries. Cross-border trams are a niche product.

- Most of these services are in the Benelux countries and the Alpine region, with many also in Nordic countries. Between the EU13 and EU14, there is also a dense network of CBPT, though they are still rare in Eastern Europe. This indicates a correlation between CBPT density and the tradition or intensity of cross-border cooperation. Eastern European countries still have some catching up to do.
- CBPT are not necessarily regional services. Many long-distance bus lines and IC rail connections are important for the accessibility of border regions, connecting cities on both sides of the border. Some of these long-distance connections have a high accessibility quality even for two or more border regions.
- The number of CBPT stops in border regions varies greatly. For bus and tram services, this is generally higher than for rail and ferry services. Interestingly, numbers are higher for services in Eastern Europe than in Western Europe. CBPT services in Eastern Europe today are scarce but tend to cover more distance than in Western Europe.
- The main target groups are very different, depending on the public transport provider and the local/regional contexts. Some services are aimed at the general public, while others are aimed at specific target groups (e.g., tourists, students, border commuters, workers at a car plant, cargo transport, etc.). Accordingly, service journey times, frequencies, ticketing systems and prices are very different.
- A large majority of rail CBPT operate along TEN-T rail corridors. This is only partially the case for bus services. For ferries and trams, TEN-T corridors do not play a role. A further development of TEN-T corridors in the rail network could therefore also contribute to improved or new rail CBPT, if the development of these corridors not only takes into account long-distance high-speed traffic, but also local and regional concerns in the border areas.
- Geographical specificities in border regions are not per se an obstacle for CBPT. On the contrary, these particularities are often the impetus for their development (e.g., ferries or special bus services). As expected, the density of CBPT is highest in agglomeration areas and twin cities, although there are many services also in mountainous areas or along rivers. Ultimately, what counts is a common understanding by stakeholders on both sides of the border as well as the political will to implement such services.
- At each border there are sections with high and low permeability. Most of the time, these correlate well with the (non)demand for transport services. However, there are also border sections that are currently not permeable, but where there is a demand for CBPT. New transport services here could lead to a comprehensive improvement in permeability of the entire border.
- Even though there are many CBPT on a border, they are often poorly embedded in domestic services. The lack of integration relates to aspects such as stops served, lack of coordinated timetables and frequencies, lack of integration into domestic ticketing systems, increased fares as well as different operating times (during the day, as well as throughout the year). While tram CBPT are fully integrated, this is only partially the case for rail and bus CBPT. However, many bus services and all ferries are not integrated, but are individual services.
- CBPT provision varies over the year. Services targeting tourists or students do not necessarily operate for the entire year. School services usually cease during school holidays, and many tourist services only operate in high season (which might be the summer for ferries, or winter for some bus or rail services in mountain areas).

3 Analysis of legal and administrative obstacles

Our stock-taking of CBPT services (Chapter 2) shows they are possible almost everywhere in the EU. This suggests that CBPT do not necessarily have fundamental difficulties, provided favourable framework conditions exist.

However, the extensive literature review to establish the inventory of legal and administrative obstacles as well as the in-depth case studies of business models for selected CBPT services (Chapter 4) shows very clearly that local and regional actors still face many challenges.

Exploring the scope of these challenges for CBPT and clarifying the underlying causes is the focus of this chapter.

The starting point of this analysis is an illustration of similarities and differences between country-internal and cross-border local public transport (Section 3.1). This is done at a systems-level with a view to provide a common understanding of the border-related particularities of CBPT. This section sheds light on the way how borders may cause difficulties for the establishment or operation of local CBPT and also explains the associated causal relations.

The detailed analysis of legal and administrative obstacles to CBPT from the inventory first establishes a classification of obstacles and identifies their root causes (Section 3.2). Then, specific aspects are examined in more detail (i.e. geographical distribution, transport modes, main problems, negative effects and impact) by highlighting their frequency and relevance (Sections 3.3 - 3.5). Finally, information on problem-solving approaches and actors to implement these is provided (Section 3.6).

3.1 Similarities and differences between country-internal and cross-border public transport

This section looks at both forms of public transport from a systemic perspective to highlight their similarities and differences.

A general similarity is that country-internal (domestic) local public transport and CBPT are both sub-sets of the wider system of passenger transport[15]. This system has three dimensions: land transport (e.g. road, rail or light rail), water transport (e.g. maritime ferries or ferries over rivers and lakes) and air transport (e.g. scheduled air transport and non-scheduled civil flying). Since the latter dimension is not addressed by this study, it is excluded from the following considerations.

The study was expected to also take mobility-related aspects into account when analysing CBPT. However, this requires expanding the analysis beyond the functional features of CBPT (i.e. existing lines, their geographical extent, modes of transport, etc.) and should avoid using mobility synonymous to passenger transport.

Mobility is a multi-layered concept comprising at least three basic elements[16], with physical mobility also involving a subjective dimension that establishes a dialectical relationship with

[15] The term is generally understood as the conveyance of persons by various means of transport, which may take place in territorial perimeters of different sizes (e.g. intra-city, suburban, intercity, international, intercontinental).

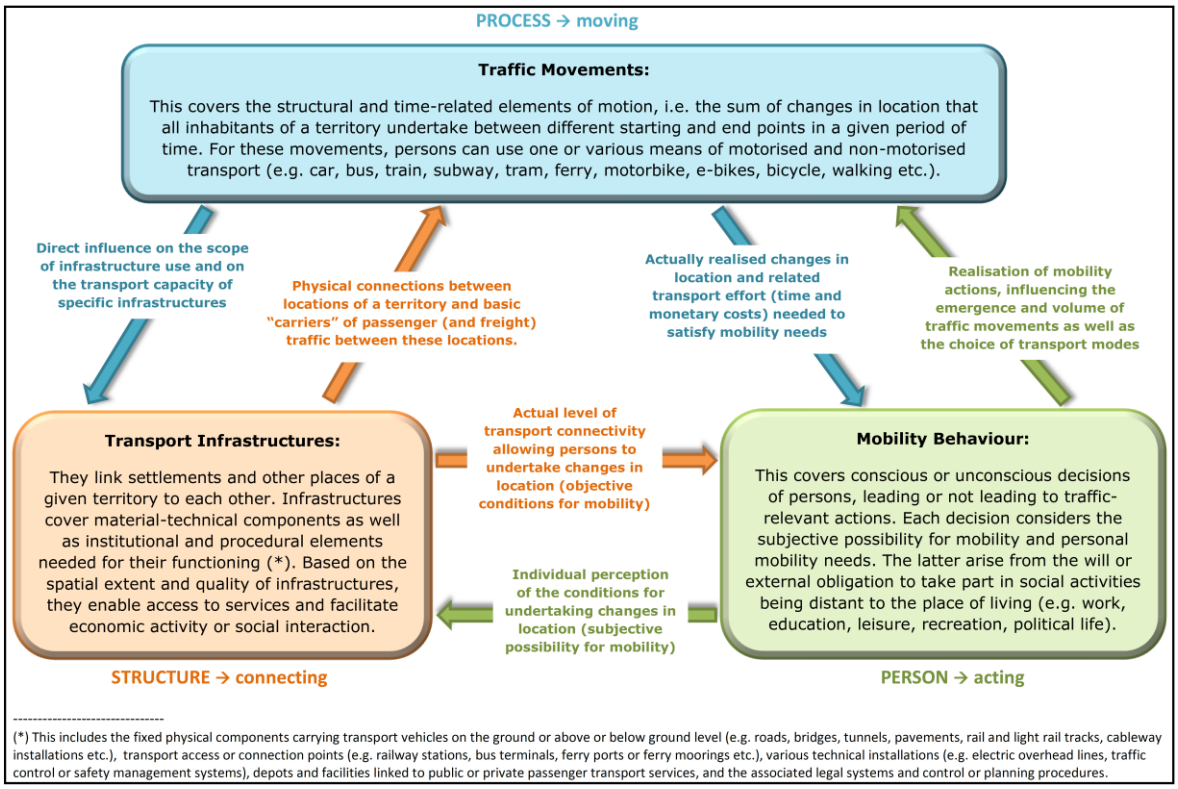
[16] (1) Physical mobility, which emphasises spatial movement between two places, with or without the help of technical devices. (2) Social mobility, as movement between social groups (e.g. career advancement and descent) or movement of social groups such as migrants or refugees. (3) Mental mobility, as movement in a person's thoughts and ideas (e.g. individual construction of places of longing, creation of new values and ideas), including also virtual movement in cyberspace. See Funke (2018), pp. 5-19.

passenger transport (Schopf, 2001, pp. 3-11; Knoflacher, 2001, pp. 13 – 18). Therefore, both sides need to be clearly distinguished:

- Physical mobility is a person's subjectively perceived possibility to move or be moved between locations to satisfy individual mobility needs (i.e. individual ability to move as a 'personal good').
- Passenger transport moves people in a given territory, reflected in the changes in location for all people in a determined time by different means of transport (i.e. traffic as the expression of physical mobility and the means of transport used for this purpose).

Based on this distinction, and by taking inspiration from a comprehensive approach developed for integrating both aspects (Schwedes et al., 2018), an explanatory model is proposed below. It links structural and operational aspects of passenger transport to the important role of the individual as a mobility-demanding and traffic-determining actor (Figure 3-1).

Figure 3-1: General functioning of the passenger transport system



Source: Service provider, own elaboration mainly based on Schwedes et al. (2018)

The model for the passenger transport system consists of three elements that each have a specific function and causal relations with the other elements (arrows). The elements and their interrelations can together depict all conceivable situations or variations in the general functioning of passenger transport:

- The 'structure' has the function to connect. Transport infrastructure links different locations to each other and is the prerequisite for any form of transport. The model considers transport infrastructures in a broader sense (Taylor, 2020; Ferrari et.al., 2018), but takes into account that each mode-specific infrastructure has a performance limit (transport capacity) (Profillidis and Botzoris, 2018).
- The 'process' has the function to move. Traffic movements are the changes in location that persons undertake in a period of time using different means of transport.

- The 'person' has the function to act. Mobility behaviour covers the subjective decisions that people make on their individual traffic-relevant actions, which in turn influence not only the occurrence and extent of traffic movements but also the use of the means of transport available for this purpose.

Since domestic local public passenger transport and CBPT are sub-sets of the passenger transport system, their functioning can also be explained by the model. In addition, the model also provides practical guidance for policy making on public transport since each element can be associated with tasks in different stages of the policy cycle. The overview in Table 3-1 specifies these aspects by focusing on the subject matter of this study.

Table 3-1: Explanatory and policy guiding function of the model for CBPT

Elements and interrelations (arrows)	Explanations for the general functioning of CBPT	Related policy tasks for CBPT
Transport Infrastructure	Shows cross-border transport connections (e.g. roads, railways, light-rail, etc.), access points (e.g. bus and railway stations, intermodal switch points etc.) and technical installations necessary for operating CBPT.	Planning, construction, management / maintenance and evaluation of transport infrastructure needed for CBPT
Structure → Process	Explains whether the infrastructure is appropriate for operating CBPT (e.g. no missing links, availability of access points to CBPT, interoperable technical installations) and has sufficient transport capacity.	
Structure → Person	Explains whether the level of cross-border transport connectivity is sufficient for inhabitants of border regions (and other persons) to change location for everyday activities on the other side of a border.	
Traffic Movements	Shows the scope and mode-specific CBPT usage for border-crossing changes in location that inhabitants of a cross-border region have undertaken in a given period of time.	Planning, management and evaluation of traffic processes linked to different modes of CBPT and better design of traffic flows with CBPT.
Process → Structure	Explains whether CBPT journeys can be handled by the mode-specific transport infrastructure within the respective service limits (e.g. need for quality improvements or capacity increases).	
Process → Person	Explains to what extent inhabitants of border regions (and other people) use CBPT for cross-border trips (e.g. modal split of CBPT in general passenger transport) and which CBPT-mode they choose if different options exist.	
Mobility Behaviour	Shows the subjective variables in transport decisions of people leading to a use (or non-use) of CBPT for cross-border trips.	Planning, management and evaluation of cross-border mobility to strategically influence human behaviour in favour of more CBPT use.
Person → Process	Explains in how far inhabitants of border regions (and other people) choose CBPT for their cross-border trips.	
Person → Structure	Explains whether inhabitants of border regions consider the quality of infrastructure to be adequate for cross-border trips by CBPT (e.g. slow speed of trains or buses, poor access to CBPT, long waiting times etc.).	

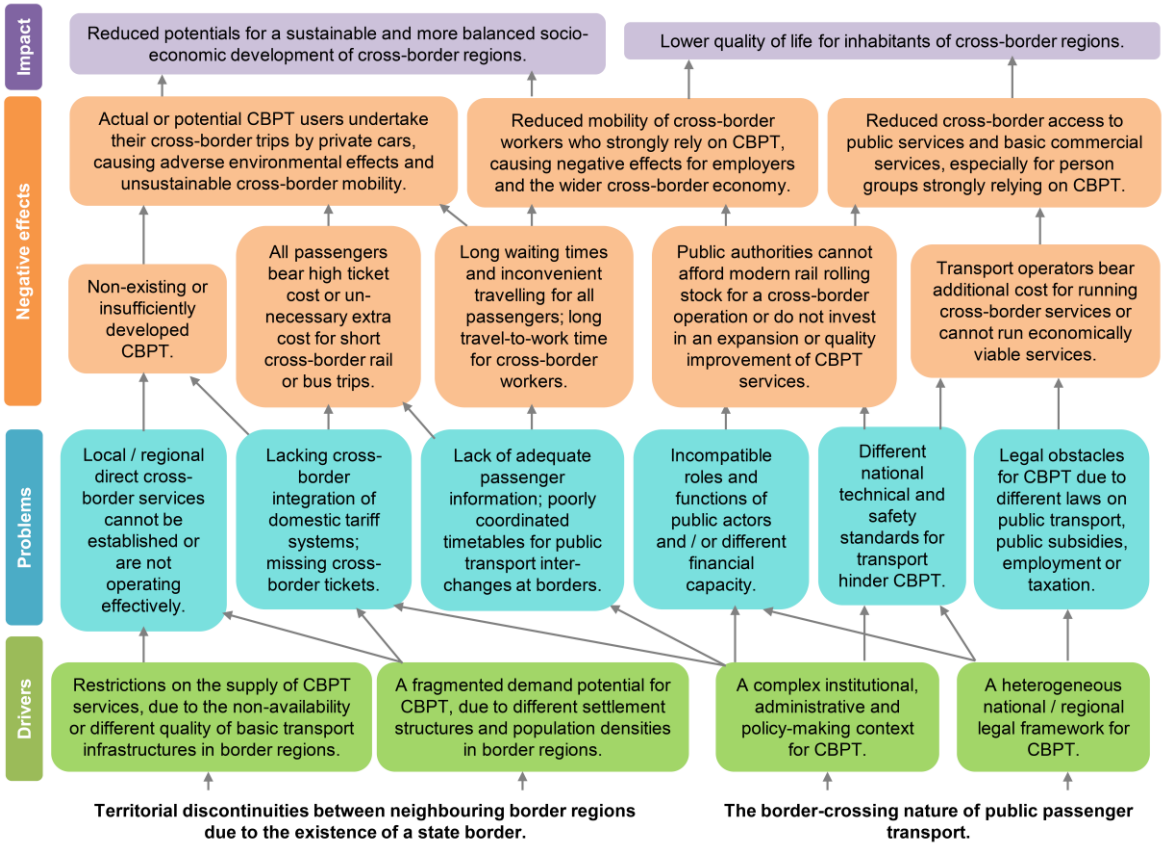
Source: Service provider, own elaboration

Despite belonging to the wider passenger transport system, **CBPT has two major particularities that are a clear difference to domestic local / regional public transport.** These relate to the border context in which CBPT services are provided:

- State borders influence the structural features of neighbouring border regions in many ways[17] and the intensity of functional exchanges between them (i.e. flows of people, goods, services and information). In particular the scope and quality of transport infrastructure connecting neighbouring border regions as well as the settlement and population features of these regions are highly relevant for CBPT. Territorial discontinuities can lead to constraints on the supply and demand for CBPT, which are usually not as pronounced as for domestic local / regional public passenger transport.
- The border-crossing provision of public passenger transport services means that CBPT has to be planned, established and operated under different legal frameworks and within a complex institutional, administrative and political context. This often leads to a variety of border-specific difficulties that do not exist for domestic local / regional public passenger transport operating under homogeneous national or regional conditions.

From these particularities emerge four 'drivers' that may lead to problems for CBPT. These problems cause variable negative effects for different types of actors (i.e. users of public transport, transport organising authorities, transport providers, etc.), together resulting in a wider adverse impact for the entire cross-border region (Figure 3-2). Depending on the specific circumstances at a border and the relevant 'causal pathways', various challenges can emerge for the set up and operation of CBPT.

Figure 3-2: 'Mind map' presenting key challenges for CBPT



Source: Service provider, own elaboration based on European Commission, DG REGIO (2017b)

[17] For example distribution and size of settlements, distribution, size and concentration of population, the economic fabric, endowment with transport and other infrastructure, availability of public services, socio-cultural characteristics, language use, etc.

Based on the functioning of the general passenger transport system, each of the four main drivers for problems in CBPT is now explained and also the links with aspects further upwards in the causal chain are examined in more detail (i.e. negative effects and impacts).

3.1.1 Transport infrastructure, supply of CBPT and cross-border mobility

Inhabitants of border regions make up around 30% of the total EU population and for these CBPT widens the range of options for cross-border mobility. That supply can emerge from new cross-border services where passenger transport is poorly developed or completely absent, but also from better interconnection of existing domestic public transport services in neighbouring border regions.

However, adequate cross-border transport infrastructure networks are a basic prerequisite for developing and operating any domestic or CBPT by road, rail or ferry. Significant discontinuities in infrastructure availability and quality can be important inhibiting factors for the development and operation of CBPT.

Border-related discontinuities in the availability and quality of infrastructure

In many border regions, road and rail networks are less dense or not as well maintained as networks in non-border regions of the same country. These shortcomings may affect only one side of a border or both sides at the same time. Neighbouring border regions frequently suffer from weak cross-border connectivity and thus from reduced accessibility[18]. This is most often due to a low density of road and rail border-crossing points or river crossing possibilities (e.g. bridges, ferries), but also because cross-border transport connections simply do not exist. Missing cross-border road and rail links mean domestic public transport services end at or close to a border and cannot be continued to the other side and connected with a neighbouring public transport network.

Low quality transport infrastructure at many borders is still an important reason for limited CBPT. Poorly maintained railway tracks, only small secondary country roads leading across a border or the absence of essential road traffic management infrastructure around bigger cities[19] are all adverse factors causing slow cross-border rail or bus services. This makes these services less effective and less attractive for actual or potential users, wherefore people often choose to not use CBPT as a means of transport. This in turn has drawbacks for passenger volumes and finally for the economic viability of cross-border services.

Adverse effects on the offer and quality of CBPT can even emerge in densely populated cross-border areas with good transport infrastructure, especially if infrastructure usage reaches or surpasses mode-specific service limits (i.e. transport capacity). The usual result is road congestion or railway infrastructure saturation, leading to slower domestic and CBPT services. This occurs when CBPT is operated on the same infrastructure that is used by other means of transport (e.g. roads: cars, buses, lorries, motorcycles, bicycles) and for different forms of transport (e.g. railways: freight and passenger transport). So even with a sufficiently dense cross-border transport infrastructure network, the limited capacity of rail or road connections for CBPT services may lead to a negative perception by potential or actual users. Such users can end up choosing alternative routes and other means of transport that better meet their cross-border mobility needs.

This illustrates the interplay between the objective conditions of cross-border transport infrastructure (i.e. connectivity, quality of existing connections and actual utilisation capacity) as a basis for the development and operation of CBPT services and the perception

[18] See on this in general: Christodoulou / Christidis (2018); European Commission, DG REGIO (2018)
[19] Exclusive bus lanes and/or traffic lights equipped with preferential treatment for domestic buses that can also be used by cross-border bus services.

of CBPT as an option for individual cross-border mobility by people in neighbouring border regions.

The contribution of CBPT to improving cross-border mobility

CBPT can contribute to implementation of the EU principle of a free movement of people when effective cross-border passenger transport services enable EU citizens to fully enjoy their right to employment in a neighbouring country. CBPT can also facilitate the cross-border access of citizens to public services, especially if better healthcare treatment or education are available on the other side of a border. Finally, CBPT can facilitate the mobility of persons who cross the border for other everyday life activities such as shopping, visits to family members and friends or short-term trips for tourism and leisure (e.g. day-excursions to neighbouring border regions, visiting cultural events, etc.).

The contribution that CBPT can make to improving cross-border mobility strongly depends on the characteristics of each cross-border region.

In more densely populated and well-connected cross-border regions with substantial CBPT, the related passenger transport services mainly contribute to a more sustainable pattern of cross-border mobility (e.g. lowering individual car use) but less to ensuring the accessibility of neighbouring border areas.

In rural and less densely or even sparsely populated border regions, but especially in remote or isolated border regions, CBPT often makes a decisive contribution to improving cross-border mobility for inhabitants. This applies in particular to people who cannot afford a private car or who are less mobile because of their age or health status. CBPT thus is often the only mobility option for people to reach everyday services that only exist across the border (e.g. primary and secondary schools, doctors, grocery shops, etc.). Hence, inhabitants in these regions depend more on efficient cross-border passenger transport services than inhabitants of more urbanised and better-connected cross-border areas.

3.1.2 Settlement structure, population density and demand for CBPT

The pattern of settlement structure and population density in EU cross-border regions varies significantly. Both aspects have developed over centuries very differently in neighbouring border regions as state borders had different degrees of permeability for socio-economic exchanges but also due to other factors (e.g. a natural barrier, military considerations, attraction of domestic or foreign growth centres, etc.).

Cross-border regions may have bigger cities or larger urban agglomerations and a high population density on both sides of a border, dispersed small and medium-sized settlements in a rural environment with low population density on both sides, or a combination of urban and rural settlement structures leading to different population densities on each side of a border.

These different constellations considerably influence the scope and ways how people, goods, services or information are crossing borders. This also leads to different traffic movements between neighbouring border regions, in terms of both total volume and geographical orientation.

Cross-border traffic movements and the demand potential for CBPT

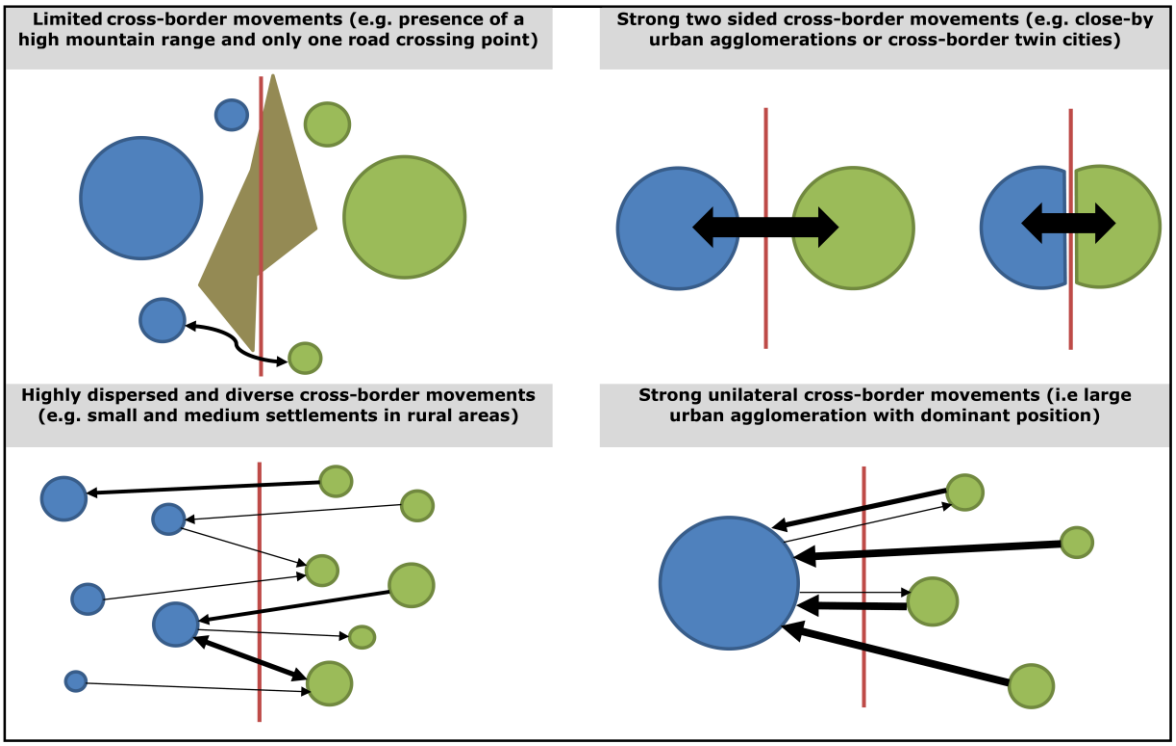
The characteristics of traffic movements between different locations within a territory are of crucial importance for the development and ongoing operation of any public transport service. The volume of traffic and the underlying travel motives allow determining the demand potential for local public transport, the temporal distribution of this demand and the

main target groups likely to use public transport services. The same logic applies to cross-border traffic movements, though a border can lead to unbalanced flows and thus to variable demand potential for CBPT.

Demand potential for CBPT tends to be wide-ranging in more densely populated and urbanised cross-border regions in many parts of north-west and central Europe. Good examples are the Öresund Region (DK-SE), most Dutch-German Euregios (DE-NL) and the trilateral 'Euregio Maas-Rhein' (DE-BE-NL), the Grand Duchy of Luxembourg with its neighbouring border areas (LU-DE, LU-FR, LU-BE), Eurodistricts 'Lille-Kortrijk-Tournai' (BE-FR) and 'Saar-Moselle' (DE-FR), the Upper Rhine Area (DE-FR-CH), the entire cross-border area around Lake Constance (DE-AT-CH-LI), the Greater Geneva cross-border agglomeration (FR-CH), EUREGIO 'Salzburg-Berchtesgadener Land-Traunstein' (DE-AT) or the multilateral CENTROPE area (AT-CZ-SK-HU). Here, people usually carry out many cross-border traffic movements each day for reaching their place of employment on the other side of a border (i.e. cross-border workers) and for other everyday activities.

However, difficulties emerge when state borders lead to imbalanced traffic movements between neighbouring regions. These can be in terms of direction and volume of movements, or a strong spatial concentration (i.e. movements only at one or two border crossing points, also due to natural obstacles), or as a combination of these aspects (Figure 3-3). Such imbalances usually make the definition of CBPT catchment areas with sufficient demand potentials much more complicated than for domestic local / regional public transport. Moreover, low or scattered demand often leads to less frequent cross-border services or even the absence of CBPT.

Figure 3-3: Patterns of cross-border traffic movements



Source: Service provider, own elaboration

A variable but more restricted user group

Other difficulties relate to CBPT often having a much more restricted user group than domestic public transport.

At many EU borders, the most significant demand potential for CBPT is from **cross-border workers** who commute each day to their places of work in neighbouring border regions.

Cross-border commuter flows usually occur at specific times in the day but can also be characterised by different patterns: strong flows in one direction, balanced and strong flows in both directions or diffuse but low flows in both directions. Temporary strong demand requires intense CBPT services in the early morning and late afternoon, but not throughout the rest of the day due to much lower passenger volumes. Although this imbalanced demand is a challenge for public transport, CBPT requires at many borders a substantial cross-border coordination to avoid an over-use of transport infrastructure or inefficiencies in the provision of rolling stock. These problems have to be addressed jointly by the public authorities responsible for planning and ordering public transport services (i.e. transport organising authorities) and/or by the transport companies operating cross-border services (i.e. transport providers). If coordination between these key stakeholders is not successful and effective, however, there can be many adverse effects for cross-border workers using CBPT.

At some EU borders, there is additional and sometimes even substantial daily cross-border traffic from **people making short-term trips across the border for reasons other than work** (e.g. shopping, leisure or cultural activities of the resident population, cross-border excursions by tourists staying in a border region, students enrolled at a university across the border, cross-border health treatment, etc.). To 'convert' these flows into a demand for CBPT, however, means cross-border passenger transport services have to be able to meet the needs of the relevant target groups. This can sometimes be achieved with more regular cross-border services during the day (i.e. outside commuting peak hours), but also with new cross-border services tailored to particular target groups (e.g. seasonal or week-end services to tourism or leisure attractions). Although these solutions serve the important public interest of reducing cross-border car traffic, they can often be more difficult to operate economically than in a domestic context (e.g. scarce or fluctuating cross-border passenger volumes leading to low service use).

School transport is in many European countries one of the most important customer segments of domestic local / regional public transport, since the target group is denied access to motorised private transport up to a certain age. Especially in less densely populated rural areas, school transport is often an important source of income for small local transport companies and secures their survival. For CBPT, however, this important demand potential is largely absent since legally defined local / regional school districts do not usually extend across national borders.

Overall, a limited or fragmented demand potential and a restricted user group can often hamper the establishment of cost efficient and needs-oriented passenger transport services. But limited or fragmented demand may also adversely affect other service-related aspects, for instance if no attractive fares or uniform tickets for cross-border journeys are offered or if passenger information is inadequate (e.g. offered only on national / regional platforms or only in one language).

3.1.3 Heterogeneous national or regional legal frameworks for CBPT

Within each Member State, local or regional public passenger transport services operate under a single and coherent legal framework that is well-known and applied by all domestic actors. These frameworks are enacted by national or regional legislators, but also at the European level. Legal frameworks for domestic public passenger transport usually include:

- general and mode-specific legislation governing a country's entire transport system;
- laws and regulations defining country-wide safety and technical standards or environmental requirements;
- specific national or regional legislation governing the provision of local / regional public passenger transport services (e.g. distribution of general or mode-specific competences for organising public transport, tendering and award of public service

obligation contracts, compensatory public funding for public service obligations, etc.);
- legislation on access and use of transport infrastructure (e.g. allocation of railway lines, track access charges, station usage fees);
- tax legislation (e.g. value added tax for service provision; granting of specific fiscal reductions, etc.);
- legislation defining the respect of passenger rights;
- general or specific legislation on employment conditions and professional qualifications (e.g. for bus, tram and train drivers).

Some elements of this legal framework for regional / local public transport are defined autonomously by Member States or regional authorities, while other aspects originate from EU legislation. These EU laws are either directly applied by Member States (EU regulations) or transposed into domestic legislation (EU directives). The secondary EU legislation on public passenger transport translates broader Treaty objectives on services of general economic interest (SEGI)[20] into harmonised EU-wide rules for the Internal Market and also regulates the provision of CBPT services. These rules have to be put into practice by national, regional and local authorities responsible for public passenger transport.

Despite uniform and EU-wide rules, however, there are still legal obstacles to CBPT that only become visible and apparent with passenger transport services across state borders.

Depending on the geographical scope of a cross-border service, key stakeholders involved in the planning, organisation and operation of CBPT have to take into account two or even more national legal frameworks. Aspects from these frameworks can become legal obstacles to CBPT, with a general distinction between EU and national legal obstacles.

EU legal obstacles for CBPT

These obstacles emerge from Union legislation on (public) transport and other relevant policy fields for which an exclusive EU competence[21] or a shared EU competence does exist[22]. Obstacles can emerge when specific aspects relevant for CBPT are not yet regulated / harmonised by existing EU secondary legislation or if the latter includes inadequate provisions hampering the development or operation of CBPT. Also incoherent implementation of EU legislation by Member States can lead to an EU legal obstacle for CBPT (i.e. differences between domestic rules or procedures used to apply EU-regulations or transpose EU-directives), since the Union level is ultimately responsible for ensuring a coherent implementation of its body of law.

Additional EU legal obstacles for CBPT can emerge from the different political status of national borders within the EU, which originates from the multiple formats of the European integration process (i.e. internal or external EU border, borders between Schengen / non-Schengen countries, borders between Eurozone / non-Eurozone countries). Adverse effects for cross-border passenger transport can emerge from prescriptions on currency use and from exchange rate losses, but also from 'exceptional situations' managed by different border regimes.

Examples for the latter are the refugee crisis in 2015 and the ongoing COVID-19 crisis, when national measures based on the exceptions foreseen by the Schengen rules have led

[20] Article 14 in the consolidated version of the Treaty on the Functioning of the European Union.
[21] For exclusive competences (see: Article 3 of the TFEU), the EU alone is able to legislate and adopt binding acts. Member States can only do so themselves if empowered by the EU to implement these acts. CBPT-relevant policies falling under the exclusive EU competence are competition rules (necessary for the functioning of the internal market) and the conclusion of international agreements (e.g. on transport-related matters with neighbouring non EU-countries).
[22] For shared competences (see: Article 4 of the TFEU), the EU and Member States can legislate and adopt legally binding acts. Member States exercise their own competence where the EU does not, or has decided not to exercise its own competence. CBPT-relevant policies falling under shared competence are the internal market, social policy (but only for aspects specifically defined in the Treaty), economic, social and territorial cohesion (regional policy), environment, consumer protection (e.g. passenger rights) as well as transport and trans-European networks.

to a temporary closure of national borders and/or the introduction of border controls. These situations have led to the partial or complete suspension of CBPT at several internal EU borders (with domestic services more or less continuing during the same periods), or introduced new obligations for CBPT-users not experienced in normal times (e.g. COVID-19-tests for short cross-border trips).

National legal obstacles for CBPT

These obstacles emerge from legislation in policy fields with no uniform EU-wide rules, because there is either no EU competence or only a supporting EU competence[23]. An obstacle usually exists when provisions on CBPT-relevant issues in domestic laws or regulations do not allow a common frame of action for the development or operation of CBPT. This may be due to the absence of provisions on one side of the border or because legislation on both sides include incompatible provisions or establish a highly asymmetric constellation for mutual collaboration.

The above-mentioned types of legal obstacles can at variable degrees affect all or only some CBPT actors on one or both sides of a border (e.g. public transport organising authorities at local, regional or national level, transport operators, transport associations). Legal obstacles can hinder the establishment of CBPT services or their ongoing operation, with both situations creating adverse effects for actual and potential users.

When such problems emerge for the development or operation of CBPT, however, local or regional actors can often only search for solutions to pragmatically 'bridge' these legal obstacles. This is due to the fact that EU legislative action is only initiated for very substantial and wide-ranging problems, but also because national governments are most likely not prepared to change country-wide laws in the short term only because of border-specific difficulties.

3.1.4 A complex institutional, administrative and political context

Closely related to heterogeneous legal frameworks is the complex institutional, administrative and policy-making context for the development and ongoing operation of CBPT. This complexity emerges from established regional / local public transport systems with specific organisational models and functional responsibilities, but also from different policy-making processes and ways of delivering public transport services on a day-to-day basis (e.g. administrative procedures, operating routines, language use, etc.).

Since EU-wide rules on domestic and cross-border public transport usually do not significantly influence country-specific organisational and procedural features of local / regional public passenger transport[24], system differences often result in major administrative obstacles. These obstacles can lead to low cross-border cooperation between public transport actors or may even provoke deliberate 'blocking behaviour' by national or regional / local public transport authorities.

Asymmetry between public transport actors

Low cooperation on CBPT often results from asymmetries between public transport actors on both sides of a border:

- Asymmetries can emerge when public authorities with responsibilities for local public transport on each side of a border are at different levels of government (i.e. local,

[23] For supporting competences (see: Article 6 of the TFEU), the EU can only intervene to support, coordinate or complement the action of Member States. Legally binding EU acts must not require the harmonisation of Member State laws or regulations. Moreover, the EU may not interfere in the exercise of competences reserved for Member States.

[24] EU legislation does not establish harmonised rules on a division of competences between public institutions in charge of public transport nor prescribe how regional / local passenger transport services have to be planned and organised. It merely recognises the established national / regional models but superimposes general procedural rules to be applied by the relevant actors (e.g. on public service obligations, public tendering, granting line concessions, respect for passenger rights, etc.).

inter-municipal, regional, national), with different competences and tasks (e.g. legislative powers and / or administrative-organisational powers) or with different operational capacities (i.e. human and financial resources, available rolling stock for passenger transport).

- Asymmetries can also emerge for cooperation between transport operators, especially if companies are in private or public ownership and transport providers on each side are operating at very different territorial scales (i.e. locally, agglomeration- region- or, country-wide).

Weak or no cooperation between CBPT actors may lead to a variety of dysfunctionalities or difficulties. Concrete examples are a lack of cross-border coordination for existing national, regional or local public transport services (e.g. no harmonisation of timetables for connecting services at borders, inadequate passenger information systems), but also lengthy administrative procedures for line concessions (e.g. bus and rail) or permits to operate trains across borders (i.e. homologation of rolling stock). These aspects frequently add to problems caused by legal obstacles or adverse territorial conditions that already hamper the set-up of new or the operation of existing CBPT.

Lacking cross-border integration of domestic tariff systems

Another and very frequent problem caused by weak cooperation is the lacking cross-border integration of domestic tariff systems and a nearly total absence of truly cross-border tariff systems for CBPT.

Within many European countries, integrated tariff systems are often established for larger cities or urban agglomerations and even for entire regions. These systems are usually governed by specific cooperative structures called transport associations. They can have different legal forms (i.e. based on public or private law) and involve different types of public transport actors. Some associations only involve the competent public transport organising authorities (i.e. transport organiser associations), others only transport providers from the relevant area (i.e. transport company associations), and others both public transport organising authorities and the transport providers (mixed transport associations).

Depending on their composition and purpose, these associations usually promote a one-ticket-policy (i.e. a single ticket valid for several modes of public transport) and apply homogenous though spatially differentiated fares for journeys within the tariff area, usually determined on ground of smaller ‘tariff zones’. These associations are also entrusted with other tasks such as the establishment of joint ticketing and passenger information systems or the distribution of fare revenues between the participating transport operators, and in some cases even with the joint planning and ordering of passenger transport services.

Along EU borders, however, cooperation on tariff issues is often differently developed or even non-existent. This may be due to the incompatibility of neighbouring domestic tariff systems (e.g. different actor-composition, tasks or tariff policies of transport associations, different size of tariff areas), partial tariff systems along borders (i.e. on one side but not the other) or other adverse factors hindering cooperation (e.g. currency and/or purchasing power differences, language barriers, different user potential, etc.).

The lack or incomplete integration of tariff systems may cause multiple problems such as

- no cross-border tickets for certain connections, requiring passengers to purchase separate domestic tickets leading to higher prices for the journey;
- no fare reductions or exemptions that usually exist in domestic public transport for certain groups (e.g. children, pupils or students, families or groups, the elderly or disabled persons);

- very different fare levels on both sides of a border, particularly affecting cross-border commuters using CBPT on a day-to-day basis for reaching their place of work in the neighbouring border region;
- a highly complex and untransparent offer of tickets or fares for cross-border trips;
- limited distribution channels for cross-border tickets, different ticket formats and purchasing or validation methods (e.g. conventional ticket distributors or e-ticketing).

The absence of cross-border tickets, fare reductions or easy-to-use ticketing systems makes the affected CBPT less attractive for actual or potential users. These aspects usually involve additional costs for users and also tend to strongly influencing their mobility behaviour. Personal decisions to not choose CBPT automatically favour other means of motorised transport for cross-border movements, with this making cross-border traffic less sustainable in overall terms.

Different political views on the development function of CBPT

Within the Member States as well as in some neighbouring non-EU countries (i.e. Switzerland, Liechtenstein, Norway, United Kingdom), the important territorial development function of domestic regional/local public transport is generally well-recognised. This is reflected in the anchoring of corresponding requirements within national or regional legal frameworks, but also in the granting of public subsidies (national, regional, local) for passenger transport services under public service obligations or special services in particularly disadvantaged areas.

For CBPT, however, a broad recognition of this important function is not yet very pronounced at many EU borders. This is often reflected in no or restrictive granting of public subsidies for cross-border local bus services, the closure of cross-border rail connections and a dismantling of existing track infrastructure, or a general reluctance to develop cross-border bus and rail services. Very often this adverse behaviour comes from national actors (e.g. central governments, national railway companies or infrastructure managers), since they do not take enough account of the interests and needs of border areas.

3.2 Basic obstacle types and their most important 'root causes'

The comprehensive picture presented in section 3.1 is confirmed by the 57 cases in the inventory of legal and administrative obstacles. This is considerably more than the CBPT cases identified by the Commission's ELABOR-study of 2017 (18 cases) (European Commission, 2017b). However, this does not mean that obstacles for CBPT have increased throughout the EU. The higher number of cases only reflects the fact that the present study has carried out more targeted research for this policy field.

Most cases in the inventory (i.e., 45) were elaborated on grounds of an extensive literature review covering documentary and online sources in English, German, French, Spanish and Dutch. The review process considered only sources published from 2017 onwards to generate an up-to-date picture[25]. Despite the use of only up-to-date information, some cases may have since made progress in tackling or even in eliminating the obstacles.

The present study also conducted a Europe-wide survey among CBPT-stakeholders and received 129 responses (Annex). More than half the respondents also provided information on obstacles that affect the establishment or current operation of CBPT (i.e. 67 responses). These responses added a further 12 cases to those identified via literature review.

[25] Information on obstacle cases described in 'older' sources was considered in the introductory section of this chapter (see: Section 3.1).

Responses also clearly confirmed 27 of the 45 literature-based obstacles, thus underpinning their continuing actuality.

Despite the combined use of literature and survey information, the inventory cases are not a numerically exact representation of all legal or administrative obstacles for CBPT at EU borders. Instead, the inventory is an empirical but partial 'snapshot' of a specific situation prevailing in the period 2017 to 2021.

3.2.1 Overview of types of obstacles

The inventory first allocated the cases identified via the literature review or the survey to a specific type of obstacle to establish a basic classification (taxonomy).

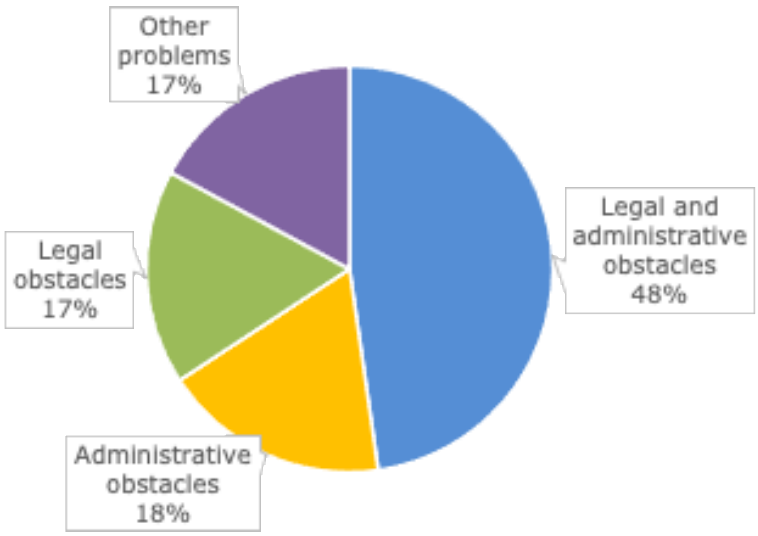
The classification of all 57 cases suggests that most problems for CBPT are 'home-made'. This means that problems mostly originate from adverse administrative practices at national, regional or local levels and from national legal obstacles, but not from weaknesses in the EU legal framework for CBPT. The exact shares within that classification are the following:

- 11% of cases are EU legal obstacles (i.e., 6 cases classified as type 1).
- 9% are national legal obstacles (i.e., 5 cases classified as type 2).
- 61% are administrative obstacles (i.e., 35 cases classified as type 3).
- 19% cannot be allocated clearly to either a legal or an administrative obstacle (i.e., 11 cases classified as 'other obstacles').

For 81% under one of the three main types of obstacle (i.e., types 1, 2 and 3), the inventory carried out a standardised assessment of the specific aspects that actually cause the obstacles (i.e. 'root causes'). Also the factors causing 'other obstacles' were examined but without a standardised approach. The findings of both assessments are shown in sections 3.2.1 to 3.2.3 below.

The picture presented above is largely confirmed by the online survey of CBPT stakeholders (Figure 3-4). However, survey answers indicate a strong tendency towards interlinking different obstacle types.

Figure 3-4: Survey answers on the most commonly encountered obstacles



Source: Service provider, based on findings of the 2021 online survey (n=117)

Around half the survey respondents indicated that legal and administrative obstacles are simultaneously creating difficulties for setting up or operating CBPT services (48%), often in combination with other problems. Also a large share of survey respondents indicating

administrative obstacles frequently referred to adverse influences from other problems, namely 15 of 20 respondents. Conversely, only 4 of the 19 respondents indicating legal obstacles also encountered other problems.

However, 17% of the survey respondents are unaware of the exact administrative or legal obstacle hindering the development or operation of CBPT services and therefore only refer to 'other problems'.

3.2.2 Root causes of EU and national legal obstacles

The root cause of half the six **EU legal obstacles (Type 1)** in the inventory is an incoherent application of existing EU legislation by neighbouring EU Member States. For aspects regulated by EU transport legislation, problems emerge if further implementation options offered by EU regulations are not used (Box below) or if national rules are applied restrictively to cross-border services (i.e. granting of public subsidies).

For the other three cases, problems originate from the political status of an EU land border. Difficulties for setting up or operating CBPT are either due to incompatible national legal frameworks on both sides of an external EU border (i.e. with Switzerland and Liechtenstein), or non-membership of some EU countries in the Schengen area (i.e. waiting times due to border controls) or in the Eurozone (i.e. currency differences complicate pricing of fares).

Problems for cross-border bus lines in the 'River Minho EGTC' (ES-PT)

On the northern part of the border between Portugal and Spain, the establishment of cross-border bus lines in the River Minho EGTC is hindered by incomplete application of provisions from Regulation (EC) 1073/2009. A legal obstacle for the cross-border extension of bus lines exists only if bus lines include urban cabotage services. In that case, Regulation (EC) 1073/2009 forbids cabotage operations by a non-resident carrier in an urban centre or conurbation, or between it and the surrounding areas (Article 15(c)). This problem could be solved by using the provisions from Article 25 of Regulation (EC) 1073/2009 which states that Member States can 'conclude agreements on the further liberalisation of international passenger services, in particular as regards the authorisation system and the simplification or abolition of control documents, especially in border regions'. However, such a bilateral agreement is still missing.

It must be noted that a Commission proposal (COM (2017) 647) for amending Regulation 1073/2009 has presented a solution to this problem. It is proposed to amend Article 15 to delete the requirement for regular services to be performed as part of a regular international service and the prohibition of cabotage operations in the form of regular services being carried out independently of a regular service.

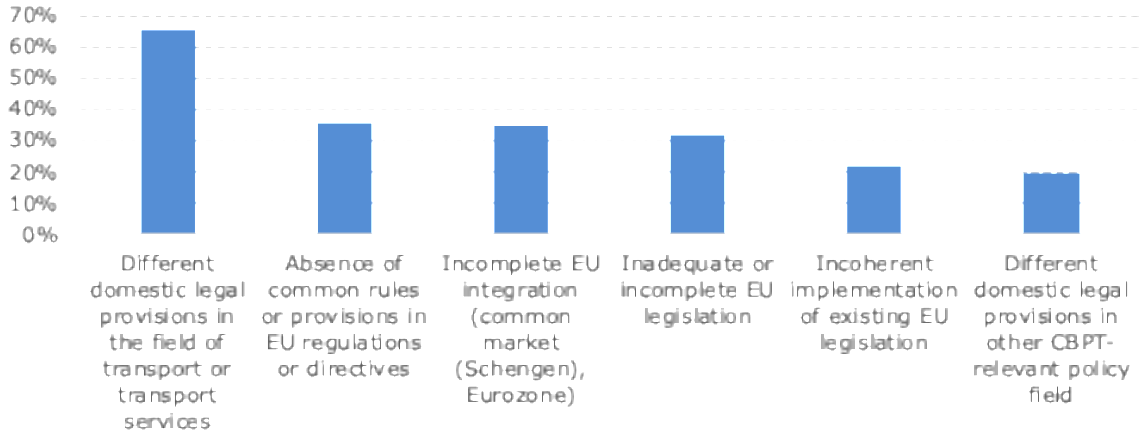
Source: Inventory case no. 14, based on AEBR/EU (2020a) and AEBR/EU (2020b).

The root cause of **national legal obstacles (Type 2)** is in all four cases an asymmetric cross-border legal context for CBPT. This asymmetry emerges from different provisions in national or regional laws and administrative directives that regulate general aspects of transport and specific topics of local public transport, for which there is no, or only a supporting EU competence. Due to the absence of a harmonised legal framework, CBPT can be hindered by:

- incompatible national legislation on the types of cross-border services entitled to receive public subsidies;
- different national railway safety standards on either side of a border;
- different regional provisions governing local public transport and tariff systems in neighbouring border regions.

In addition to the root cause identified by the inventory assessment, **the online survey** provides further insights into aspects leading to EU or national legal obstacles (Figure 3-5).

Figure 3-5: Survey answers on national or EU legal obstacles



Source: Service provider, based on findings of the 2021 online survey (n=77)

Many survey respondents indicate that different domestic legal provisions on general transport and regional/local public passenger transport or other CBPT-relevant policy fields are the main source of obstacles hampering the set up or operation of CBPT.

Survey respondents also refer frequently to an absence of common rules or provisions in EU legislation, to inadequate or incomplete EU legislation and to incomplete EU integration due to different formats of the European integration process (i.e. inclusion in the Schengen Area or the Eurozone) as causes of EU legal obstacles.

However, the references to an absence of common rules or inadequate / incomplete EU legislation somehow contradict findings from the literature-based obstacle cases in the inventory.

3.2.3 Root causes of administrative obstacles

Administrative obstacles (Type 3) are most numerous in overall terms and also have a broad variety of causes leading to problems and difficulties for CBPT (Table 3-2).

For 75% of cases, either a lack of coordination of existing regional/local public transport services or a lack of harmonisation of fares and ticketing systems or a lack of will on the part of national actors (e.g., administrations, national railway companies, etc.) were the main causes for problems.

Table 3-2: Administrative obstacles and their 'root causes'

Adverse administrative practice	No. of cases	% of type 3 obstacles
Non-willingness of national authorities to initiate or support solutions that could eliminate specific problems for CBPT (e.g. a national administration perceives a problem as 'irrelevant' and therefore does not take action).	9	26%
Asymmetric cooperation between the competent public authorities in the cross-border region, which leads to different policies on CBPT on each side or prevents that specific CBPT problems being jointly tackled.	5	14%
Structural differences between transport operators delivering CBPT on each side of a border (e.g. companies directly owned by public authorities, semi-public or private transport providers operating at a local, agglomeration- / region-wide or country-wide scale).	2	6%

Lacking cross-border coordination of existing national, regional or local public transport services (e.g. timetables, interconnection at borders, passenger information systems).	7	20%
Lacking harmonisation of fares on both sides of a border or absence of a single cross-border tariff system (i.e. integration of existing systems under 'one roof').	10	29%
Different administrative cultures (i.e. ways of delivering policies) or different working procedures / routines of transport operators on either side of the border.	1	3%
Other adverse practices.	1	3%

Source: Service provider, own elaboration based on CBPT obstacle inventory data

A good example for slow action of national-level authorities on CBPT is the lengthy intergovernmental discussion on initiating two direct cross-border international railway services between Latvia and Estonia, which have not produced concrete results (Box below).

Lengthy inter-governmental discussions on two direct cross-border railway passenger services (EE-LV)

The Joint Sessions of the Estonian-Latvian and Latvian-Estonian Intergovernmental Commissions (IGC) are an important platform for border regions, enabling them as equal members to address their development needs and obstacles to cross-border cooperation directly at the government level. Within this context, the establishment of two international cross-border rail passenger transport services have been discussed for several years but no concrete solutions reached by the end of 2019.

Already in 2012, the option of opening a Tallinn-Riga direct passenger train service was addressed in the IGC and discussed during the following years. Although a third passenger train between Tallinn-Tartu-Valga was launched in May 2014 on the Estonian side, there was still no operational cross-border Tallinn-Riga passenger train in 2015. While the Estonian delegation stressed the possibilities for establishing this line, the Latvian delegation is concerned with the economic viability of this service. In 2017, the Estonian delegation observed that there was still no suitable solution for border regions and therefore suggested to keep this aspect on the IGC agenda. Since then, however, no further discussions took place in subsequent IGC meetings (2018, 2019) and no progress was made.

In 2017, the Estonian delegation to the IGC proposed discussing the possibility of introducing a Riga-Tartu direct cross-border train service. For this cross-border railway connection, representatives of the railway companies Eesti Liinirongid Ltd (ELRON) and JSC 'Pasažieru vilciens' met in Riga on 16 February 2017. Joint discussions continued in the IGC during the following years but did not produce further advancement on the issues at stake. Due to the persisting difference of views within the IGC, it was suggested in 2018 that discussion on the Riga-Tartu railway line should be continued in 2019.

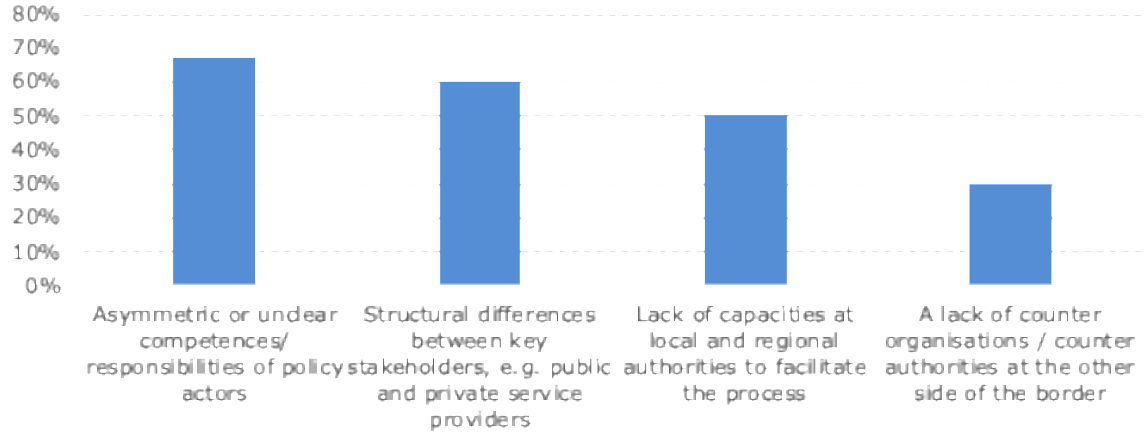
Source: Inventory cases no. 37 and 38, based on IGC (2012), IGC (2015), IGC (2017a), IGC (2017b), IGC (2018), IGC (2019) and The Baltic Times (2019).

In addition to the root causes identified by the inventory assessment, **the online survey** provides further insights into other aspects leading to administrative obstacles (Figure 3-6).

Asymmetric competences and structural differences between public transport stakeholders are the most frequently mentioned aspects causing administrative obstacles. Slightly more than half the survey respondents also refer to lacking capacities of local and regional stakeholders, which hinders the establishment of new or the operation of existing CBPT services. In the latter cases, stakeholders might be willing to establish or maintain a CBPT service but require further input from national players.

In most cases, however, key stakeholders seem to have adequate counterparts (e.g. public authorities, transport service providers) on the other side of the border. Only 28% of the respondents perceive the lack of adequate counterpart organisations as an obstacle.

Figure 3-6: Survey answers on administrative obstacle causes



Source: Service provider, based on findings of the 2021 online survey (n=79)

3.2.4 Root causes of 'other obstacles'

For the 11 cases classified as 'other obstacles', a little more than half of them result from a simultaneous existence and complex interplay of various causes linked to obstacle types 1, 2 and 3 (i.e. 6 cases).

For the remaining 5 cases, the root causes are adverse spatial conditions and structural factors (e.g. unbalanced cross-border commuter flows, limited demand, variable service supply intensity, low profitability of CBPT service etc.) that together hinder a development of CBPT between neighbouring border regions. Many aspects of these obstacles emerge from the border-related particularities of CBPT (Section 3.1.1). They are discontinuities in the territory and structure settings of neighbouring border regions (e.g. settlement patterns and population density, infrastructure endowment) or unbalanced functional exchange relations (e.g. flows of persons, goods, services and information). Good examples are factors hindering a development of cross-border bus and train services along the permeable western part of the Franco-Belgian border (Box below).

All these cases point to complex relationships, which makes it much more difficult to conceive and implement a solution that can eliminate the cause of a problem as well as the related adverse direct or secondary effects in a cross-border region (Section 3.5).

Scarce or scattered demand for cross-border bus and train services (BE-FR)

On the French-Flemish border, commercial success of cross-border lines is not at all guaranteed. Public transport by rail and bus is mainly used by a large number of people to the same destination at the same time. Typical examples are 'home-to-work trips' and 'home-to-school trips'. However, there is very little of the latter across the French-Flemish border. While many thousands of French workers cross the border every day, they live in widely dispersed locations (also in the countryside) and often have irregular working hours. CBPT is not able to respond to this situation, not even domestic public transport. Therefore, most (cross-border) commuters travel by car.

For cross-border traffic movements undertaken for other purposes, it is just as difficult for public transport to provide a viable solution. Substantial cross-border shopping indeed exists on the French-Flemish border, often with families and a car boot full of goods on the way back. These shoppers resign themselves to car-queuing around shopping centres rather than using public transport.

Source: Inventory case no. 12, based on Boval (2020)

3.3 Geographical distribution of obstacle cases and most affected transport modes

This section first examines to what extent the 57 obstacle cases adversely affect EU borders (i.e. geographical scope) and at which borders the obstacles are found. The section then sheds light on the modes of transport most affected by obstacles and looks at the exact border location of adversely affected modes.

However, the spatial distribution of obstacles presented below is in no way an exact representation of the real problem intensity at different EU borders. This is because the 57 cases are only well-documented examples found in the literature, or via the online survey.

3.3.1 Geographical scope and location of obstacles

Some 86% of obstacles adversely affect either the entire length or a smaller segment of a specific EU border between Member States or between Member States and neighbouring non-EU countries (i.e. NO, LI, CH and UK). Some of the cases affect multiple internal EU borders (14%), but none adversely affects all internal borders between Member States. This suggests that in policy fields for which an EU-level competence or a supporting EU competence exists, no new EU legislation for CBPT is needed.

In 53% of cases (30), **obstacles only affect a smaller segment of bilateral EU land borders** between Member States or with neighbouring non-EU countries (i.e. NO, LI, CH and UK). This high concentration of cases with negative effects on smaller border segments can be explained by two factors:

- The vast majority of these cases are administrative obstacles (21), which account for 68% of all Type 2 cases included in the inventory. Administrative obstacles and their multiple causes (Section 3.2) usually relate to very particular circumstances in specific border regions, so they are only noticed at a smaller geographical scale.
- 6 cases point to border-specific adverse spatial conditions (e.g. physical obstacles) or diverging territorial-structural features (e.g. discontinuities of transport infrastructure, settlement structure or population density). In these cases the setup or operation of CBPT is most often hindered by a lack of demand, or locally unbalanced or scattered demand potential (e.g. cross-border workers, other user groups). This has negative effects on the intensity of service supply or the profitability of a service.

More than half the cases affecting smaller border segments (16) are on borders in two larger geographical areas: the North-West Europe area and the North-Central Europe and South-East Europe area. The other cases are evenly distributed across the three remaining large geographical areas (Table 3-3).

Table 3-3: Obstacles affecting smaller segments of a bilateral EU land border

Larger geographical area	No. of cases by border	Total cases
Northern Alpine and Upper Danube area	AT-HU (2), FR-CH (1), AT-DE (2)	5
Western Mediterranean and Southern Alpine and Adriatic area	ES-PT (3), AT-IT (1), IT-CH (1)	5
North-West Europe area	BE-FR (4), BE-NL (1), DE-NL (1), FR-DE (2)	8
North-Central Europe and South-East Europe area	CZ-DE (2), DE-PL (6)	8
Northern European and Baltic Countries area	FI-SE (2), EE-LV (1), SE-NO (1)	4

Source: Service provider, own elaboration based on CBPT obstacle inventory data

For one third of all cases listed in the inventory (33%, or 19), **obstacles adversely affect the entire length of a specific EU border** between Member States or between Member States and neighbouring non-EU countries (i.e. NO, LI, CH and UK). The large majority of these (15) are found at borders in three larger geographical areas (Table 3-4):

- the Northern Alpine and Upper Danube area,
- the North-Central Europe and South-East Europe area,
- the Northern European and Baltic Countries area.

Problems along these 19 borders originate mostly from administrative obstacles (11). These are in all four larger geographical areas[26] and in general have two main causes: the non-awareness or non-willingness of national authorities to initiate or support solutions that could eliminate CBPT problems (5 cases) and a lacking cross-border coordination of existing public transport services (3 cases).

Table 3-4: Obstacles affecting the entire length of an EU border

Larger geographical area	No. of cases by border	Total cases
Northern Alpine and Upper Danube area	FR-CH (1), AT-CH (1), AT-HU (1), AT-SI (1), AT-SI (1)	5
Western Mediterranean and Southern Alpine and Adriatic area	ES-FR (2)	2
North-West Europe area	BE-FR (1), DE-NL (1)	2
North-Central Europe and South-East Europe area	DE-PL (1), HU-SK (1), HU-HR (1), HU-RO (1), BG-RO (1)	5
Northern European and Baltic Countries area	DE-DK (1), SE-DK (1), EE-LV (3)	5

Source: Service provider, own elaboration based on CBPT obstacle inventory data

A good example for weak coordination is found at the Belgian-French border, where the absence of cross-border data on public transport and organisational asymmetry between CBPT actors hinder improvement of the unsatisfactory situation of currently existing CBPT services (Box below).

Along the 8 remaining borders, problems stem from:

- EU legal obstacles (3 cases), since neighbouring Member States are part of different European integration formats (i.e. border between EU and CH, Eurozone / non-Eurozone countries),
- the simultaneous existence and complex interplay of adverse factors linked to obstacle types 1, 2 and 3 (3 cases),
- national legal obstacles (2 cases) relating to specific aspects for which there is no EU competence, which lead to an asymmetric cross-border legal context for CBPT.

Lack of cross-border data on public train or bus services and asymmetry of CBPT organisations (BE-FR)

Along the entire Franco-Belgian border between the regions of Hauts-de-France, Flanders and Wallonia, CBPT is sub-optimal. This is caused by a decline in cross-border rail links, local/regional bus networks that normally stop at the border (i.e. few or no cross-border bus lines) and cross-border lines that do not match the actual demand. An improvement of this situation is currently hindered by two main obstacles: (1) a lack of adequate information / data on the use of and

[26] Northern Alpine and Upper Danube area (FR-CH, AT-SI); Western Mediterranean and Southern Alpine and Adriatic area (two cases for ES-FR); North-West Europe area (BE-FR); North-Central Europe and South-East Europe area (DE-PL, HU-HR); Northern European and Baltic Countries area (SE-DK, DE-DK, two cases for EE-LV).

demand for CBPT services as well as (2) differences between regional/local public transport systems on either side of the common border.

The lack of jointly exploitable cross-border data on public train or bus services not only makes it difficult for regional actors to identify current supply and existing shortages or bottlenecks, but also prevents them from elaborating a cross-border mobility scheme for the border zone of the Hauts-de-France, Flanders and Wallonia regions. Various survey responses also indicate additional problems from the asymmetry of CBPT organisations on both sides of the border. Since it is hard to find common ground between national and regional players, it is generally difficult to change or adapt the current CBPT offer (e.g. more services in peak hours or during specific events). Moreover, local and regional actors often have limited capacities to implement effective solutions.

Source: Inventory case no. 6, based on Agence de développement et d'urbanisme de Lille Métropole (2017) and survey responses 34FR, 44FR, 46FR, 63FR and 73FR

Only 8 cases show that the same obstacle affects multiple internal borders between EU Member States. This is most often found in cross-border regions with multilateral cooperation, where the obstacle affects all or most of the bilateral borders in the concerned cooperation areas. A good example is suboptimal cross-border ticketing in the trilateral 'Euregio Maas-Rhine' (Box below). Other obstacles are found in the 'Greater Region' (DE-FR-LU-BE) and the 'Euroregion Neisse-Nisa-Nysa' (DE-PL-CZ).

A multiple border effect is also observed for specific Member States (especially Slovenia and Hungary), since the same obstacle creates hindrances for CBPT at all or most of a country's borders.

Suboptimal cross-border and e-ticketing in Euregio Maas-Rhine (BE-NL, DE-BE, DE-NL)

Within the Euregio Maas-Rhine, CBPT services are very well developed because of intense cooperation involving all partners and CBPT actors during past decades. However, suboptimal ticketing is still hampering worry-free and seamless travel across borders. More than 100 different tickets are offered by transport companies in the Euregio, with only a few valid for cross-border journeys. Furthermore, specific standards for e-Ticketing were developed separately in each of the three neighbouring countries. In the Euregio, there are now three electronic ticketing systems for domestic public transport that collide at the national borders. The difference between these systems affects all bilateral borders in the Euregio and has not made life easier for cross-border travellers. In the Netherlands they need an OV-chipkaart, in Germany a VDV-card and in Belgium a MOBIB card. The main challenge is therefore to enable border-crossing interoperability between the nationally divergent standards and systems.

Source: Inventory case no. 13, based on Elsmann / Warnecke (2017) and Staatskanzlei des Landes Nordrhein-Westfalen (2019a)

For the obstacle types causing these multiple border effects, however, the situation is not very clear. These effects can emerge from:

- a single administrative obstacle affecting various borders simultaneously (3 cases for obstacle type 3),
- different national rules in Member States for applying or transposing EU-legislation and the use of different currencies in neighbouring Member States (2 cases for obstacle type 1),
- a combination and adverse interaction of various causes mentioned under obstacle types 1, 2 and 3 (2 cases for obstacle type 4),
- different national-level legal provisions in a CBPT-relevant policy field for which there is only a supporting EU competence (1 case for obstacle type 2).

3.3.2 Most affected transport modes and their location at EU borders

The four modes of public transport (i.e. train, tram, bus, ferry) are differently affected by the obstacles in the 57 cases. Around 74% of cases (42) affect only a single mode:

- 21 cases adversely affect cross-border railway passenger transport services. Among these, 10 are local / regional cross-border railway lines with at least one stop in two contiguous border regions in two countries. 9 are international railway lines with stops in each border area of a cross-border region. The two remaining cases affect both local / regional cross-border and international railway lines (ES-FR; Greater Region borders LU-FR and LU-BE).
- 18 cases adversely affect local / regional cross-border bus lines with at least one stop in contiguous border regions of two different countries.
- 2 cases adversely affect ferry connections: one is a ferry (passengers, cars) across a river separating two contiguous border regions in two countries (BG-RO) and the other is a maritime ferry (passengers, cars, trains) across a strait / sound with trips lasting less than 1 hour in each direction (DE-DK).
- In one case, the obstacle affects a cross-border 'tram-train' (Karlsruhe model) running on a network of inner-city light rail tracks and mainline railroad tracks, with the latter being also used by other conventional local/regional or international train services (DE-FR).

The remaining 15 cases adversely affect multiple modes. The most frequent combination is 'bus and train' (11 cases), while other combinations relate either to 'train-bus-ferry' (IT-ST) and 'bus-tram' (FR-CH) or cannot be clearly identified from cases based on survey responses (2 cases).

The geographical location of the most affected transport modes (or combinations of modes) is presented in the overview table below (Table 3-5).

Table 3-5: Border location of obstacles affecting different transport modes

Mode or mode-combination	No. of cases by border	Total cases
Obstacles affecting local / regional cross-border railway lines	AT-SI (1), BE-FR (1), DE-NL (1), DE-PL (1), CZ-DE (1), AT-DE (1), FR-DE (1), HU-HR (1), AT-CH (1)	9
Obstacle cases affecting international railway lines	AT-IT (1), DE-PL (4), FI-SE (1), EE-LV (2), all bilateral borders of Euroregion Neiße DE-PL-CZ (1)	9
Obstacles affecting local / regional cross-border bus lines	AT-SI (1), BE-FR (2), BE-NL (1), ES-PT (3), FR-CH (1), IT-CH (1), DE-PL (2), FI-SE (1), EE-LV (2), HU-SK (1), ES-FR (1), all national borders of Slovenia (1), all bilateral borders of Euroregion Neiße DE-PL-CZ (1)	18
Obstacles affecting bus and railway lines	AT-HU (2), BE-FR (2); DE-NL (1), AT-DE (1), AT-HU (1), CZ-DE (1), SE-DK (1), SE-NO (1), all bilateral borders of Euregio Maas-Rhein DE-NL-BE (1)	11

Source: Service provider, own elaboration based on CBPT obstacle inventory data

3.4 Problems caused by legal, administrative and other obstacles

Should there be legal, administrative or other obstacles at a border, the resulting problems are usually what CBPT stakeholders perceive first in practice. Problems can be discovered during the planning and set-up of a new cross-border service or in the course of operating

an existing CBPT service. Once problems are perceived, CBPT stakeholders can explore the cause of the obstacle and then start developing joint solutions to either eliminate or at least mitigate that obstacle.

The 57 legal, administrative or other obstacles identified at the beginning of the inventory analysis (Section 3.2) cause multiple problems in the cross-border regions concerned. It is therefore interesting to see which CBPT life cycle phases are affected by these problems and what kinds of problems are observed in the cross-border areas.

3.4.1 Problems affecting the development of new CBPT services

In **61% of cases** (35), obstacles **create problems** that adversely affect the **planning or set-up of new CBPT services.** For around half of these cases (17), the obstacles cause 'only' one problem that hinders the development of new CBPT services. For the other 18 cases, however, one obstacle or the interplay of several obstacles creates multiple problems that simultaneously hinder the setting up of new CBPT services. Most common are 2 or 3 problems in parallel, but a few extreme cases have 4 or even 5 problems.

A good example for the latter constellation is the variety of difficulties that local actors from the twin-cities Tornio and Haparanda are facing in establishing a joint public operator for urban bus services (Box below).

Multiple problems hindering the establishment of a joint bus operator for the cross-border twin-cities Tornio and Haparanda (FI-SE)

At the border between Finland and Sweden, the twin-cities Tornio and Haparanda work together under a permanent cooperation structure ('Provincia Bothniensis') that also deals with CBPT by bus and rail. The twin cities have established a 'joint travel centre' (HaparandaTornio Resecentrum), where all local, regional and national buses stop to have a smoother transfer and to facilitate commuting with public transport.

Despite these improvements, there is no single and joint public transport operator providing urban bus services in the twin-cities. Until now, there are separate operators on both sides of the border. Although both cities focus their work on setting up a single public transport operator, a large number of difficulties prevent them from making progress. The main legal and administrative obstacles to setting up a joint transport operator for city buses are:

- EU laws and national regulations for organising public transport. Legislation should not impose heavy organisations but allow for flexibility in the delivery of CBPT services (i.e. direct provision by local authorities or by private transport companies).
- Taxes. For tickets, VAT in Finland is at 10% and in Sweden 6%, whereas for international traffic VAT is at 0%.
- Ticketing. In cross-border traffic, the ticket must show different starting countries and different boarding countries. Moreover, there is the rule that 'the ticket selling country is the transporting country'. How is this rule applied to cross-border urban traffic?
- Ticket systems. Local stakeholders have to find a joint selling system that works for both countries. This is easy for domestic travel, since tickets are available from one system. Difficulties emerge in the cross-border context, also due to particular context factors (see below).
- Fare distribution. Also this issue has to be solved and raises a number of crucial questions. How to credit the income of the ticket sales? To which county/city? What are the shares of each country/city?).

There are many other factors to be considered when setting up a single cross-border public bus service:

- Two languages generate administrative requirements for bilingual passenger information and ticket systems, but also for the driving personnel to be able to work in both languages. This makes the set-up of the service more time consuming and also more expensive.

- The possibility to mobile pay and getting tickets with an app, independent from the passenger's country.
- Intermodal connections, due to a growing need for seamless cross-border rail-road traffic (e.g. development of an intercity-train line Helsinki-Haparanda-Stockholm; night trains between Sweden and Finland)
- Elaborating a joint working model for organising local public transport (domestic) and cross-border traffic.
- Two time-zones 'separating' Tornio and Haparanda and the two currencies in both countries have to be considered. Yet, these aspects are not so difficult to solve nowadays.

Source: Inventory case no. 34, based on Dahlstrand et.al. (2019)

When looking at all 35 cases affecting the initial development of new CBPT services, the most frequent problems are:

- Hindered or even impossible cooperation on CBPT, due to different functions and responsibilities of national, regional or local public transport authorities on each side of the border (17 cases).
- Missing cross-border transfer service between two domestic public transport lines ending close to the border (13 cases).
- Very different financial capacities (budgetary resources) between regional / local public transport authorities on each side of the border (12 cases).
- The need to purchase specific rail rolling stock able to operate on both sides of the border, due to the lack of interoperability of national railway systems (5 cases).
- Missing or costly statistical information on demand and supply for CBPT, hindering cross-border planning by regional or local authorities (5 cases).
- Transport operators have first to undergo complex or lengthy licensing and approval processes for vehicles (i.e. buses and rolling stock), due to different technical standards and safety provisions (3 cases).
- Other adverse but border-specific factors (15 cases).

These findings illustrate that the planning and set-up of new CBPT services is very often a highly complex endeavour that requires tailor-made cooperative approaches involving actors from different governance levels (national, regional, local) on both sides of the border (see: Section 3.6 below).

3.4.2 Problems affecting the ongoing operation of CBPT services

In 34 cases[27], obstacles are creating problems for the ongoing operation of CBPT. These problems adversely affect the quality of CBPT services (22 cases) or the scope of the service offer (4 cases) or both at the same time (8 cases).

Especially in the latter constellation, difficulties can be substantial and make the operation of sufficient and high-quality cross-border services more complicated. A good example for simultaneous supply-side and service quality problems is at the German-Dutch border, where the interplay of both aspects means CBPT is not yet optimal (Box below).

Suboptimal CBPT (bus, rail) along the entire German-Dutch border

In the past 15 years, many improvements of CBPT by rail and bus have been achieved along the entire German-Dutch border. However, the variety of continuing problems shows that domestic and CBPT offers have to be more standardised / harmonised and also to be further improved in terms of quality.

Standardisation and expansion of railway networks is needed in the Dutch-German border area to facilitate cross-border commuting. One initiative should be to close the current connection gap

[27] Several cases in this second group also cover the set-up of new CBPT (first group), so the total number of cases is higher (57 - 35 = 22).

in Enschede with few metres of railway track to make the public transport connection more attractive for both sides. Moreover, there are still many peculiarities that hinder efficient and attractive cross-border public bus transport. Problems emerge from a combination of three factors: (1) The lack of recognition for the economic need to subsidise public transport on sections of cross-border bus lines (on both sides until the border), both in national or regional legislation and in public transport organising authorities on either side of the border. (2) Linking domestic public transport lines to cross-border lines should be implemented wherever possible. (3) Service prohibitions for line sections on the other side of the border should be dismantled.

Problems of CBPT quality and user friendliness must be eliminated to stimulate the use of public transport. Timetable information must be harmonised and uniform ticketing systems implemented, since current differences in tariff and payment systems make it difficult to use public transport across borders. Cross-border tickets or low-threshold offers should be created for facilitating trips to the neighbouring country. This is particularly relevant in rural areas along the German-Dutch border where a simple, transparent and affordable ticket system would facilitate cross-border travel even in old age. Elderly persons are often afraid of not being able to find their way around the mass of information at ticket counters. Finding online information is less of a problem for 'digital natives', but for people who do not have access to digital media or are not familiar with them. This is a hurdle for maintaining contacts with their neighbours.

Source: Inventory case no. 12, based on Staatskanzlei des Landes Nordrhein-Westfalen (2019b), (2019c), (2019d), Infoportal mobil.nrw (2020), Eisenbahnjournal Zughalt.de (2019)

Adverse influences on the quality of existing CBPT services can emerge from only one problem or the interplay of several problems. To capture these issues, the inventory assessment uses eight predefined options and one 'other' option. For the 30 relevant cases[28], the observed problems for service quality are the following:

- Different ticket formats or different ticket validation methods on either side of the border (13 cases).
- Inadequate or missing passenger information on fares, ticket types, timetables or connecting services (9).
- Absence of a cross-border direct service (train, bus) and necessary change for reaching the final destination (8).
- Very different fare levels for local public transport on each side of a border, due to different purchasing power and/or different currencies in the border regions (7).
- Non-application or different recognition of domestic fare reductions for specific person groups on cross-border trips (6).
- Limited distribution channels for cross-border tickets, requiring passengers to purchase separate tickets for each side of a border (4).
- Non-availability of modern rolling stock that can operate on both sides (2).
- Lengthy technical and organisational hand-over procedures for trains or long waiting times for trains or buses at border crossings due to border controls (1).
- Other adverse factors (11).

The latter group includes further problems such as a suboptimal development of railway infrastructure in border regions causing slow passenger trains (3 cases), a lacking integration of cross-border services into a single tariff system (3), non-acceptance of cross-border services by the population or the national government (2 cases), sub-optimal coordination of timetables for buses and / or trains (2 cases) and non-user-friendly departure times of a CBPT (1 case).

The service offer of existing CBPT **can be adversely affected by one or more problems.** To identify the relevance of problems, the inventory assessment has used five pre-defined

[28] This covers 22 cases where problems exist only for service quality and 8 cases with parallel problems for both service quality and the service offer.

options and one option 'other'. The assessment for the 12 relevant cases[29] shows the following result:

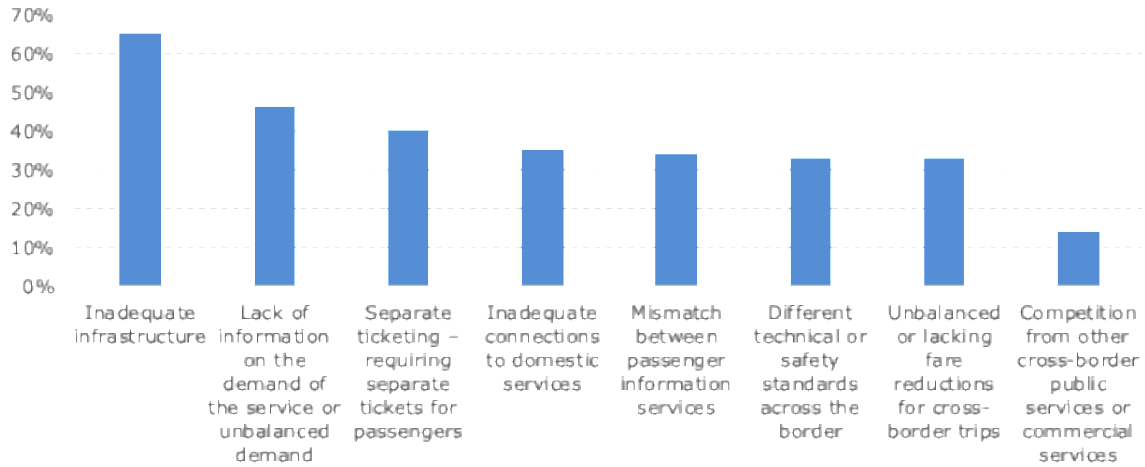
- Low profitability of an existing cross-border service or termination of a service due to no economic viability (9 cases).
- Insufficient density of the CBPT-offer for cross-border trips throughout the day for reasons other than work (e.g. shopping, cultural activities, students going to university across the border), due to few departures or a temporal limitation of service provision (5 cases).
- Insufficient CBPT-offer during peak hours in cross-border regions with high cross-border commuter flows, due to low transport capacity, limited service provision or a lack of line extensions and new lines (5 cases).
- Insufficient week-end or seasonal services (holidays) for the resident population or tourists (3 cases).
- Restrictions on cross-border local bus lines, due to the obligation to operate as 100% commercial international lines or the ban on cabotage or non-access to public subsidies (3 cases).
- Other adverse factors (5 cases)

The online survey of CBPT stakeholders confirms the relevance of the above problems for the ongoing operation of CBPT services (Figure 3-7).

Inadequate infrastructure is most frequently mentioned by survey respondents as a problem for the supply of CBPT, in particular for cross-border rail transport. Missing railway connections and poorly maintained tracks or outdated technical infrastructures mean cross-border railway passenger services are operated less frequent or at lower speed. Also a lack of interoperability due to different voltages or safety standards are mentioned as problems affecting the supply of cross-border rail passenger transport.

Other frequent supply-side problems are a lack of information on demand or imbalanced demand within a cross-border region, with both aspects making economic viability for CBPT more difficult or even impossible.

Figure 3-7: Frequently mentioned supply-side or service quality problems



Source: Service provider, based on findings of the 2021 online survey (n=88)

Local and regional stakeholders also encounter problems that adversely affect the quality of CBPT services. These are associated with non-integration of neighbouring tariff systems

[29] This covers 4 cases where problems exist only for the service offer and 8 cases with parallel problems for both service quality and the service offer.

(e.g. separate ticketing, lack of cross-border tickets, inadequate fares, non-recognition of fare reductions for specific groups), but also inadequate passenger information systems.

3.4.3 Wider relevance of problems for the set-up and operation of CBPT

The previous sections have shown the broad variety of problems for CBPT along EU borders. To make this complex picture more transparent, broader 'problem groups' with wider relevance across the EU are noted below.

Looking across the 57 obstacle cases in the inventory, it appears that the large majority of cases (52) can be assigned to one of the following **seven problem groups:**

1. Around 25% of cases (14)[30] are affected by diverse public transport governance systems and different policy concepts, lacking cooperation between key stakeholders (national or regional public authorities, transport providers, etc.) and complex administrative procedures or adverse political behaviour.
2. 21% of cases (12)[31] are affected by lacking cross-border integration of domestic tariff systems and inadequate ticket pricing, non-recognition of free public transport for severely disabled persons and sub-optimal ticketing information.
3. 14 % of cases (8)[32] encounter problems from unprofitable operation of cross-border services and missing public subsidies or from other aspects with adverse financial effects.
4. Around 9% of cases (5)[33] are affected by inadequate railway infrastructure or lacking interoperability of rolling stock.
5. Around 9% of cases (5)[34] face difficult territorial conditions and / or missing demand for CBPT.
6. Around 9% of cases (5)[35] are affected by sub-optimally developed cross-border bus and rail services.
7. Finally, 5% of cases (3)[36] suffer sub-optimal timetable coordination or non-user-friendly timetables.

The above groups offer starting points for developing joint problem-solving approaches that address related aspects in an integrated manner within cross-border regions.

3.5 Negative direct and secondary effects caused by problems for CBPT and their wider impact

The previous section has shown that legal, administrative or other obstacles lead to a variety of problems hampering the set-up of new cross-border transport services or the ongoing operation of existing CBPT. These problems in turn cause negative direct effects for different types of actors and may induce additional secondary effects with adverse consequences for regions on one or both sides of a border. All negative direct and secondary effects finally result in a wider adverse impact, which may hamper sustainable socio-economic development and the further integration of entire cross-border regions.

On the basis of this general observation, we will now present individual elements of this causal chain among the 57 cases.

[30] Inventory cases no. 8, 14, 15, 16, 26, 31, 33, 37, 38, 45, S-50, S-54, S-55 and S-56
[31] Inventory cases no. 7, 13, 21, 22, 23, 29, 32, 40, 41, 42, 43 and 44
[32] Inventory cases no. 1, 3, 4, 10, 30, 35, 36 and S-48
[33] Inventory cases no. 18, 20, 27, S-46 and S-53
[34] Inventory cases no. 2, 5, 9, 17 and 24
[35] Inventory cases no. 12, 19, 34, S-49 and S-51
[36] Inventory cases no. 25, 28 and 39

3.5.1 Negative direct effects for CBPT stakeholders and users

Problems for CBPT usually lead to negative consequences that directly affect key stakeholders in the development or provision of CBPT (i.e. local / regional transport organising authorities, transport operators) as well as individuals who use or envisage using CBPT. For both groups, negative direct effects may lead to monetary or non-monetary costs or a combination of both.

For most of the 57 cases, problems cause one or two negative direct effects (41 cases). For the remaining 16 cases, however, problems cause 3 and sometimes even 4 negative direct effects at the same time. When examining the 41 cases more closely, the following types of negative direct effects can be observed:

- Strongly reduced mobility of persons living in sparsely populated, rural or very isolated parts of a cross-border area (12 cases).
- Long waiting / travel time and inconvenient travel for all passengers (11 cases).
- Missing local or regional cross-border public bus or rail services, due to economic unviability (11 cases).
- Passengers bear high ticket cost for short cross-border rail trips or have to pay more for their trip due to a lack of information on cheaper tickets (11 cases).
- Local or regional authorities cannot elaborate a cross-border strategy for integrating domestic public transport services or developing new CBPT (7 cases).
- Transport operators bear additional costs for running local / regional cross-border bus or train services (7 cases).
- Long travel-to-work time for cross-border workers (6 cases).
- Other negative direct effects (23 cases).

The latter group includes many direct effects with negative consequences for stakeholders involved in the development or provision of CBPT (i.e. local / regional transport organising authorities, transport operators). These effects frequently concern the extensive efforts for administrative stakeholders to set up an effective and peer-to-peer or multi-level cooperation for CBPT (7 cases). The same is also felt by transport providers, especially if efforts for operating cross-border services go far beyond what is usual in a domestic context (1 case). Other negative direct effects block or hinder cooperation on CBPT between administrative stakeholders, either due to strongly diverging views and policy priorities (4 cases) or because of adverse central-level political influences (1 case).

Direct effects with negative consequences for actual or potential users must be taken very seriously, as they always influence individual mobility behaviour and may also lead to a shift away from using CBPT. A good example of negative direct effects for users can be found at the Danish-Swedish border (see box below).

An issue requiring particular attention is the frequent non-recognition of free public transport for severely disabled persons on cross-border local/regional railway services. Thanks to the online portal of the NGO ‘Seh-Netz’, there is comprehensive information for all German borders. It shows gaps at the German-Austrian border (see box below) and several other borders (DE-FR, DE-PL, DE-CZ, DE-NL), but also many examples having achieved continuous recognition of free transport (e.g. on cross-border railway, suburban railway, bus, tram and ferry services).

Negative direct effects for users of CBPT services

In the **Øresund Region (DK-SE),** also known as Greater Copenhagen, several problems have to be tackled to achieve more seamless and user-friendly CBPT. The main issues are ticketing and passenger information. Interviews with user groups or individual customers highlight negative direct effects of suboptimal transport systems that make cross-border travel far from simple. Especially incompatible tariff zones and the complexity of the zoning system adversely affect local

users as well as tourists. The effects of fragmentation are highlighted by a young person travelling from the Swedish to the Danish side: '*What should I expect when I travel to Denmark? Yes, it's awkward and there's a lot to keep track of!* (…) *If I'm going to Sydhavn [a district in Copenhagen], well we've changed some zone there, so it'll be more expensive. And then I also have to have a metro supplement, except only if I have a monthly ticket, except not if I have a single ticket. Yet there's the Rejsekort [Denmark's smart card] and then I have to have the supplement for that as well … or you take the car or just drop it [the trip]*'. In extreme cases, customers having unintentionally bought the wrong ticket even feel like criminals.

In Germany, free transport in local public transport for severely disabled persons helps their local mobility and thus participation in public life. Persons with a special severely disabled card can use many buses and trains free of charge. On several cross-border **railway connections between Germany and Austria,** free of charge transport for severely disabled people is not recognised on the Austrian parts of a journey. This includes R and REX trains of the Austrian Federal Railways (ÖBB) operating on the 'Braunau/Inn (AT) - Simbach/Inn (DE)' and 'Schärding (AT) - Passau (DE)' railway lines. Also on the 'Bregenz (AT) - Lindau (DE)' line, there is no recognition on ÖBB trains REX / S 1. Finally, there is no recognition on the cross-border section 'Innsbruck (AT) - Mittenwald (DE)' in ÖBB trains R and REX as well as in the regional train (RB 6) of DB Regio Bayern.

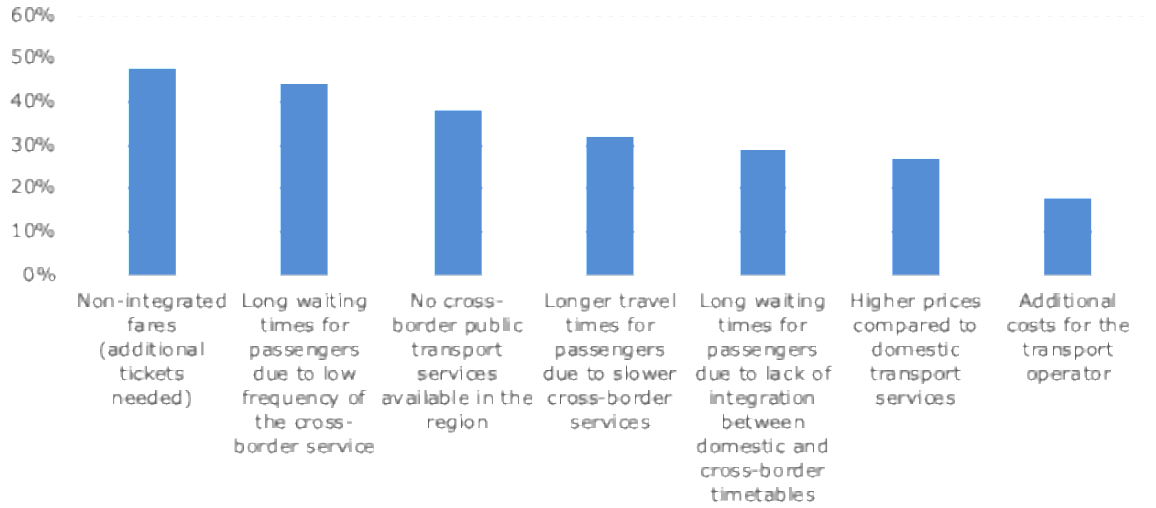
Source: Inventory cases no. 32 and 43, based on Ryan / Wretstrand (2020) and Seh-Netz (2020).

Many of these negative direct effects are confirmed by **the online survey** (Figure 3-8). Most of the negative direct effects concern CBPT users and are due to the non-integration of fare systems on both sides of a border (48% of respondents), which sometimes also leads to higher fares for cross-border than for domestic trips for a comparable distance.

Other frequent negative direct effects are long waiting times for passengers, caused either by a low frequency of the CBPT services (44% of respondents) or a lack of coordinated timetables between domestic connecting transport services (around 30% of respondents), and longer travel times due to a slow cross-border services.

Negative direct effects for transport operators are of clearly lower importance.

Figure 3-8: Negative direct effects emerging from problems affecting CBPT



Source: Service provider, based on findings of the 2021 online survey (n=90)

Small differences in the response patterns can be observed between the basic types of obstacles. Survey respondents who referred to legal obstacles (types 1 and 2) mention more often 'higher prices for transport services' and 'additional costs for transport operators' as negative direct effects. Survey respondents who referred to administrative obstacles (type 3) mention relatively more often a 'lack of public transport services', 'longer travel times due to slow CBPT services' and 'non-integrated fares'.

3.5.2 Negative secondary effects

For 65% of the 57 cases, negative secondary effects are also observed. These effects are most often found in cases where the negative direct effect induces further undesirable developments on one or both sides of a border (28 cases). Further secondary effects are noticed in a few cases where contextual factors or other obstacles aggravate an existing negative direct effect (9 cases). In several cases, both afore-mentioned constellations are observed (6 cases)

For the 28 cases where **negative direct effects also induce one or more negative secondary effects in parts or all of a cross-border region,** the following undesirable developments are observed:

- Traffic jams and air or noise pollution on the main road axes of a cross-border region, because cross-border commuters and other travellers (e.g. individuals frequently practicing cross-border shopping, tourists) use private cars due to missing or suboptimal CBPT (18 cases).
- Reduced internal accessibility of a cross-border region, because local / regional CBPT services are not initiated or stopped due to economic unviability (9 cases).
- Adverse consequences for the cross-border labour market and the entire cross-border economy because fewer people seek jobs across the border due to high travel-to-work times by CBPT (10 cases).
- Adverse consequences for enterprises, because cross-border commuters are often late to work due to frequently delayed CBPT services (6 cases).
- Other effects (4 cases), including unilateral road closure due to high commuter traffic and negative consequences for tourism. An example for the latter is in the box below.

Secondary effects negatively influencing development of the Austrian-Slovenian cross-border area

The cross-border area between Carinthia (AT) and Koroška region (SI) is an attractive tourism destination. It has a considerable amount of cycling infrastructure as well as tourism and recreational products. In the area, bicycle transfer should be supported by a cross-border local bus service between Mislinja (SI) and Lavamünd (AT). Under Slovenian law, however, local cross-border public bus services cannot be subsidised. This complicates the set-up of a cross-border bus transfer for cyclists, although pilot runs of a service took place in 2019 and 2020. However, a long-term solution for subsidising this cross-border public bus line requires changes in the Slovenian Road Transport Act. Should the current situation not improve, this will cause negative side effects for tourism development.

Moreover, also the future accessibility of the entire cross-border area can be adversely affected. The Austrian 'Koralm High-Speed Railway' line still under construction (expected completion in 2025) will most likely generate new demands for regular cross-border bus services not present today. In the future, the new passenger train station in St. Paul (Lavant River Valley, AT) will serve as a hub for the high-speed rail connection in the cross-border region. This will most likely raise the need for a cross-border bus connection from Dravograd (SI) to Lavamünd (AT) and further onwards to St. Paul.

Source: Inventory case no. 4, based on TRANS-BORDERS (2018), (2019) and (2020).

For 9 cases, **other contextual factors or obstacles aggravate the negative direct effects caused by an existing problem** including:

- Poor rail track conditions or missing road traffic management infrastructure (e.g. exclusive bus lines), reducing the speed of cross-border rail or bus services (4 cases).

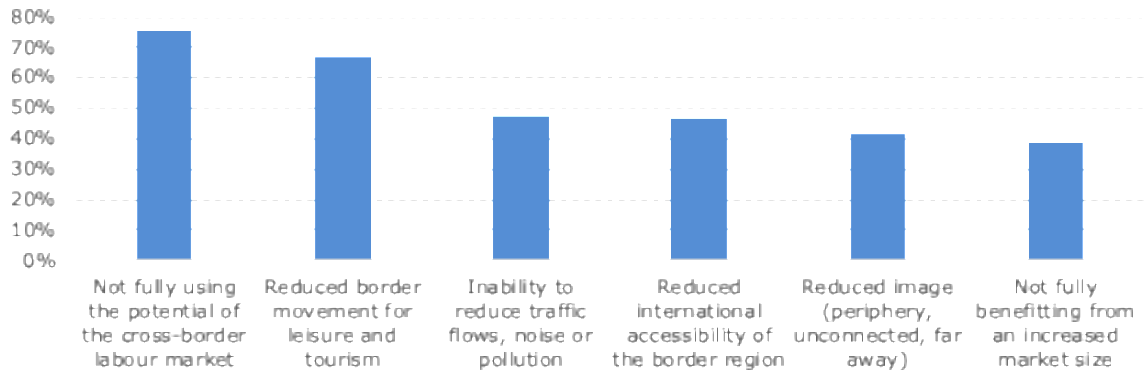
- Lacking or poorly developed support infrastructure at local access points or transition interfaces (e.g. train and bus stations), hindering or reducing the actual use of CBPT by inhabitants of border regions (4 cases).
- A language barrier and lack of multilingual passenger information, reducing the awareness of potential users about the scope of existing CBPT services or specific cross-border ticket offers (2 cases).
- A language and culture barrier, hindering cooperation on CBPT between local or regional public authorities and transport operators (1 case).

3.5.3 Wider impact hindering the development of cross-border regions

Together these negative direct and secondary effects result in a wider adverse impact that can hinder the socio-economic development and functional integration of cross-border regions, but also harm the environment and lower the quality of life for inhabitants in these areas.

These features are also confirmed by **the survey of CBPT stakeholders** (Figure 3-9), as adverse impacts on socio-economic development were most frequently mentioned by survey respondents. In the view of most respondents, non-existing or poorly developed CBPT services are limiting possibilities to fully develop a cross-border labour market and also reduce cross-border mobility of people in the fields of leisure and tourism.

Figure 3-9: Frequently mentioned socio-economic development impacts due to obstacles for CBPT



Source: Service provider, based on findings of the 2021 online survey (n=90)

Other frequently mentioned adverse impacts are the inability to reduce cross-border car traffic and the associated noise or air pollution. But also lower international accessibility and a reduced image of border regions as well as sub-optimal benefits from a larger market are often mentioned.

Small differences between the responses of survey participants can be observed. Respondents who referred to legal obstacles (types 1 and 2) mention relatively more often the inability to reduce traffic flows, noise or air pollution as a relevant impact. Survey respondents who referred to administrative obstacles (type 3) mention relatively more often inabilities to fully use the potential of the cross-border labour market and to fully benefit from an increased the cross-border market as relevant impacts.

3.6 Approaches to dealing with legal and administrative obstacles

The preceding analysis of cases from the inventory clearly shows that there cannot be a 'one-size-fits-all solution' for dealing with the diversity of CBPT problems and the associated

negative effects. This statement is supported by **two findings** from the classification and geographical location of cases (Sections 3.2 and 3.3 above):

- First of all, because most problems have their roots in specific administrative actions at national, regional or local level (61% of cases are type 3 obstacles) and in different national or regional laws for which EU-wide harmonisation is excluded due to a lack of competences (9% of cases are type 2 obstacles). In addition, border-specific framework conditions play a significant role in hindering the set-up or ongoing operation of CBPT services (19% of cases are 'other obstacles').
- Secondly, the root causes of obstacles also correlate strongly with the geographical location of legal and administrative obstacles. The overwhelming majority of obstacles affect only smaller segments of land borders between Member States or with neighbouring non-EU countries (53% of cases) or the entire length of specific borders between Member States or with neighbouring non-EU countries (33% of cases). No cases affecting all internal EU borders were found.

To address border-specific problems, tailor-made solutions are required instead. They must be adapted to the local / regional context of a border (e.g. territorial-structural features, legal-institutional settings) and should include different types of action depending on the problem encountered.

Therefore, an in-depth assessment of these aspects was carried out for the inventory cases to derive general indications for the design of appropriate problem-solving approaches.

3.6.1 Seizing the scope of the problem

To develop a tailor-made solution for a border, it is first important to get an accurate impression of the full range of difficulties as well as the causal links between them.

The overall 'source-problem-effect relationship' at a given border strongly conditions the scope and combination of the types of actions needed for an appropriate problem-solving approach. In general, there are **straightforward** or **complex relationships** (see: Box below).

'Straightforward source-problem-effect relationship'

This relationship is characterised by a clear link between an inadequate provision in a piece of legislation or a specific inappropriate administrative practice (source), the difficulties or hindrances that legal provision or administrative practice creates for CBPT (problem), and the negative consequences this problem causes for CBPT-actors and public transport users or within the entire cross-border region (effect). In this situation, it is easy to conceive and implement a solution in principle, provided the concerned and competent stakeholders are willing to take action. Once the source is eliminated, the problems and negative direct or secondary effects will disappear.

'Complex source-problem-effect relationship'

This relationship sees the simultaneous presence of various legal and administrative issues or further unfavourable context factors, all of which interact closely with each other (source). The result of this interaction creates difficulties or hindrances for CBPT (problem), with this multifaceted problem again causing negative consequences for CBPT-actors and public transport users or within the entire cross-border region (effect). It is usually quite difficult to identify and disentangle exactly which factors at 'source-level' are primarily causing a given problem and the associated negative direct effect. Moreover, the interplay of legal and administrative issues or other contextual factors might further aggravate the problem for CBPT, or induce more wide-ranging in the entire cross-border region (i.e. negative secondary effects). This complexity makes it much more difficult to conceive and implement a solution. Approaches that only address specific aspects of this constellation are unlikely to lead to lasting solutions, whereas integrated (multifocal) approaches

tend to be more appropriate for eliminating or at least alleviating the multi-layered difficulties as well as the associated negative direct or secondary effects.

Source: Service provider

When assessing and classifying the cases with regard to both constellations, 65% have a straightforward source-problem-effect relationship and 33% a complex source-problem-effect relationship[37].

- Cases with a **straightforward source-problem-effect relationship (38)** are most often administrative obstacles (27). The remainder are linked to EU legal obstacles (5), 'other obstacles' (4) or national legal obstacles (2). When looking at the different modes of public transport, straightforward relationships are most often found for trains (17 cases) and bus lines (11 cases). Also cases adversely affecting different mode-combinations are relatively important (8, mostly 'bus-train'). The remainder modes are less concerned by this (i.e. 1 'tram' and 1 'ferry').
- Cases with a **complex source-problem-effect relationship (18)** are most often linked to administrative obstacles (8) and 'other obstacles' (7), but sometimes also to EU legal obstacles (2) and national legal obstacles (1). When looking at the different modes of public transport, complex relationships most often adversely affect different mode-combinations (7, mostly 'bus-train') and bus lines (6). The remainder affect train connections (4) and a ferry connection (1).

From the findings of this general assessment, one could easily conclude that the pathway to a solution is relatively simple for two thirds of the cases. This expectation has to be nuanced, as the achievement of solutions is always influenced by the required types of action as well as the number and types of actors to be involved for implementing them.

3.6.2 Possible types of action for problem-solving approaches

The inventory has assessed which types of action could be used for the design of appropriate problem-solving approaches. A total of 14 pre-defined actions were considered, which can be applied individually or in combination.

This assessment was carried out for the 45 cases identified by the literature review[38] as well as for two survey cases with sufficient background information (i.e. 47 cases in total). For the remaining 10 survey-based cases, however, information was not sufficiently detailed to carry out this assessment.

The assessment first took a closer look at the frequency that individual types of action appear under the 47 cases (Table 3-6). This shows the range and relevance of the types of action needed to address the problems.

Table 3-6: Relevant 'types of action' for the 47 cases

Types of action	No. of cases
EU-level legislative action on transport and/or CBPT	1
EU-level legislative action on other policy fields relevant for CBPT	0
National-level legislative action on transport and/or CBPT	4
National-level legislative action on other policy fields relevant for CBPT	0
Conclusion of interstate agreements on CBPT	9
Tools provided by the 'European cross-border mechanism' (ECBM)	1

[37] One case cannot be clearly allocated due to limited information.
[38] In most of these cases, the documentary sources also included first indications on measures to eliminate a problem or improve the current situation.

Pragmatic 'bridging' of shared problems	38
Establishment of joint structures for managing CBPT (e.g. EGTC)	8
Establishment of a new CBPT or consolidation of the existing CBPT offer	19
Demand-related measures to stimulate greater use of CBPT	18
Stronger coordination of domestic fare systems for public transport	26
Elaboration of a joint strategy for developing and planning CBPT	14
Building a joint CBPT knowledge base	9
More intense and structured cross-border cooperation between key actors	40
Other practices	4

Source: Service provider, own elaboration based on CBPT obstacle inventory data

The findings from this table can be summarised as follows:

- The most important types of action for solutions are a 'more intense and structured cross-border collaboration between key actors' (40 cases) and a 'pragmatic bridging of shared problems (38 cases), followed by 'stronger coordination of neighbouring domestic fare systems for public transport' (26 cases).
- Important types of action are also the 'establishment of a new CBPT or a consolidation of the existing CBPT offer' (19 cases), 'demand-related measures for stimulating a greater use of CBPT' (18 cases) and the 'elaboration of a joint strategy for developing and planning CBPT (14 cases).
- Some relevance especially for the set-up of CBPT are actions 'building a joint CBPT knowledge base' (9 cases), 'conclusion of interstate agreements for CBPT' (9 cases) and the 'establishment of joint structures for managing CBPT' (8 cases).
- The remaining three types of action are clearly less relevant[39] or even irrelevant in context of the analysed cases (i.e. EU and national legislative action on other policy fields relevant to CBPT).
- Few 'other' practices were found in addition to those already mentioned. These practices concern raising the hierarchical level for policy discussions on CBPT (1 case), lobbying for stimulating the implementation of rail infrastructure improvement by national actors (1 case), an amendment of existing local / regional public service obligation contracts (1 case) or test runs for certain CBPT services (1 case).

The above figures also show that **most problem-solving approaches need to combine several types of action** to establish new CBPT services or to improve the operation of existing CBPT. Across the 47 cases, the constellations are as follows:

- Most frequent are approaches combining 4 types of action (13 cases) and 5 types of action (10), followed by approaches combining 3 actions (9) and approaches including 6 or even more actions (7).
- For the 16 cases with a 'complex source-problem-effect relationship', it is not surprising that problem-solving approaches most often have to combine 5 or even more types of action (11 cases).
- Problem-solving approaches including fewer types of action are clearly less frequent (6 cases). Approaches with only one action are found in 2 cases and approaches with two actions in 4 cases.

A good example for a 'complex source-problem-effect relationship' requiring a problem-solving approach with multiple actions is at the Bavarian-Austrian border. Here, partners at

[39] National-level legislative action with regard to transport and CBPT; EU-level legislative action with regard to transport and CBPT; Tools provided for by the 'European cross-border mechanism' ECBM.

different government levels have to address various topics (i.e. legal, organisational and financial) to develop a joint cross-border transport association (see box below).

Demanding problem-solving approach to develop a cross-border transport association on the Bavarian-Austrian border

Within the EUREGIO 'Salzburg-Berchtesgadener Land-Traunstein' (DE-AT), different national and regional legislation on public transport as well as asymmetric cooperation between a federal state (Salzburg in Austria) and two counties (Berchtesgadener Land and Traunstein in Bavaria, Germany) are complicating the set-up of a joint cross-border transport association with integrated tariffs. Partners from both sides of the border have intensively worked together for several years to find an institutional-organisational and financial solution capable of 'bridging' the complex situation.

In 2015 / 2016, a small-scale Interreg V-A project carried out a comprehensive analysis of CBPT services (bus and rail) and examined the legal and organisational framework for establishing a cross-border transport and tariff association (EUREGIO-Verkehrsverbund / Tarifverbund). This association should be capable of jointly ordering the means for public transport and applying a uniform tariff system covering the cross-border area. For this, the study also examined the establishment of an EGTC as potential solution.

The aim of the ongoing discussions is to create the largest possible cross-border tariff area for this transport association so the additional costs per passenger linked to the cross-border distribution of revenue are as low as possible. For this, however, more data is needed. Currently, no up-to-date commuter figures are available since road traffic is not documented on a cross-border basis, nor are passenger numbers of public transport companies in Bavaria in the direction of Austria recorded. The federal state of Salzburg is already in the process of collecting data on who commutes by car into Salzburg and out to Bavaria (via a 'commuter flow analysis'). On the Bavarian side, however, progress will take longer. The two border districts of Traunstein and Berchtesgadener Land are negotiating with the Bavarian government in Munich about co-financing to implement this initiative. This is because a study has shown that both districts would have to raise around EUR 500,000 to 600,000 per year to secure Bavarian-sided application of the Salzburg transport association SVV common tariff.

Source: Inventory case no. 21, based on Salzburger Verkehrsverbund (2016); ESPON 2020 Cooperation Programme (2018); Land Salzburg (2019); Salzburg ORF.at (2019).

3.6.3 Stakeholders suited to initiating problem-solving approaches

In addition to possible actions, the inventory also assessed which types of actors are most suited for initiating problem-solving approaches. For this, 53 cases could be examined but four survey-based cases had to be excluded as information was insufficiently detailed.

The assessment considered seven stakeholder types with specific functions and tasks in the set-up or ongoing operation of domestic and cross-border local public passenger transport services (Table 3-7). The result can be summarised as follows:

- Regional authorities are clearly in a leading position to initiate problem-solving approaches (40 cases), since they are transport organising authorities and sometimes also legislators on domestic local/regional public transport. The latter role is the responsibility, for example, of all German federal states (Länder) and the Italian Autonomous Province of Bolzano-South Tyrol.
- Very relevant are also national authorities (27 cases). This is mainly due to their role as legislator defining general rules for public passenger transport and their function as transport organising authorities (mostly for rail passenger transport), but also because specific central-state agencies ensure country-wide management or control tasks in the field of transport.

- At a clear distance but with similar importance are transport associations (18 cases) and local authorities (17). This can be explained by the important role of local authorities as transport organising authorities and the cooperative tasks of transport associations to define fare-levels and ticketing systems or jointly order public transport services.
- Cross-border entities (18 cases) are also important but mainly have a mobilisation and coordination function in relation to other CBPT stakeholders rather than a role in directly providing CBPT.
- Problem-solving approaches can also be initiated by individual transport companies (14 cases), especially in specific areas of activity (e.g. quality improvements of services, coordination of connections and timetables, etc.).

None of the cases requires the EU level to take action, which also correlates with the findings of our earlier analysis (see: Section 3.2).

Table 3-7: Stakeholders most suited to initiate solutions

Key stakeholders	Main function(s) for domestic public transport and CBPT	No. of cases
EU level	Legislator for EU-wide harmonised rules for transport and passenger transport	0
National authorities	Legislator and transport organising authority, also including tasks for special national transport agencies (i.e. allocation of line concessions or rail track access rights, regulation or control functions)	26
Regional authorities	Transport organising authority, sometimes also acting as legislator for regional/local public transport	40
Local authorities	Transport organising authority, very often ensured by public law-based groupings of municipalities	17
Transport associations	Public or private cooperative structure determining fares and ticketing system, but sometimes also acting as transport ordering body	18
Cross-border entities	Primarily acting as coordinating structure, but sometimes also as transport organising authority	18
Transport operators	Provision of one or more passenger transport services	14

Source: Service provider, own elaboration based on CBPT obstacle inventory data

To implement the types of action of a problem-solving approach, **the large majority of cases have to involve several stakeholders** (i.e. 42 of the 53 cases). Most frequent are approaches that involve 3 stakeholders (19) and 2 stakeholders (15), but there are also approaches with more stakeholder involvement (8 with 4 or more stakeholders). Unsurprisingly, nearly all problem-solving approaches with multi-stakeholder involvement address situations at borders with a 'complex source-problem-effect relationship' (7 cases).

The 11 cases requiring only one stakeholder for implementing a problem-solving approach mostly involve national authorities. This often applies to cross-border railway services (4 cases), especially when different national policies exist on both sides or if cooperation between national administrations is slow or poor railway track conditions hinder CBPT. But also for cases where public subsidies cannot be granted to local cross-border bus services, problems have to be solved at the national level by amending legislation (3 cases). Under the remaining 4 cases, regional authorities have to be active. The approaches all address problems for the ongoing operation of CBPT and concern issues such as suboptimal

timetable coordination, inadequate passenger information or low profitability of an existing service.

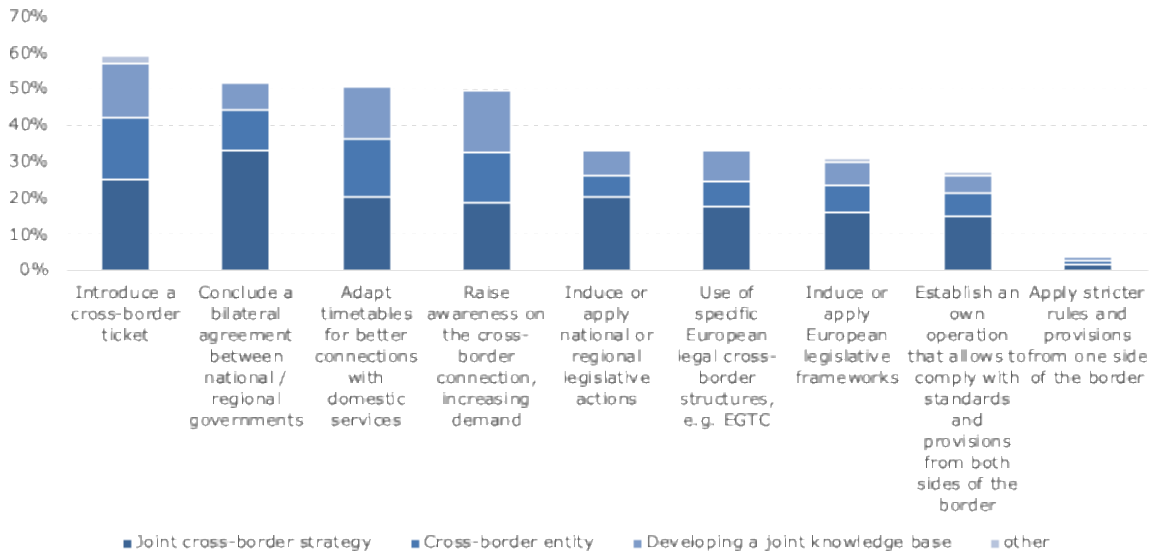
3.6.4 Preparing and implementing solutions in practice

The above-mentioned features as well as the need for combining different types of actions and stakeholders in a problem-solving approach are also confirmed by the survey of CBPT stakeholders.

When asked **which problem-solving approaches could address current obstacles to CBPT,** respondents were proposed nine solutions that might include four types of action: (1) a joint cross-border strategy, (2) the involvement or set-up of a cross-border entity, (3) the elaboration of a joint knowledge base and (4) other appropriate actions. The answers highlight (Figure 3-10):

- The most frequent solutions are the introduction of a cross-border ticket (60%), followed by a conclusion of bilateral agreements (51%) and an adaptation of timetables to better connect domestic services with cross-border services (50%) as well as stronger awareness-raising about cross-border services to increase demand (49%).
- Other more formal solutions were less frequently mentioned (e.g. use of EU or national legal solution, use of EGTC), with the application of stricter rules on one side of the border being the least relevant solution (3%).

Figure 3-10: Possible solutions to cross-border obstacles for CBPT



Source: Service provider, based on findings of the 2021 online survey (n=91)

For the four types of action that could form part of a solution, a joint cross-border strategy is frequently perceived as an important intermediate step or pre-condition for implementing a solution. A joint cross-border strategy is clearly most important for the conclusion of bilateral agreements between national or regional governments.

The establishment or involvement of a cross-border entity and the elaboration of a joint knowledge base are less often mentioned as pre-conditions or facilitating factors for solutions. However, differences can be observed by type of solution: a cross-border entity or a joint knowledge base is relatively more important when a solution aims to introduce a cross-border ticket, to adapt timetables and to raise awareness of CBPT.

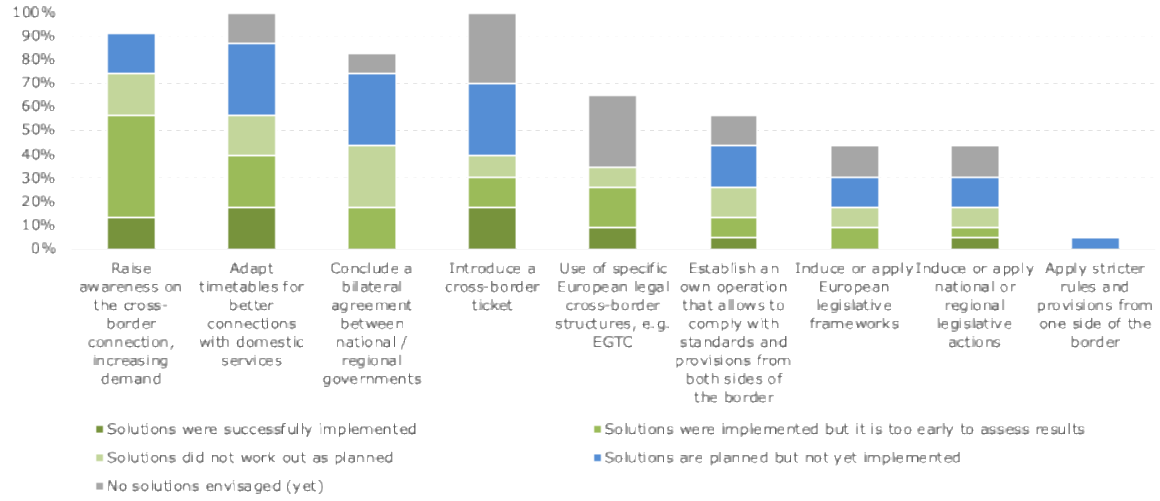
Tackling legal or administrative obstacles to CBPT is very often a trial-and-error process, during which stakeholders implement individual actions or comprehensive approaches with varying degrees of success.

This can be illustrated by responses to the online survey, which show how stakeholders have already tried to overcome CBPT obstacles (Figure 3-11):

- Most respondents implemented solutions to raise awareness of CBPT services, followed by adapting timetables (i.e. green shaded parts of bars). Also the conclusion of a bilateral interstate agreement and the introduction of a cross-border ticket are frequently mentioned. The success of these solutions is already visible in some cases, but for most of them it is too early to assess the results. However, some attempts have not been successful, especially the conclusion of bilateral agreements.
- The implementation of other more formal solutions is clearly less important. Of some importance is the establishment of joint cooperation structures with their own legal personality (e.g. EGTC) as well as the development of own transport services that meet the standards on both sides of a border.
- Stakeholders are planning to introduce nearly all these solutions but have not yet implemented them (blue shaded parts of the bars). This is evident for all the strongly preferred solutions, but also for most of the less relevant and formal solutions.

Summarising these experiences, there is a relatively high preference and also likelihood of success in the implementation of more 'operational solutions' (i.e. awareness raising, introduction of cross-border tickets, timetable coordination). Conversely, however, preference and success are clearly less pronounced for structural-legal solutions.

Figure 3-11: Solutions implemented by survey respondents



Source: Service provider, based on findings of the 2021 online survey (n=26)

4 Lessons on recurrent CBPT challenges from case studies

A selection of 31 case studies provides detailed information on CBPT across European borders[40] (Figure 4-1). The lessons detail the service's provisions to operate and address a specific transport demand. Findings may be specific to one service or the same for multiple services along the same border segment. The section also refers to the service's governance arrangements and financing, agreements for the use of infrastructure, minimum standards for service quality and safety, etc. These aspects ideally ensure that the CBPT service can thrive and meet the demand of the local population for improved cross-border accessibility now and in the future.

Each case study describes these features of a specific CBPT service, common challenges and solutions (Table 4-1). The last column in the table indicates the case study focus on governance and/or operational challenges and solutions. Challenges influence the approach and thus service provision and as such impact cross-border region interactions and development (Chapter 3).

The case studies' focus is on addressing demand in border regions, which implies a focus on problems and thus challenges rather than the root causes of obstacles to CBPT. The cases studies depict mainly pragmatic challenges, such as tariff integration, integration of timetables, links to connecting services and insufficient capacity in local and regional stakeholders to facilitate processes. The causes in terms of inadequate agreements or cross-border cooperation are mentioned when relevant to identifying solutions. Overall, the case studies highlight more pragmatic elements as defining factors for the service to meet demand in the border region. The individual case studies are annexed as separate files to this report.[41]

The following section presents lessons learnt from the 31 case studies. The lessons depict how governance arrangements (Section 4.1) and operational provisions (Section 4.2) of CBPT help to meet demand in border regions (Section 4.3). Governance arrangements and operational provisions are described along with key challenges and solutions introduced by stakeholders in the border regions. As such the following highlights how different elements of a CBPT service help to meet demand.

[40] The 31 cases studies depict diverse approaches to providing CBPT. The cases are not representative of all CBPT services identified in this study, but depict a variety of examples of business models, challenges, and solutions. Cases have been selected to represent the large structural variety. They illustrate different transport modes (tram, train, bus, and ferry), from across Europe and different types of border areas by geography, population density and cooperation history. The final selection was agreed between the study team and the European Commission. For more information on the selection see Annex 7.9)

[41] The case studies differ in scope and length depending on their focus, context and available information.

Figure 4-1: Overview of case studies

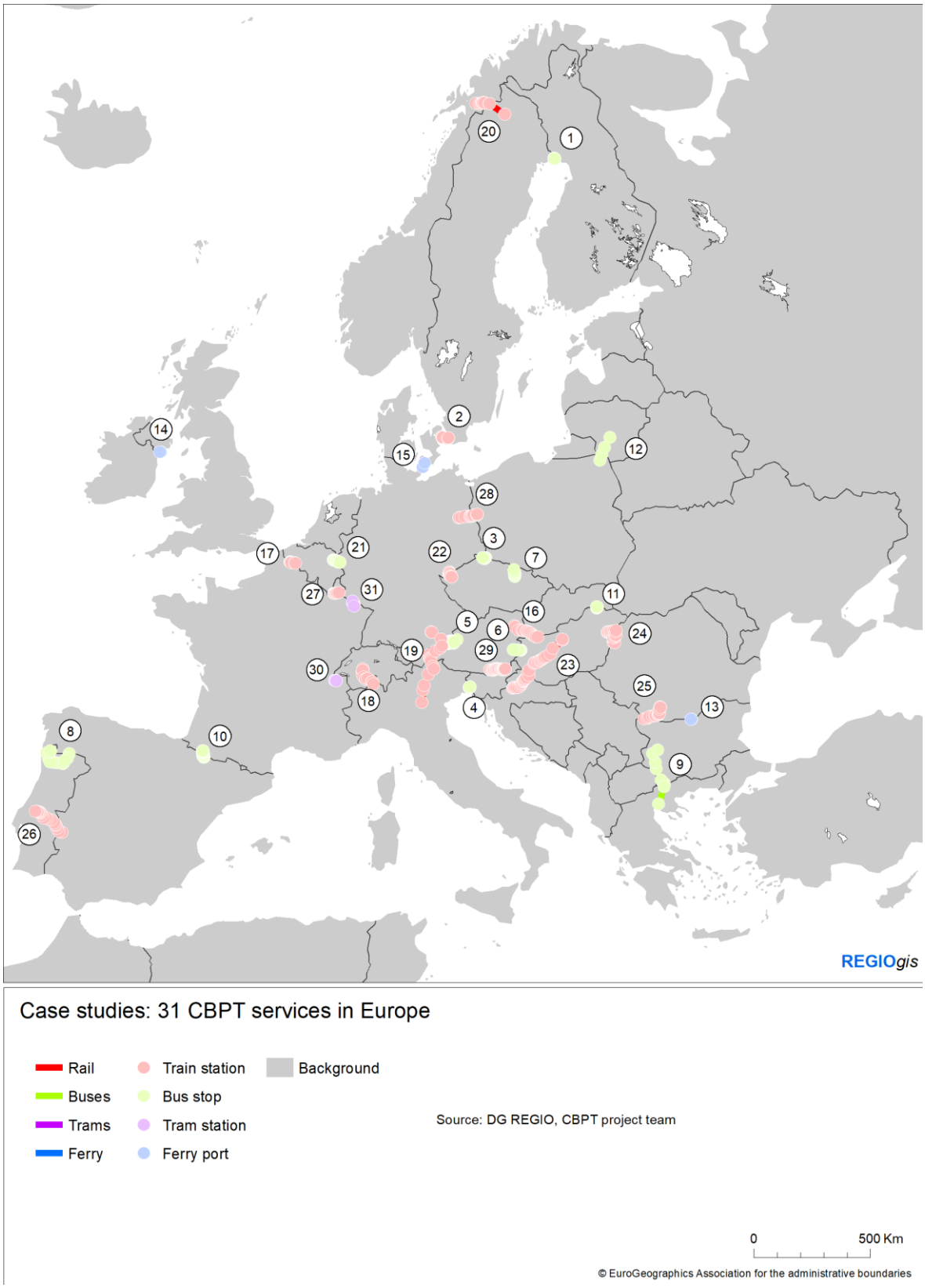


Table 4-1: Challenges and solutions in the case studies

Case study	No. in Figure 4-1	Obstacles and solutions	Main case study focus
Bus			
Haparanda (Sweden) – Tornio (Finland)	1	Integration and linking to domestic public transport systems	Operational
		Asymmetric governance systems for public transport	Governance
Zittau (Germany) – Bogatynia (Poland)	3	Different legal frameworks	Governance
		Imbalanced public funding for transport services	Operational
Gorizia (Italy) – Nova Gorica (Slovenia)	4	Application of the EU Cabotage Directive	Governance
'Mozart express': Reit im Winkel (Germany) – Salzburg (Austria)	5	No obstacles for operation despite challenges hampering improvement of the service including governance (unable to stop multiple times in Austria) and operational aspects (lack of information in domestic transport systems)	.
Szombathely (Hungary) – Oberwart (Austria)	6	Limited interoperability of the service, lack of connecting services	Operational
		Lack of information about the service in domestic transport systems	Operational
Verín (Spain) – Arcos de Valdevez (Portugal)	8	Asymmetric competences between public administrations	Governance
		No cross-border coordination in planning and provision	Governance
		Insufficient knowledge of the legal frameworks	Governance
Bedous (France) – Canfranc (Spain)	10	Inadequate infrastructure Lacking fare reduction for cross-border trips	Operational
Hisdasnémeti (Hungary) – Kechnec (Slovakia)	11	Insufficient knowledge of the legal frameworks	Governance
		Lack of information about the service in domestic transport systems	Operational
Suwałki (Poland) – Kaunas (Lithuania)	12	The commercial service has not encountered major obstacles or difficulties hampering its initial set up or its ongoing cross-border operation. The main obstacle is in the inability of domestic passenger transport.	.
Maastricht (Netherlands) – Aachen (Germany)	21	Asymmetric governance systems for public transport and ongoing dialogue to solve these	Governance
		Interoperability of tariffs	Operational
Train			
Lichkov (Czechia) – Gorzanów (Poland)	7*	Inadequate infrastructure (outdated infrastructure and lacking interoperability)	Operational
Thessaloniki (Greece) – Sofia (Bulgaria)	9*	Inadequate infrastructure to provide a full service from end-to-end stations	Operational
		Competition from other commercial services	Demand

Case study	No. in Figure 4-1	Obstacles and solutions	Main case study focus
Vienna (Austria) – Győr (Hungary)	16	Technical interoperability issues causing long journey times	Operational
Domodossola (Italy) – Spiez (Switzerland)	18	Lack of common rules and regulations	Governance
		Inadequate infrastructure	Operational
Innsbruck (Austria) Brennero (Italy)	19	No obstacles for operation despite challenges hampering improvement	.
Narvik (Norway) – Kiruna (Sweden)	20	Lack of common rules and regulations	Governance
		Natural conditions demand high investment to maintain infrastructure	Operational
Johanngeorgenstadt (Germany) – Karlovy Vary (Czechia)	22	Limited timetable integration hampering full potential	Operational
		Insufficient infrastructure limiting attractiveness and accessibility	Operational
Budapest (Hungary) – Zagreb (Croatia)	23	Inadequate infrastructure (outdated and lacking interoperability)	Operational
		Lack of local demand in the border regions for the service	Demand
Oradea (Romania) – Debrecen (Hungary)	24	Inadequate timetable to address or stimulate demand for the service	Operational
		Inadequate rail infrastructure	Operational
Vidin (Bulgaria) – Craiova (Romania)	25	Late and inadequate infrastructure hampering full potential	Operational
		Incomplete EU integration, border controls hampering full potential	Demand
Badajoz (Spain) – Entroncamento (Portugal)	26	Lack of capacity in local and regional authorities to facilitate the process	Governance
Luxembourg (Luxembourg) – Athus (Belgium)	27	Inadequate infrastructure hampering the full potential of cross-border interactions	Operational
Maribor (Slovenia) – Bleiburg (Austria)	29	Insufficient passengers despite political willingness to operate the line	Demand
Lille (France) – Tournai (Belgium)	17	Lack of passenger information hampering governance processes including raising awareness of the added value of cross-border services	Governance
		Mismatch of ticket fares	Operational
Berlin (Germany) – Kostrzyn (Poland)	28	National focus on transport planning and framework	Governance
		Language barriers	Operational
Copenhagen (Denmark) – Malmö (Sweden)	2	Tariff integration and application of coordinated tariff zones	Operational
		Different political views on cross-border transport provision at national levels	Governance

Case study	No. in Figure 4-1	Obstacles and solutions	Main case study focus
Tram			
Geneva (Switzerland) – Annemasse (France)	30	Adverse political administrative development in the set-up phase	Governance
'Saarbahn': Saarbrücken (Germany) – Sarreguemines (France)	31	High charges for the use of French infrastructure	Operational
Ferry			
Puttgarden (Germany) – Rødbyhavn (Denmark)	15	The Fehmarn Belt strait hinders adequate connectivity to address demand for border regions	Operational
		Different regulations hinder coordination of wages and ticket prices.	Governance
Greenore (Ireland) – Greencastle (UK)	14	Geographic barrier for cross-border movements Public participation and optimal technical solutions Financing and operational adjustments	.
Zimnicea (Romania) – Svishtov (Bulgaria)	13	Incomplete EU integration, border controls hampering the full potential of the cross-border connection	Demand
		Inadequate infrastructure, predominantly from and to the ferry ports	Operational

** Partially or temporarily operated by rail buses due to infrastructure work*
Source: Service provider, own elaboration based on CBPT case study reports (annexed separately)

4.1 Agreements shape complex organisation structures and delivery of CBPT

As indicated in the solutions to overcoming CBPT obstacles (Section3.6.3), the provision of CBPT services entails the participation of a large variety of players, including public authorities at national, regional and local levels, transport associations, service providers and responsible agencies for infrastructure. Competences laid down in the normative base for public transport and its different modes defines the players for service provision as well as the operational provisions.

CBPT provision demands complex collaboration. The provision of CBPT requires the involvement of many players, as highlighted by most case studies. As with domestic services, this includes public authorities at national, regional and local levels, transport associations, service providers and agencies for infrastructure. Each of these contributes with different competences to the development of the service, as defined in national legislation and regulations. These competences differ across countries. As a result, providing services across national borders requires complex governance arrangements. For example, the rail connection between Lille (France) and Tournai (Belgium) requires agreement between two private transport providers each with different stakeholders. The Belgian transport provider mainly addresses a national perspective, whereas the French provider has a regional focus. In addition, different organisations are responsible for rail infrastructure.

Local and regional players need capacities to facilitate governance processes and bring together the players. Local players demanding a cross-border connection for the benefit of the border region need to deal with governance differences and asymmetric distribution of competences, which requires capacity, as highlighted in the Verín – Arcos de Valdevez case: An asymmetric distribution of competences among key players for public transport and the lack of European regulation of cross-border services means 'that any cross-border local transport project, requires a complex process of analysing public administrations (local/regional) and administrative procedures and proposing new legal ad-hoc agreements. For the moment this would generate a disproportionate workload for local authorities, considering that they usually do not have the legal knowledge, and the human and/or material resources to deal with these cross-border complexities'. A lack of capacity risks not realising specific potential of CBPT in border regions. The Kaunas – Suwałki case illustrates an interest in domestic transport of players in the border region. Hence, the cross-border service operated by a commercial party is not adapted to specific demand in the border regions.

Cross-border entities are important to bring players together. Several cases illustrate the importance of cross-border entities for the development of CBPT. Although not all cross-border entities such as EGTCs (e.g in Gorizia – Nova Gorica, Lille – Tournai (see below), Innsbruck – Brennero), or Euroregions have the necessary competences for transport, they have networks and the capacity to bring together the relevant players to discuss possibilities and challenges to CBPT provision.

Action group 'cross-border mobility'

The Eurometropolis as a cross-border entity plays an important role in addressing and overcoming mismatching fare systems. As an EGTC, the Eurometropolis has its own legal personality which enables it to act as a cross-border entity and ensure efficient and coherent cross-border cooperation despite structural differences between its members (see also section 2.1).

The Eurometropolis initiates and facilitates processes bringing together key players. It facilitates exchanges and encourages stakeholders to take responsibility for cooperation and coordination. These exchanges take place in the action group 'cross-border mobility' which has 150 members (Eurometropolis, 2021).

Within this action group the Eurometropolis organises activities and initiatives. Activities include organising dialogue between players. Although most dialogue takes place among peers, i.e. at the level of civil servants or politicians, the Eurometropolis highlights the importance of meetings between different types of stakeholders from different territories. Such meetings have proven to be eye-openers for some politicians on the impact of actions and activities beyond their territory. These aspects are typically not discussed in other meetings.

CBPT is also supported by other forms of cross-border collaboration. Case studies along German and Austrian borders highlight the use of transport associations. These are responsible for bringing together local players for public transport provision and for regional coordination of fare systems. The cases studies on the bus connections Maastricht – Aachen, Reit im Winkel – Salzburg and Zittau – Bogatynia as well as the rail connection Innsbruck – Brennero show how local and regional stakeholders from across borders are involved in these associations. Dutch and Belgium stakeholders are members of the transport association of Aachen and surroundings (AVV). The association has three to four meetings with international partners per year to discuss cross-border aspects of public transport.

A lack of a cross-border entity or network structure to facilitate governance processes risks a CBPT service not adapted to the needs of residents in border regions. The Luxembourg – Athus case illustrates a lack of connecting and local services at the train station in Athus, limiting commuter use of the rail connection. As such, the rail connection loses its competitive advantage, which is particularly visible in times of infrastructure maintenance.

Interreg funding helps initiate collaboration and setting up cross-border structures. Case studies describe the benefits of Interreg projects for stakeholder involvement and improving CBPT services. Interreg projects facilitate setting up cross-border services by financing feasibility studies as mentioned for the connections Szombathely – Oberwart and Thessaloniki – Sofia. The EMR Connect project brings together public and private players to advance service provision for CBPT, as described in the Aachen – Maastricht case. Each of these examples brought together relevant players for CBPT. The collaboration (as a whole or between partners bilaterally) continued often after the project, helping development of the service.

From Interreg project to cross-border transport service

The bus connection Zittau – Bogatynia is a result of the Trans-borders Interreg project. The project, co-funded via the Interreg Central Europe programme included the set-up of a working group in which potential partners met and received advice on the framework conditions for setting up the line (needs, funding, etc.). The project focused on 'investigating and planning a bus line from Zittau via Bogatynia to the Czech town Frýdlant v Čechách, with a connection to the Polish health resort Świeradów-Zdrój on weekends (Bus 691).'

Agreements formalise cooperation. The provision of each CBPT service has a normative base. Cross-border agreements between the key stakeholders are key to provision of these services (see also Section 4.2).

- Several cases illustrate agreements resulting in bilateral management and service delivery models. Joint service agreements or concessions allow providers from both countries to offer the services. Examples include the bus connection Gorizia – Nova Gorica and the train connection Thessaloniki – Sofia. The case studies illustrate agreements on the split of service delivery as well as infrastructure maintenance and minimum quality standards.
- Several cases illustrate unilateral management and service delivery, meaning that an authority from one side of the border is responsible for the management and operation of the service. Examples include the bus connections Bedous – Canfranc, Szombathely – Oberwart, Hisdasnémeti – Kechnec, Maastricht – Aachen and tram connections Geneva – Annemasse and the Saarbahn. The governance arrangements for the service and in the border region in general define the benefits for the border region. For example, the Maastricht – Aachen bus service is well integrated in the public transport networks on both sides of the border due to wider cooperation of stakeholders. On the contrary a lack of involvement of local players hinders full use of the Szombathely – Oberwart and Hisdasnémeti – Kechnec bus connections.
- Some cases illustrate bilateral management and a single service delivery model. This implies that stakeholders across the border jointly set standards for operational provisions and contract a single service provider, via public tendering or a public service obligation. The train between Kiruna and Narvik is one example and the regional train between Aachen and Maastricht is another. Stakeholders from the Netherlands (province of Limburg) and Germany (Aachen transport association) jointly drafted the terms of reference ensuring applicability of requirements from both countries to operate the service. Finally, the private transport operator Arriva had the most competitive offer and hence operates this rail connection.

Interstate agreements facilitate cross-border collaboration. Interstate agreements indirectly facilitate cross-border service provision. Operation of the tramline between Geneva, Switzerland, and Annemasse, France, could for example be contractual as a result of the multilateral Karlsruhe interstate agreement on cross-border cooperation between Germany, Luxembourg, France and Switzerland.

On 6 November 2019, the Canton of Geneva and the Agglomeration Community Annemasse signed the 'Cross-border Cooperation Agreement on tramway line 17' to formalise their collaboration. The 'Cross-border Cooperation Agreement' is a specific cooperation instrument provided for by Article 3 of the multilateral Karlsruhe interstate agreement. The Agreement on tramway line 17 defines the service and basic elements governing cooperation (Articles 1-4, 6, 7). It also defines the ownership of light-rail infrastructure, buildings and rolling stock (Article 5), service commissioning, the transport offer and principles of operation and maintenance (Articles 8-10) as well as matters relating to tariffs, service financing and the fiscal regime (Articles 11-15). In addition, a bilateral agreement between France and Switzerland avoids double taxation of Swiss workers on the service in France.

Another example concerns a collaboration agreement to establish a joint framework to supervise railway companies in Spain and Portugal. The agreement between the national railway safety authorities of Portugal (Instituto da Mobilidade e dos Transportes, I.P IMT) and Spain (Agencia Estatal de Seguridad Ferroviaria, AESF) defines conditions for application of European Regulations that develop the Directive (EU) 2016/798 on railway safety, in relation to common safety methods for assessing conformity with requirements. This is an important step to further develop the rail connection between Badajoz (Spain) and Entroncamento (Portugal).

National priorities challenge meeting CBPT demand in border regions. Several case studies highlight a need for additional capacities of local and regional players to raise awareness among national players for CBPT. National players are important in different ways for the CBPT business models. The service may be provided by a national transport operator or by a private operator owned by a national authority. A concession for the cross-border service may be held by a national authority, or national players own the infrastructure, or national legislation sets minimum requirements for service provision and quality standards. At the same time, these players have national level priorities and thus often a domestic focus.

Low levels of interest from decision makers and politicians or when priorities focus on national issues can result in challenges for collaboration on cross-border public services. The case study reports on the rail connections Lichkov – Gorzanów, Berlin – Kostrzyn, Maribor – Bleiburg and Copenhagen - Malmö, as well as the bus connection Kaunas – Suwałki describe how domestic priorities hinder the development of cross-border services. In the case of Maribor, service improvement in Bleiburg and better connecting services in Austria are hampered since domestic lines have priority. As a consequence, reaping the benefits of the border connection for the Slovenian stakeholders is delayed.

Local and regional player join forces as a reference group

The rail connection between Kiruna (Sweden) and Narvik (Norway) is based on public service obligations by Swedish and Norwegian national authorities and currently run by the rail company Vy Tåg which operates nationally in Sweden. The rail connection is mainly used by tourists. Inter alia, the benefit of tourism in the border area meant local and regional players joined forces as a reference group for the train services.

The reference group allows stakeholders to share their needs and expectations to optimise and improve the public train services and accessibility. The role of the group is to support tourism and increase train travel along the line through joint marketing, continuous dialogue and coordination. As such the reference group also benefits national level players.

Currently the group includes Vy Tåg and the Swedish Transport Administration together with local businesses and authorities such as the Chamber of Commerce in Norrbotten, Swedish Lapland Visitors Board, Kiruna Lapland, Swedish Tourist Association, Destination Jokkmokk, Avki and Region Västerbotten, Experience Boden, regional public transportation authorities in Norrbotten and Lapland Resort (Kiruna Lapland, 2021). Norwegian stakeholders are currently not part of the reference group, but have been in the past (Visit Narvik, 2021).

Developing and maintaining governance arrangements takes time and continuous effort. Governance arrangement as well as the normative base for transport provision changes from time to time. The above lessons need to be regularly reviewed and updated. The Greenore – Greencastle ferry as well as the Maribor – Bleiburg case shows setting up services can take a lot of time. The Slovenia – Austria case demonstrates a need for a continuous dialogue with stakeholders to reach consensus and make small steps towards change. However, bigger changes are also necessary to impact the service. Here, collaboration between service providers and local communities or the general good will of national governments is not sufficient, steps have to be made to activate the funds and resources for infrastructure investments.

Passenger data increases awareness on the added value of cross-border services. Decision-makers and other stakeholders may overlook the added value of cross-border services due to a lack of information and data. Indeed, complete and up-to-date passenger data on cross-border services is often missing. Private operators may have data but do not make it public for competition reasons. For local and regional authorities, it is often too expensive to set up regular monitoring to collect flow data. The EGTC Eurometropolis Lille-Kortrijk-Tournai overcame this issue by initiating a study which used students to test CBPT services and report their experience. This qualitative information was equally effective to raise awareness on cross-border issues among key players as statistical data. Issues reported by the students made the challenges visible to key stakeholders. As such the EGTC made sure cross-border connections became a higher priority for stakeholders.

A cross-border dimension in domestic strategies facilitates coordination. Including cross-border aspects in strategic policy documents brings attention to cross-border public services for a variety of players. Moreover, strategic documents can ensure consideration of cross-border aspects beyond individual projects or political terms, as they focus on long-term development. Different case studies highlight long development paths to develop and adjust CBPT. The Sustainable Urban Mobility Plan (SUMP) initiated by Nova Gorica in 2012 was important for the cross-border bus service. The plan covered the Slovenian region of Gorizia, including the Italian city of Gorizia. Although an integrated cross-border mobility plan never really went into being, this SUMP was an important step towards a common agenda for the development of cross-border mobility despite different governance arrangements. Also, acknowledgement of cross-border interactions in Euregio Meuse Rhine contributes to continuous development of CBPT services, as mentioned in the Maastricht – Aachen case study. Reference to cross-border aspects in strategic policy documents increases awareness of these connection for decision-makers at various levels.

CBPT is resilient. Due to the COVID-19 pandemic, several cross-border connections temporarily ceased. Examples included the Narvik – Kiruna rail connection and the bus connections Zittau – Bogatynia and Szombathely – Oberwart. In the latter case, the service ceased since it provides transport for Hungarian pupils attending school in Austria. With home-schooling the line became temporally obsolete. All case studies show how governance arrangements and the normative base of cross-border transport ensured continued services once border restrictions were lifted. Governance arrangements and a solid normative base for service provision facilitated recontinuation of services despite the force majeure of the pandemic.

4.2 Operational provisions for public transport

Operational provisions describe the most noticeable features for users of the cross-border connection. Case studies refer most often to timetables, fare systems and ticketing. Fewer case studies discuss quality standards, infrastructure maintenance and finance.

Agreements frame operational provisions. Agreements between stakeholders as discussed in section 4.1 are key to defining operational provisions for CBPT. Typical

elements in the agreements are the timetable, tariffs and mutual recognition of tickets, fare reductions, marketing, renumeration, validity period and possibly plans for extension and connectivity as presented in the Zittau – Bogatynia case study.

- Services with bilateral management and service delivery models typically split service operation at the border. For example, both operators provide the service an equal number of times per day, with an equal chance to collect benefits from the service (ticket sales). These cases also show that costs remain a responsibility of respective authorities in each country. Generally, each service provider adopts minimum requirements for service provision from the neighbouring country. The above-mentioned cross-border structures and networks facilitate coordination of the service (section 4.1). For Johanngeorgenstadt – Karlovy Vary, EgroNet with German and Czech partners, improves service delivery by focusing on cross-border tickets and better coordinating timetables.
- Services under unilateral management and service delivery generally apply operating standards from their country and adopt stricter rules from the neighbouring country only where necessary. For example, tickets valid in the French region of Aquitaine are used on the connection to Canfranc in Spain. To increase demand, private service providers adjust their operational provisions to standards across the border. For example, bus 350 between Aachen and Maastricht also recognises German tickets and adapted the timetable to connect to train services in Aachen. Service providers benefit from these operational provisions and generally pay fees to use local and regional services, including infrastructure maintenance (see also below).
- Services operating under bilateral management and single service delivery models apply generally a mix of standards and provisions from both countries as laid down in management agreements and specifications. An example is the national-level agreement in the rail service case study between Kiruna and Narvik.

For bus services, EU Cabotage rules further shape service provision. Directive 1073/2009 allows service providers to operate in neighbouring countries without disturbing local competition balances. The Mozart express tourist bus, the Szombathely – Oberwart bus for pupils and the bus between Hisdasnémeti and Kechnec targeting cross-border commuters comply with these rules as they have specific target groups and only one stop across the border, ‘the destination’. The lack of stops makes the service uninteresting for residents on the ‘destination’-side of the border, so they do not compete with local services. At the same time, the cabotage rules hinder further expansion of the line on the ‘destination’-side if desired by local authorities. To comply with cabotage rules, local and regional authorities would need to prove and agree that the cross-border services do not compete with domestic public bus services, as illustrated in the Maastricht – Aachen, and Gorizia – Nova Gorica cases studies (see below).

Dealing with EU Cabotage rules in the twin city Gorizia – Nova Gorica

The European regulation offers the possibility to derogate from cabotage restrictions for international bus and coach services, allowing cross border urban services based on bilateral agreements between the competent administrations. Italian and Slovenian national laws assign the governance of cross border services to regional competence.

Given this framework, local transport operators obtained from the Friuli Venezia Giulia Regional Administration for Italy, and the Ministry of Transport for Slovenia, special permission to derogate from the cabotage restrictions imposed by the EC Directive 1073/2019 and operate a cross border bus service between the two cities.

Service provision is thus based on a joint agreement between the Gorizia and Nova Gorica public transport operators, which share equal responsibility for the service and evenly share operating costs and revenues. In fact, of the 20 daily trips, 10 are by the Gorizia operator and 10 by the Nova Gorica operator.

Adequate infrastructure. Rail based case studies highlight the need for agreements on infrastructure to enable and support service delivery and meet safety requirements in both countries. Inadequate infrastructure risks save cross-border travel as illustrated by the case study Johanngeorgenstadt – Karlovy Vary. A lack of agreement on infrastructure use risks increasing journey time as mentioned in the case of Vienna – Győr, or risks making the service costlier. Changing fees for the use of rail infrastructure in France makes operating the service increasingly expensive for Saarbahn, the sole entity responsible for the tram connection between Saarbrücken, Germany and Sarreguemines, France. Bulgarian and Romanian stakeholders addressed this issue by forming a specific commission overseeing the use of infrastructure between Vidin-Calafat. The 'Danube Bridge Vidin-Calafat' commission maintains the Danube bridge which the railway service uses, financed by usage fees (infrastructure tax) and state subsidies. Monitoring the bridge infrastructure is by the different partners allowing them to respect different national standards. The commission monitors the Bulgarian side of the bridge and Romanian Railways (CFR) monitors railway infrastructure on the bridge in Romania.

Specific provisions for the cross-border connection. Case studies discuss a variety of operational provisions specific to the cross-border connection.

- The Szombathely – Oberwart case study describes how timetables are adjusted to meet the demand of the pupils crossing the border. The Greenore – Greencastle case describes a timetable adjusted seasonally depending on the number of tourists. Therefore, such services are less adequate for the population in the border regions. Irregular timetables hinder cross-border commuting.
- Several cases studies describe the extension of tickets across national borders. The cases of Innsbruck – Brennero and the Saarbahn note unilateral extension of tickets. Such tickets are particularly useful to cross the border but still require additional tickets to travel further in the border region.
- The cases of Lille – Tournai, Lichkov – Gorzanów and Berlin – Kostrzyn note multilingual passenger information. Wider use of multilingual passenger information in buses and trains, at stops and stations as well as online portals stimulate demand for the service.
- Players in Svishtov, Bulgaria improved pedestrian paths to the port facilitating accessibility to the ferry service to Zimnicea (see box below).

Improved walkability at the ferry port in Svishtov

Since the ferry started in 2010, the Municipality of Svishtov has made increasing efforts to improve pedestrian access to the port, revitalising a former industrial area into a more socially attractive

facility for passengers (European Commission, 2021a). This is the result of a cross-border transport strategy, promoted by the European Regional Development Fund (ERDF) through the Romania-Bulgaria Operational Programme 2007-2013 to improve the flow of people and goods and boost local businesses and tourism. The Programme has successfully supported the realisation of sidewalks, parking for two buses and 15 cars, 7 informative interactive monitors, and a pedestrian overpass that connects the port with the centre of Svishtov (accessible also for people with reduced mobility). According to the Municipality of Svishtov, a growing number of commuters and tourists are discovering areas on the other side of the Danube. However, despite the progress, more infrastructure is needed to unravel the real potential of cross-border connections (European Commission, 2021a).

Provisions embedding the cross-border connection in wider networks. In addition to the specific service provisions, most case studies discuss how the cross-border service in embedded wider transport networks on one or two sides of the border. Examples address accessibility to the cross-border service, fare integration, cross-border tickets, and passenger information.

- **Integration of the cross-border connection in domestic network to improve accessibility**. Several case studies describe efforts to link timetables of domestic services to the cross-border service to improve accessibility of the border area. For example, the timetable of bus 350 between Maastricht and Aachen corresponds with the train timetable in Aachen. Limiting waiting times between these two services increases the number of users of the cross-border service. Similarly, the bus timetable between Bedous and Canfranc is defined by the train service in Bedous. As such, people departing from Canfranc in Spain can access a wide range of places in France.

  Several case studies highlight a lack of timetable coordination on one side of the border. This concerns mainly unilaterally managed services as well as cases where national interests hamper collaboration between players on both sides of the border. In many cases, cross-border commuters rely on connecting services to reach their destination. Because of inconsistencies between cross-border and domestic services many commuters take their car so cross-border services are mainly used by tourists relying less on specific connecting services. The case of Maribor – Bleiburg illustrates for example how uncoordinated timetables at the train station in Bleiburg hamper use of the line for many travellers. As the waiting time for connecting services in Bleiburg becomes too long most cross-border travellers take the car instead of using the train.

- **Cross-border tickets meeting a cross-border region wide demand.** Cross-border tickets are valid in regions on both sides of the border. As such they enable residents and visitors to profit from a wider network of public transport, including border connections. Public transport in the Greater Geneva area is an example of a highly integrated cross-border ticketing system (see below). Also, the case studies of Johanngeorgenstadt – Karlovy Vary and Maastricht – Aachen discuss specific cross-border tickets. In addition border-region tickets are introduced for specific target groups, for example students in Lille – Tournai and Maastricht – Aachen. Each of these solutions require close collaboration between different partners as player in the area needs to recognise the ticket. Such ownership is created by allowing the players to keep revenues from such tickets, as illustrated in Maastricht – Aachen or apply transparent distribution models as illustrated for EgroNet in the Johanngeorgenstadt – Karlovy Vary case study.

Lacking such governance arrangements implies alternative solutions. Many cases describe extending ticket validity across the border. Examples are found in Copenhagen where a joint Öresund Fare system is based on different zones allowing tickets from one side of the border to be used to ‘some extent’ in public transport on the other side.

Léman Pass in Greater Geneva

Already in the early 2000s an integrated tariff enabled travellers to use buses, trolleybuses, trams, trains and boat shuttles on Lake Geneva with a single ticket. From December 2019, the two-tier Léman Pass integrates tariffs within the Canton of Geneva and cross-border. Tickets can cover only parts of the area (e.g. the Canton of Geneva), combinations of zones or all nine zones. This approach is supported through the joint transport association management in charge of coordinating two transport associations, one of which includes the Swiss and French public transport companies.

- **Joint passenger information.** Passenger information on both sides of the border provides visibility on the service (see for example Haparanda – Tornio below). This entails including the service in timetables and journey planners, signs with real time information and instance tourism leaflets. The cases of Szombathely – Oberwart and Hisdasnémeti – Kechnec illustrate how a lack of communication and awareness of the possibility hampers using the full potential of these services to benefit the wider public. Both cases have specific target groups but are open to the public. However, other people do not use the services as the timetables are not communicated in the Hungarian systems.

Shared travel centre in Haparanda-Tornio

The shared travel centre in the twin city Haparanda-Tornio is important for the Swedish and Finnish regional buses, as well as the local bus services (ring line and city line) because those services meet at the travel centre. A single travel centre has made it easier to coordinate timetables and enabled passengers to change between bus services. With one main travel centre, at least one aspect for travellers has been integrated into the public transportation services, making it easier to change bus services without having to walk across the border. In other words, the local bus system is embedded into a wider CBPT system, to enable smoother regional bus changes on both sides of the border.

The case studies illustrate a diversity of operational provisions for cross-border services, shaped by service agreements and governance arrangements as well as the demand for cross-border movements. The adequacy of these operational provisions depends largely on the specific need for the cross-border service.

4.3 Benefits and impacts of CBPT

CBPT plays a marginal role in cross-border flows. In the Eurometropolis Lille-Kortrijk-Tournai on the French-Belgium border about 5% of almost 500,000 daily cross-border movements takes place via public transport. In the twin city of Gorizia – Nova Gorica the cross-border bus connection represents approximately 1% of the cross-border motorised transport. In 2020, about 310 persons used the tram connection Saarbrücken–Sarreguemines on an average working day against 7,600 car movements. Despite this marginal role, CBPT connections are important for border regions.

CBPT enhances connectivity for border regions. Public transport services provide additional opportunities to cross borders. This is most visible for ferry connections as water bodies represent physical barriers for residents to use nearby services across the border. Without the ferry connections between Puttgarden – Rødby, Greenore – Greencastle and Zimnicea – Svishtov travel times were considerably longer. The same applies to some extent to mountainous areas as mentioned in the cases of Bedous – Canfranc, Spiez – Domodossola, and Innsbruck – Brennero.

Particularly tourists profit from cross-border connections, along with day visitors they are among the key users of CBPT described in the case studies. The Mozart express bus between Reit im Winkl and Salzburg specifically targets tourists. Even though anybody can

use the service, its timetable and frequency make it less useful for cross-border commuters. Also, in places with relatively many cross-border interactions, such as Aachen – Maastricht, tourists and day visitors remain a key target for the CBPT services. 52% of users of the Lille-Tournai connection are day visitors, mostly for shopping. Users of the train connection between Domodossola and Spiez are 50% commuters and 50% tourists. Only between Domodossola and Brig, the first stop in Switzerland is the share of commuters higher (60%).

Public transport provides opportunities to use cross-border services. Case studies describe how public transport facilitates the use of cross-border services. The bus connection Szombathely – Oberwart specifically targets students from Hungary attending education in Austria. In this case, public transport facilitates the cross-border character of education. Similar functions of CBPT can be observed elsewhere as well. About 48% of the users of the rail connection between Lille and Tournai are students.

Using the potential of a European labour market. Public transport facilitates the European internal market, notably the labour market across the border. The bus connection between Hisdasnémeti and Kechnec specifically targets workers from Hungary to reach workplaces across the border in Slovakia. The short extension of a Slovak bus service to Hungary provides significant added value for cross-border flows and boosts cross-border employment, as described in the case study. Also, the rail connection between Vienna and Győr is mostly used by cross-border commuters, predominantly from Hungary to Austria. In this case, most commuting is on a weekly or monthly basis by people working in vocational positions and various blue-collar services. Daily commuting is more typical among people working in the service sector (e.g. retail), as well as highly qualified staff working in Austria.

Reducing traffic flows and offering environmentally friendly transport. Public transport provides environmentally friendlier options than personal cars. Case studies along congested routes highlight this benefit. This includes urban areas around Geneva, Luxembourg greater region and the twin city of Gorizia – Nova Gorica. Benefits are also mentioned in mountainous areas, where fewer connections increase traffic congestion, such as Bedous – Canfranc in the Pyrenees and Innsbruck – Brennero in the Alps.

Public transport highlights the functional linkages of border regions. A physical link is sometimes a symbol for integration. Moreover, it brings stakeholders from either side of the border together to work on a variety of challenges in cross-border areas. For example, the Mozart express, a tourist bus in the southern part of Germany links to Salzburg in Austria enabling intensified cooperation between local and regional tourism players on both sides of the border. Another example is the network of CBPT in the Eurometropolis Lille-Kortrijk-Tournai on the French-Belgium border. Border interactions by public transport are one way of communicating and raising awareness on a variety of cross-border movements, including students and the use of sport facilities on either side of the border. Indirectly CBPT connections help improve coordination among stakeholders across the border. Similarly, stakeholders of little used public transport connections described in the case studies, use the physical link to increase wider involvement, embed the service in domestic networks to induce demand, and showcase the added value of the connection for the border region as in the cases of Maribor – Bleiburg and Badajoz – Entroncamento.

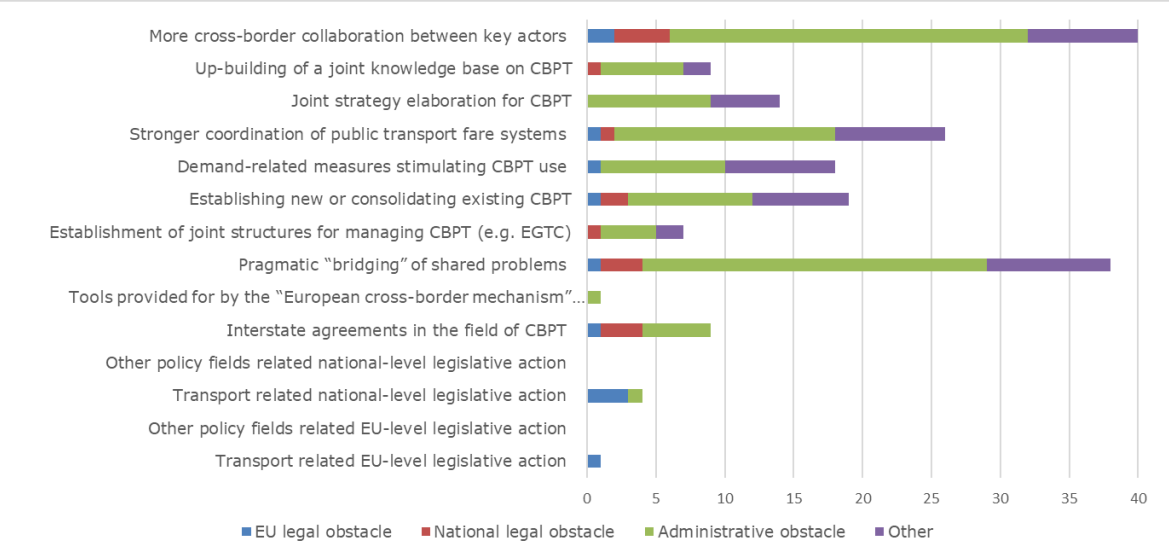
CBPT provides access to domestic transport networks across borders. Cross-border services allow residents and visitors in border regions to profit from increased accessibility beyond the transport connection. Many case studies highlight the importance of linking the cross-border service to domestic services. Between Haparanda and Tornio, the shared bus services may only cover a small distance but are important links to Swedish and Finnish domestic transport services. Similarly, the ferry between Svishtov and Zimnicea connects with services to Bucharest and the rest of Romania from Zimnicea. Case studies illustrate different ways to facilitate this connecting role of CBPT.

CBPT has thus a dual role for border regions. Directly it contributes to better connectivity and accessibility. Indirectly it contributes to enhanced cooperation. Case studies show how business models are adapted to this, respecting the legal and administrative contexts. Regardless of the context all examples show how business models meet demand either responsively or pro-actively.

5 A toolbox for CBPT planners and implementers

The analyses of obstacles (Chapter 3) and CBPT case studies (Chapter 4) illustrated the benefit of CBPT services and that these may require complex solutions (Figure 5-1). The analysis indicates that some types of solutions are frequently required. Soft tools tend to be most important for mitigating CBPT obstacles. Often, they must be combined with other tools. This leads to tailor-made approaches for CBPT services and how the toolbox comes into play. This chapter provides a structured overview of solutions to the development and implementation of CBPT services.

Figure 5-1: Number of obstacles by type of solution



Source: Service Provider, own elaboration based on CBPT obstacles inventory data

Based on actions outlined in Section 3.6.2, Table 5-1 further details the toolbox, which is annexed to this report as a separate file. It shows several approaches which may be considered under different groups of tools. For instance, 'pragmatic bridging' may imply changes in organisational or governance approaches or a combination of these. Establishment of joint structures is a governance tool, although, for instance, the EGTC is a legal tool. However, establishing an EGTC implies a solution related to governance issues.

Table 5-1: Overview of tools described in the toolbox

Groups of tools[42]	Approaches to solutions	Tools
Legal *(Chapter 2 of the toolbox)*	EU-level legislative action on transport and CBPT	• EU-wide harmonisation of legal frameworks
		• Introduction of European Cross-Border Mechanism (ECBM)
	National-level legislative action on transport and CBPT	• Application of the European Cross-Border Mechanism: Commitment and Statement
		• Interstate agreements on the provision of services
		• (Coordinated) Amendment of national and regional legal frameworks
	'Pragmatic bridging' of shared problems	• Setting up one-sided transport associations to facilitate cooperation across the border

[42] The numbers refer to the chapters in the Toolbox file.

Groups of tools[42]	Approaches to solutions	Tools
Organisational / Governance *(Chapter 3 of the toolbox)*		• Cooperation between transport associations across the border
		• Establishment of a cross-border transport association
	Joint structures for managing CBPT	• Establishment of new joint organisations for different CBPT tasks
		• European Grouping of Territorial Cooperation (EGTC)
		• European Economic Interest Group (EEIG)
		• Key contact person/organisation as multiplier and one-stop-shop
	Collaboration between key actors	• Political support from local and regional players
		• Networks and permanent working groups or roundtables with relevant players
		• Other cross-border structures for stable cooperation
Planning *(Chapter 4 of the toolbox)*	Establishing new CBPT or consolidating existing CBPT	• Coordination and integration of domestic timetables
	Joint planning activities	• Lobbying towards national and regional governments and EU institutions
		• Elaboration of a joint strategy for developing and planning CBPT
		• Better coordination of domestic infrastructure planning
	Joint knowledge base	• Database with experience from other regions' CBPT
		• Factsheets on own activities in relevant languages
		• Analysis of framework conditions (e.g. legal/regulatory context)
		• Monitoring of recent and ongoing developments (e.g. cross-border flows, political processes)
		• Identify funding opportunities (e.g. Interreg, CEF)
Information and marketing *(Chapter 5 of the toolbox)*	Demand-related measures to stimulate a greater use of CBPT	• Multilingual information about the border region, its destinations and activities
		• Integrated offers
Ticketing *(Chapter 6 of the toolbox)*		• Target group-oriented ticketing
	Stronger integration or coordination of domestic tariff systems	• Consideration of differences in fare levels and national ticketing systems
		• Cross-border tariff systems, unilateral extension of domestic tariff systems and cross-border tickets
Technical *(Chapter 7 of the toolbox)*	Harmonisation of technical standards	• Physical infrastructure (e.g. missing links, platform heights, electrification of railway)
		• Rolling stock and their equipment (e.g. ticket validation)

Source: Service provider, own elaboration

The objective of the toolbox is to offer guidance and information to stakeholders involved in CBPT development or provision. Each tool is described using a standardised structure for points summarised in Figure 5-2. Thus, the toolbox is a starting point for action to develop new or improved CBPT rather than a step-by-step guide. It gives examples for further inspiration. As such, the toolbox is one element to help those developing CBPT. This way, the toolbox may be used more flexibly at different stages and for different aspects of CBPT development. The tools described in the toolbox are 'building blocks' that can be combined in different ways. Further visual illustration of combinations of solutions may give inspiration on how to use the toolbox. There are cross-references in the toolbox to further information sources, while case studies and obstacles link the toolbox with the other deliverables of the present study.

Figure 5-2: Structure of tool factsheets

Name of the tool	
Type of tool	Legal / administrative / organisational & governance / planning / information / technical / ticketing
Relevant obstacles	Obstacles from task 2 (legal, political, organisational, administrative, geographic / socio-economic / …)
Specific type(s) of adverse effect	Sub-groups of obstacles from task 2 to further specify the obstacle
Phase	Planning / Development / Implementation / Provision
Modes of transport	Train / Bus / Tram / Ferry / combination
Geographical coverage	Border relations (e.g. between specific countries)
Other relevant tools	Solutions and tools often combined with the tool
Short description of the tool, including objectives and obstacles (task 2) Requirements, success and failure factors Possible achievements Practical examples of application from task 3.1	
Further information: Links / literature / references	

Table 5-2 shows common links between groups of obstacles with the tools, which facilitates the search for tools to tackle a specific obstacle. The links are not exhaustive and may not include all obstacles within a group.

Table 5-2: Frequent solutions by type of obstacle

Groups of tools	Tools	Obstacles / problems due to …						
		unprofitable CBPT / lack of finance	difficult territorial context / lack of demand	inadequate ticket pricing / lack of tariff integration & information	diverse governance systems	sub-optimal CBPT development	inadequate railway infrastructure / lack of inter-operability	suboptimal timetable coordination
Legal	EU-wide harmonisation of legal frameworks						X	
	Introduction of European Cross-Border Mechanism (ECBM)				X			
	Application of the European Cross-Border Mechanism: Commitment and Statement				X			
	Interstate agreements on the provision of services	X			X	X		
	(Coordinated) Amendment of national and regional legal frameworks	X			X	X	X	
Organisational / Governance	Setting up one-sided transport associations to facilitate cooperation across the border		X	X	X			X
	Cooperation between transport associations across the border		X	X				X
	Establishment of a cross-border transport association			X	X	X		
	Establishment of new joint organisations for different CBPT tasks			X	X	X		X
	European Grouping of Territorial Cooperation (EGTC)			(X)	X	X	(X)	
	European Economic Interest Group (EEIG)			X	X	(X)		
	Key contact person/organisation as multiplier and one-stop-shop			X	X	X	X	
	Political support from local and regional players	X		X	X	X	(X)	

Groups of tools	Tools	Obstacles / problems due to …						
		unprofitable CBPT / lack of finance	difficult territorial context / lack of demand	inadequate ticket pricing / lack of tariff integration & information	diverse governance systems	sub-optimal CBPT development	inadequate railway infrastructure / lack of inter-operability	suboptimal timetable coordination
	Networks and permanent working groups or roundtables with relevant players	X	X	X	X	X	X	X
	Other cross-border structures for stable cooperation			X		X		X
Planning	Coordination and integration of domestic timetables		X	X	X	X		X
	Lobbying towards national and regional governments and EU institutions	X			X		X	
	Elaboration of a joint strategy for developing and planning CBPT	X	X	X	X	X	X	X
	Better coordination of domestic infrastructure planning				X	X	X	
	Database with experience from other regions' CBPT	X	X	X	X	X	X	X
	Factsheets on own activities in relevant languages	X			X		X	
	Analysis of framework conditions (e.g. legal/regulatory context)	X	X	X	X	X	X	X
	Monitoring of recent and ongoing developments (e.g. cross-border flows, political processes)	X	X	X		X		X
	Identify funding opportunities (e.g. Interreg, CEF)		X			X	X	
Information and marketing	Multilingual information about the border region, its destinations and activities		X	X		X		X
	Integrated offers		X	X		X		X
Ticketing	Target group-oriented ticketing		X	X				

Groups of tools	Tools	Obstacles / problems due to …						
		unprofitable CBPT / lack of finance	difficult territorial context / lack of demand	inadequate ticket pricing / lack of tariff integration & information	diverse governance systems	sub-optimal CBPT development	inadequate railway infrastructure / lack of inter-operability	suboptimal timetable coordination
	Consideration of differences in fare levels and national ticketing systems		X	X		X		
	Cross-border tariff systems, unilateral extension of domestic tariff systems and cross-border tickets			X	X			
Technical	Physical infrastructure (e.g. missing links, platform heights, electrification of railway)		X			X	X	
	Rolling stock and their equipment (e.g. ticket validation)						X	

Source: Service Provider, own elaboration based on CBPT obstacles inventory data

6 Conclusions and policy pointers

This chapter offers **policy relevant findings that bring together insights from all tasks of the study**. This study's objective is to improve the tools at the disposal of public authorities and other stakeholders, to promote the development of (new) CBPT services in border regions. To achieve this, the analysis includes:

- the development and analysis of a comprehensive inventory of existing CBPT within the European Economic Area (EEA) that for the first time offers a visual overview of CBPT in Europe;
- the development and analysis of an inventory of obstacles to the implementation of CBPT to shed light on potential challenges and solutions to CBPT development;
- in-depth analyses of CBPT case studies showing practical applications; and
- potential tools to support planners and implementers addressing obstacles to CBPT service development.

Large variety of CBPT services in the EEA shows potential service gaps

The analysis of the CBPT inventory shows large diversity of CBPT across Europe. Of particular interest may be **border sections that are currently not permeable, but where there is a demand for CBPT services**. New transport services here could lead to a comprehensive improvement in permeability of the entire border and in turn contribute most effectively to improving accessibility in border regions for the benefit of citizens. The most prominent examples are in some parts of the Upper Rhine, partially along the French-Belgian and Belgian-Dutch borders and a few segments of the French-Swiss border. There are local cases in the agglomeration area Bratislava-Győr-Vienna, at the Italian-Slovenian and Slovenian-Croatian border and partially between Poland and Slovakia. Addressing this lack of CBPT would lead to an improvement of these countries' overall border permeability by increasing the share of border segments with good permeability.

Following the priority to establish services in non-permeable border segments but with latent demand, CBPT inventory analysis hints at **further service gaps**, especially in regions with CBPT experience. Indeed, the CBPT inventory shows that nearly all borders have some CBPT. So, solutions exist for all borders at least to some extent. **Particular attention should be given to borders with no or very limited bus services**, that may result from specific challenges despite a potential demand. Examples are the border between Bulgaria and Romania or in the Baltic States. For instance, the Estonian-Latvian twin city Wałk-Valka does not have any CBPT services despite being a similar size as other twin cities in Europe with such services. Such cases should be revisited to examine the potential benefits of CBPT.

CBPT can benefit from better integration to overcome some obstacles

Looking into the geographic details of CBPT service provision, i.e. stops, the CBPT inventory reveals that even though many CBPT exist on a border, they are often poorly embedded in domestic services. The lack of integration relates to aspects such as stops served, the location of stops (i.e. CBPT stops are away from stops of national services), lack of coordinated timetables and frequencies, lack of integration into domestic ticketing systems, increased fares as well as different operating times (during the day and throughout the year). This lack of integration reduces the benefits of many services and is visible in many obstacles. Addressing the **integration of CBPT in domestic networks**, where both exist, contributes to increasing the attractiveness of public transport compared to individual motorised transport, serving wider policy objectives of the EU Green Deal. Thus, regions with domestic and CBPT services lacking integration may focus first on this **demand-oriented integration before aiming at additional transport links and services**.

Examples are, for instance, at the German-Dutch border or in the Øresund Region between Denmark and Sweden.

Integration has several dimensions. It may concern tariffs, timetables of connecting services or intermodal integration with domestic services. The latter has not been a focus of this study but is relevant for smooth public transport in cross-border regions, especially rail and bus links. Ferries are often not well connected to other modes, not least due to the additional infrastructure required. Such lack of integration with domestic services and across modes is visible for instance if public transport users must walk across the border, even if the domestic line timetables are coordinated. While this coordination is beneficial for citizens as it reduces travel time, it still shows a lack of CBPT service provision that could yield more benefit for citizens.

Case study insights illustrate concrete options for action

Case studies illustrate further potential for integration that could yield more benefits for border area citizens and/or make CBPT services more viable. Examples are cross-border bus services with specific target groups:

- **Tourist buses** lack integration with local public transport. Better coordination of public transport timetables could enhance the attractiveness of these services and contribute to the viability of tourist buses beyond peak seasons.
- A bus serving **commuters** between Hungary and Slovakia is available to the general public but only used by employees due to limitations of the service. Operating hours and final stops are designed to serve employees of a specific factory. Extending operating hours and the final stop could enhance attractiveness for other citizens.
- Buses primarily targeted at facilitating cross-border transport for **students** tend not only to offer operating hours unsuitable for other citizens, especially if they do not operate on weekends or during school holidays.

While these examples show CBPT shortcomings, such **targeted services can be good starting points to verify the potential demand and collect experience before putting the CBPT on a broader basis**. Keeping long-term objectives and potential benefits of CBPT in mind, such approaches may help to get stakeholders involved and may be easier to establish than more complex solutions. Based on such experience, further integration and extension may be easier to implement.

Combining tools as 'building blocks' helps tailor-made solutions

These findings show that developing sustainable CBPT that successfully meets local and regional demand requires **tailor-made solutions** that address border-specific problems. Solutions must be adapted to the local and regional context (e.g. territorial-structural features, legal-institutional settings) and should include different types of action depending on the problem. Different 'building blocks' as described in the **toolbox** contribute to developing such tailor-made solutions. To identify potentially useful combinations, the seven main groups of obstacles identified in the study may help:

- diverse public transport **governance systems** and complex administrative procedures;
- inadequate cross-border integration of **domestic tariff systems** and suboptimal **passenger information**;
- unprofitable CBPT or other **adverse financial effects**;
- inadequate railway **infrastructure** or inadequate interoperability;
- unfavourable **territorial context conditions**;
- **suboptimal** cross-border services; and
- suboptimal **timetable coordination**.

Guidance targeting each of these groups of obstacles may further enrich the inspiration of hesitant stakeholders.

Tailor-made solutions may go beyond combining tools

The analysis yields conclusions that could be relevant for specific cases and serve as additional eye-openers:

- To make services more viable, operators use **strategic alliances**, such as with tourism ferries. To reduce efforts for potential customers, they may join with tourist associations selling ferry tickets together with other services. Similarly, providers of CBPT with a smaller target group (e.g. school buses, employee transport) can benefit from strategic alliances. The partners may be outside the transport sector and address coordinated marketing of CBPT services or develop attractive offers. The ARPAF[43] project 'Crossborder' gives hints of this for mobility management from the perspective of a regional company.
- Another approach to obtaining experience and knowledge of CBPT can be the **interaction of public stakeholders with private operators**. In Europe many long-distance bus services also serve border areas and are thus considered as CBPT. The analysis reveals some ambivalence concerning these services. They improve accessibility in border areas, which is positive for EU integration and creates benefits for several border regions. However, they usually lack the involvement of local and regional stakeholders, and these services are subject to profitability. Interaction with these private operators may create benefits on both sides. Local and regional stakeholders can raise awareness about the services in the cross-border region to encourage profitability and thus sustainability of the lines in the border areas. Also, regional stakeholders may develop feeder services and thus work on a better domestic integration of long-distance services. At the same time, this interaction may fill the gap of experience and knowledge to get more familiar with the challenges of CBPT, even if these differ between local lines and long-distance services.
- **TEN-T planning for railway links are ambivalent for border regions**. On the positive side is the infrastructure development. But it also brings risks to border regions, since TEN-T looks primarily at time savings between agglomerations rather than at the local and regional level. This may call for bottom-up initiatives, e.g. by cross-border institutions, to include the regional cross-border perspective in the planning for railway services along TEN-T corridors from the beginning. A proper planning for regional CBPT rail services (in addition to long-distance rail) may then even increase profitability of the TEN-T link.

Tools include actions for a better knowledge base

Around half the survey respondents indicated that legal and administrative obstacles simultaneously create difficulties for setting up or operating CBPT (48%), often also in combination with other problems. Many survey respondents indicating administrative obstacles frequently refer to other problems. In addition, the analysis revealed different assessment of EU legislation adequacy between practitioners and the literature. These findings hint at **limitations or a lack of knowledge, experience or understanding** for CBPT. This could be addressed at different levels through targeted actions. In many cases this could even imply knowledge creation actions from e.g. EU and regional levels.

Knowledge creation may be initiated at EU and cross-border level

The **EU level can contribute to this by**:

- providing information and communicating the benefits of CBPT in other regions;
- sharing information on the normative basis for CBPT in border regions per country. For all countries this could include information on responsibilities, national

[43] ARPAF is the acronym of the Alpine Region Preparatory Action Fund that supports EUSALP Action Groups in implementing their work plans (https://www.alpine-region.eu/publications/alpine-region-preparatory-action-fund-arpaf).

legislation, etc. to facilitate knowledge creation. Enhancing use of the EGTC instrument builds on such information provision through CoR.[44]

- promoting cross-border and flow data. Showing potential demand can trigger CBPT initiation. The permeability analysis offers first hints, but additional flow data could support this normative analysis. In case of one-sided high demand, stakeholders from the 'other' side with low demand needs to be actively approached to create common problem understanding and convince them of the mutual benefits of establishing a CBPT.
- advocating territorial impact assessments on the broader impact and added value of cross-border transport connections. Such assessments of regions make benefits visible that remain hidden when analysing a single CBPT line. For this assessment other developments (e.g. environmental conditions, labour market, urban development) matter as well. The aim of such assessments is to showcase the value added of CBPT, for instance by visualisation (infographics) rather than case descriptions. This showcasing may be at different levels to achieve effective storytelling and should be less about best practices, but more to help start a dialogue and give food for thought. Such approaches may also help address the domestic focus many stakeholders have. Changes in spatial planning are an example of how this refocus can be achieved.

Cross-border entities such as Euroregions can contribute by embedding transport issues in their territorial context. Practical experience shows yet another role for **cross-border entities.** They can be key to bringing stakeholders together. Although they usually lack competences for CBPT services, their capacities, networks and cross-border perspective help initiate and develop CBPT.

Turning obstacles into possibilities

Often actors from border regions are too quickly discouraged by obstacles instead of seeing them as an opportunity or starting point for a CBPT. Structural differences, such as different population densities on both sides of the border could generate demand for specific transport services, and different wage or price levels could be actively exploited in the provision of the service, to name just two examples. Ultimately, a change in awareness must be created among actors so that obstacles are not just understood as disadvantage but as opportunity.The European Commission and cross-border entities will have to play a key role in this process, in disseminating knowledge and best practices, and in engaging with the actors from the border regions.

[44] See https://portal.cor.europa.eu/egtc/about/Pages/National-dispositions.aspx

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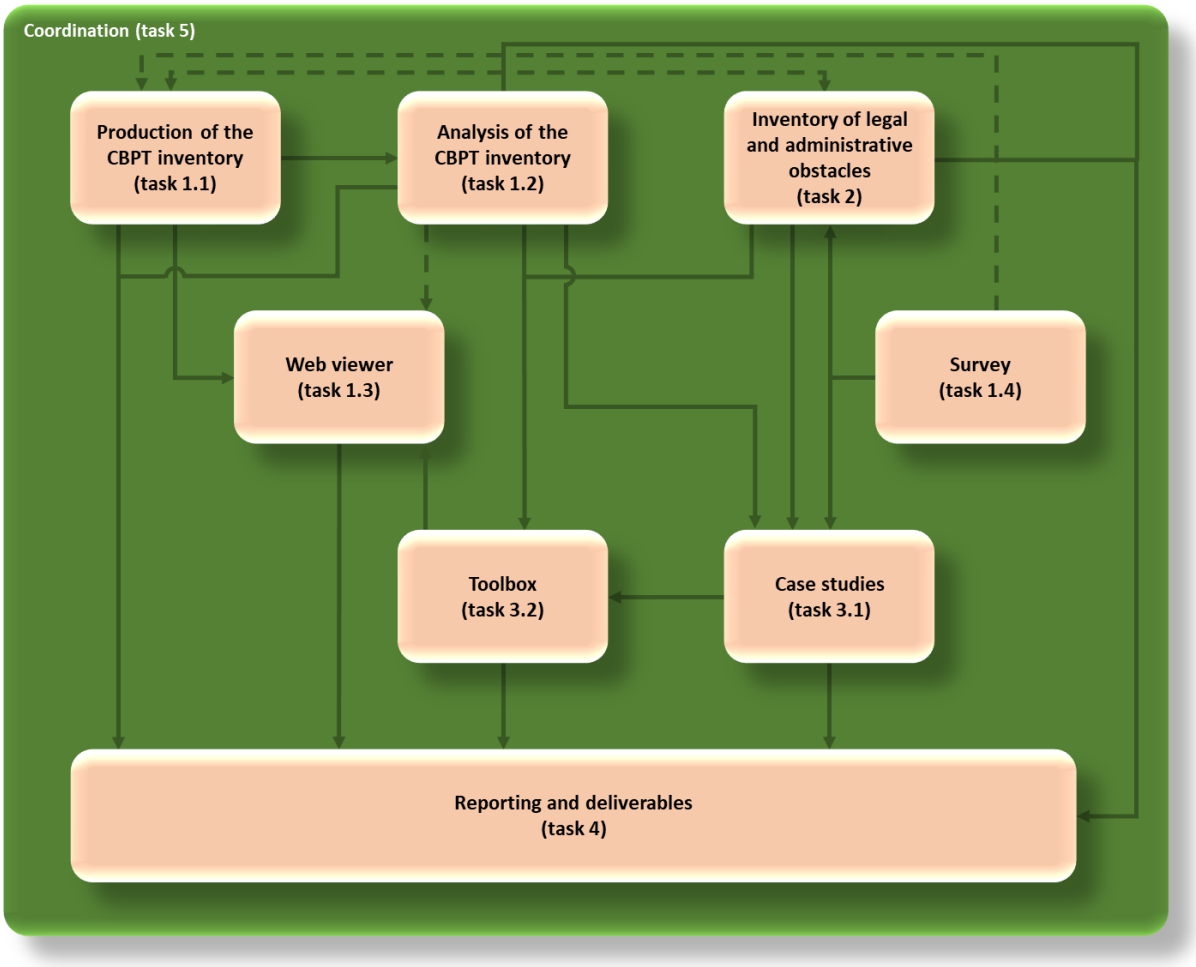
7 Annex – Study process and methodology

The objectives of this study were a stocktake of existing CBPT, an inventory of legal and administrative obstacles for CBPT and developing a toolbox for planners and CBPT implementers. To achieve this, three tasks provide the input for all reporting and deliverables as summarised in the figure below. The three tasks match the three study objectives. They were further divided to explicitly address all the analytical steps (e.g. task 1 consists of tasks 1.1 to 1.4).



The following sub-sections provide a summary of methodological steps and approaches that go beyond the literature and document reviews and interviews that were conducted throughout the study, especially for developing the inventory of obstacles, case studies and the toolbox. The sub-sections follow the task logic of the overall study process as provided above.

7.1 Data sources for the CBPT inventory

Compiling the inventory

The CBPT inventory used different data sources as described in this chapter.

To avoid potential impacts on service provision caused by the Corona pandemic, it was agreed to use timetables for the winter 2019/2020 period as far as possible, i.e., before the pandemic.

This inventory covers four modes of transport: railways, buses, ferries and trams.

The compilation started by extracting relevant cross-border services from central databases (MERITS, national GTFS feeds, PT operators, RRG GIS Database), resulting in a first version of the inventory. This version was used to develop the Web Viewer Application (Chapter 2.3). Stakeholders then used this application to review and check the initial inventory, providing feedback on missing services to the project team. This feedback was taken on board and further CBPT were added to the inventory by using distributed data sources such as websites, regional GTFS feeds, printed timetables and others. A deadline of 31 March 2021 was applied for receiving stakeholder feedback. Feedback after this date was not considered. Services which started after this date have also not been included in the CBPT inventory, including the

- Léman Express (Geneva-Annemasse, CH-FR);
- M1 bus line Hombourg-Hout (FR)-Saarbrücken (DE).

Any future update of the CBPT Inventory should take these services into account.

Rail services

Cross-border rail services for this inventory are largely based on MERITS data made available by DG REGIO.

The MERITS database, owned by UIC, contains integrated timetable data of many European and some non-European countries, with inputs from several hundred railway companies, which is published twice a week. It includes schedules of trains, a significant number of (inter-)regional and long-distance buses and some ferry services, altogether about 600,000 services in Europe. It also covers more than 67,000 stations and stops, including geo-coordinates and UIC location codes.

MERITS data includes information on rail transport services for 9 December 2018 to 14 December 2019 (371 calendar days).

From this database, 1,352 rail services compliant with the definition of cross-border services have been identified and included in the inventory. For these services, it was possible to analyse the frequency during the four seasons of the period and on each day of the week in the specific season. When available, additional information from MERITS related to the name of the company operating the service, the name of the service and the type (i.e., regional, intercity, night train etc.) was included in the inventory.

Stakeholder validation through the survey and with help of the Web Viewer highlighted some cross-border services not included in the MERITS database. To fill these data gaps, information on passenger rail services (i) collected by JRC and made available to the project team via DG REGIO, as well as (ii) derived from the sources indicated by stakeholders and compiled by the project team were used.

The analysis of JRC data allowed the identification of some other cross-border services (mainly operated by minor local rail companies) which were not included in the MERITS database. Following these checks, 62 services have been added to the inventory which currently includes 1,414 cross-border rail services.

Bus services

Cross-border bus services were compiled from different, national GTFS datasets. For some countries (France, Hungary, Italy), national GTFS feeds do not exist; instead, regional GTFS datasets were used. From these data, bus services complying with the definition of

CBPT were identified and extracted. Additional long-distance bus services were added from the MERITS database or directly from the operators (such as Flixbus, Eurolines, etc.).

Using different input data sets means that timetables are unfortunately not all available for the same period. As far as possible, timetables for winter 2019/2020, were used. In exceptional cases, however, more recent timetables such as for winter 2020/2021, had to be used. For the sake of clarity, the timetable used is indicated in the inventory.

Unlike the MERITS database for trains, which provides data for one year, a GTFS file usually provides information for a limited time period. This means, for bus services it is not possible to analyse frequencies for different times of the year (spring, summer, autumn, winter).

The inventory distinguishes between urban/regional bus services, long-distance and specialised services such as tourist or school buses.

Stakeholders validated the bus services with help of the Web Viewer. Through this feedback, another 147 bus services were added to the inventory. Detailed information was then taken from distributed data sources and manually integrated into the inventory[45].

Ferry services

Cross-border ferry services were obtained to a large extent from the RRG GIS Database[46]. Additional ferry services on Lake Geneva were taken from SKI/BAV (Switzerland) in GTFS file format. A few services were added based on survey feedback.

A basic distinction is between car and passenger ferries. The former cross major rivers such as the Rhine or Danube, or the sea, while the latter are services on lakes such as Lake Constance or Lake Geneva, mainly for tourism.

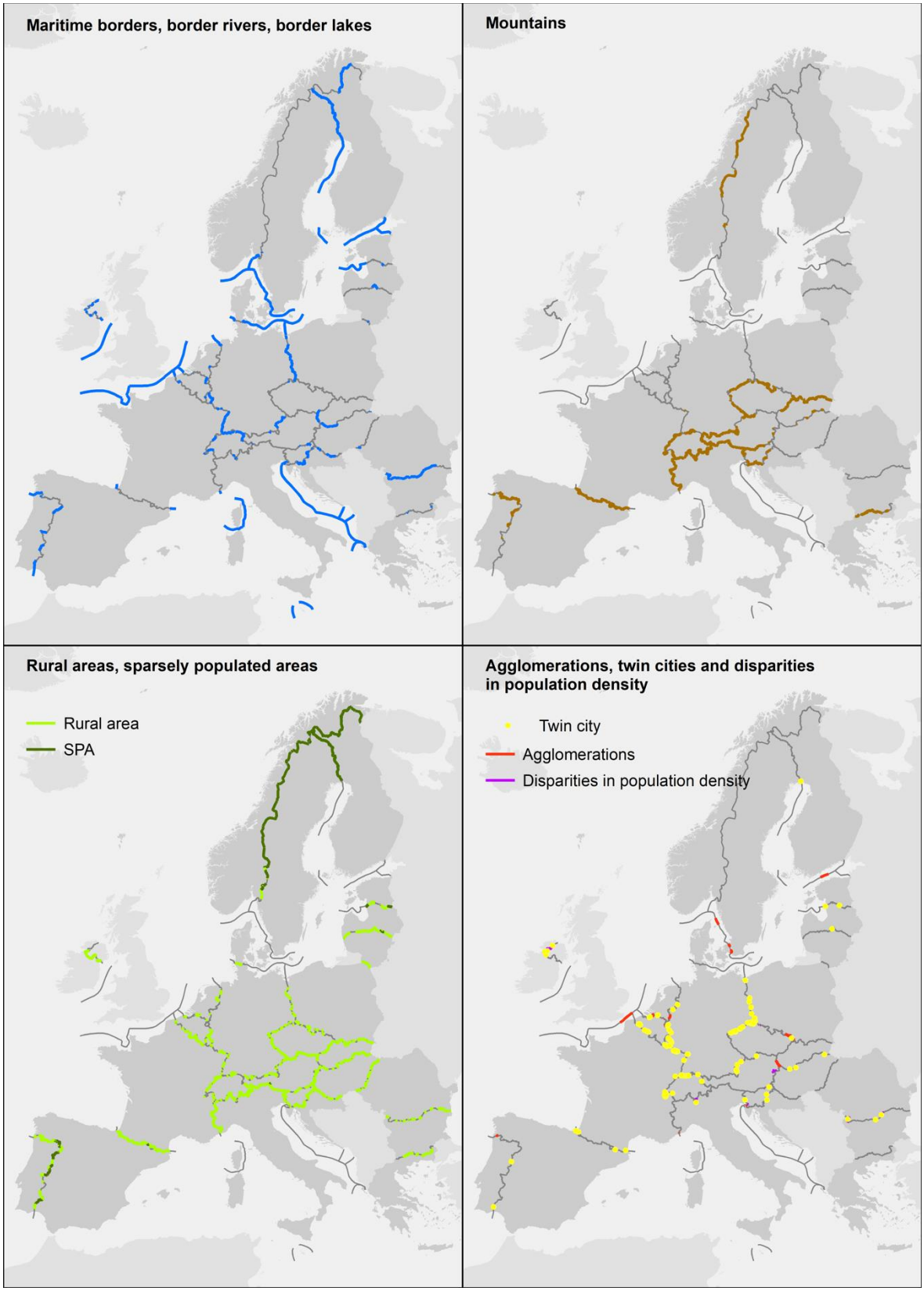
Tram services

Information on cross-border tram services were obtained from national or regional GTFS feeds; essentially the same as for bus services. This means the conditions as described above apply here. Tram services in the Geneva area have also been validated by stakeholders.

[45] In many cases the stakeholders indicated websites or other data sources; however, none of these sources were in GTFS format.
[46] http://www.brrg.de/database.php?language=de

7.2 Border specificities

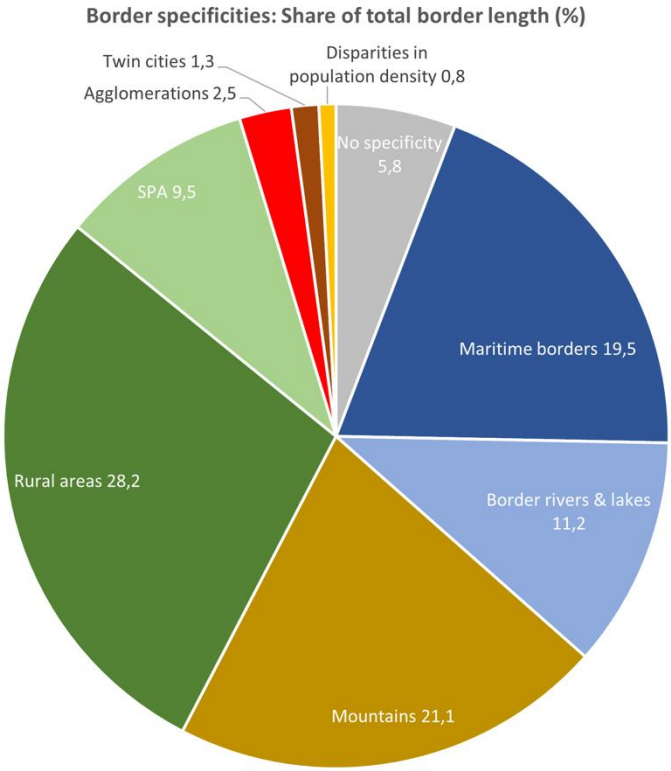
Figure 7-1: Overview of border specificities



Only 5.8% of national borders have no specificity (Figure 7-2). 28% of all border segments are in rural areas, the highest proportion, followed by 21% in mountain areas and 19.5% are maritime borders. Border rivers and lakes account for more than 11%, followed by 9.5%

in SPA. Agglomerations, twin cities and disparities in population density have only minor shares, of less than 2.5%.

Figure 7-2: Border specificities - share of total border length



7.3 Groups of countries

Figure 7-3: Border types by group of countries

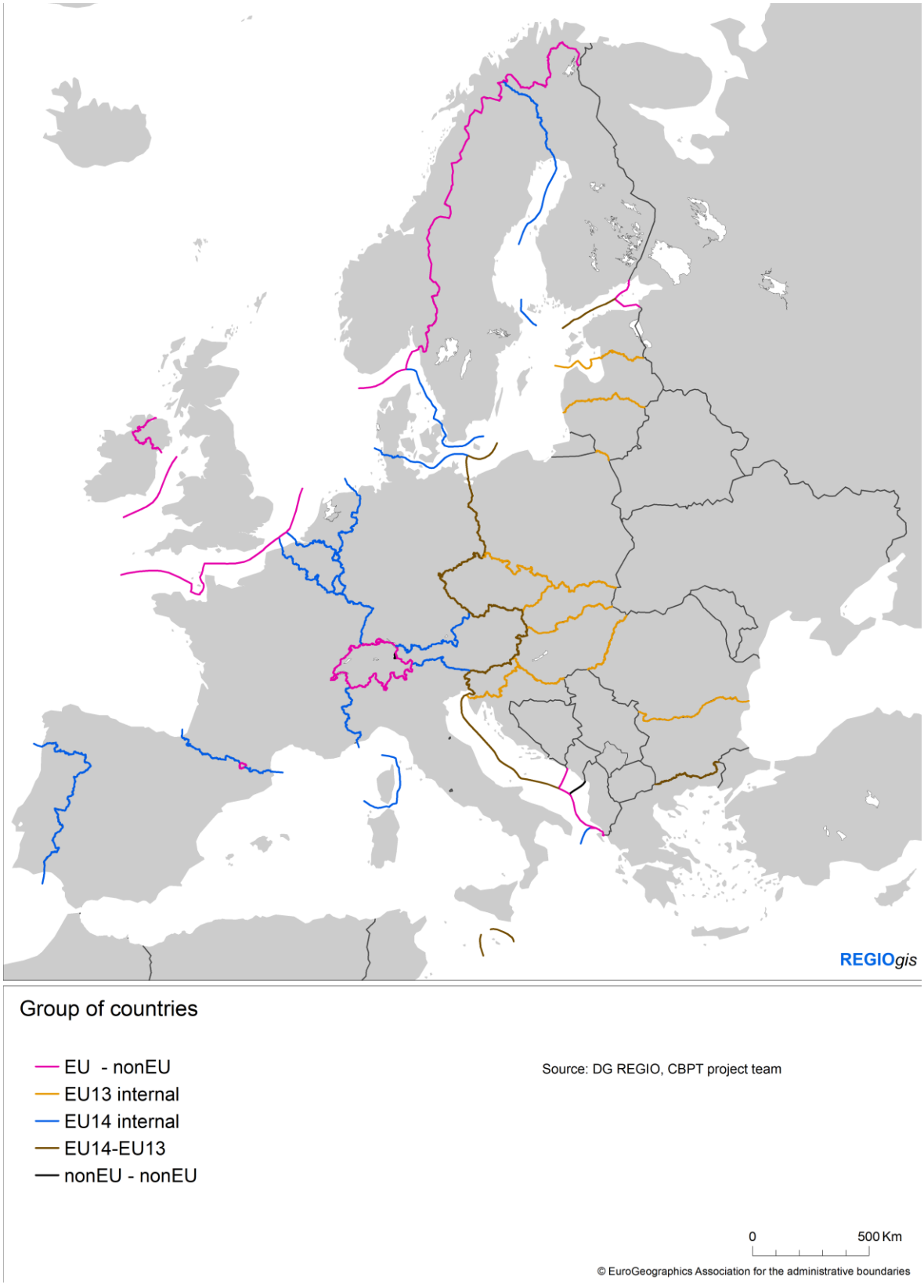
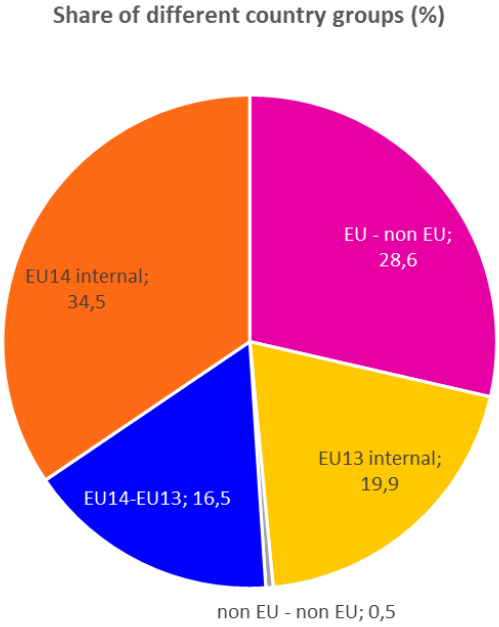


Figure 7-4: Share of country groups



Zoom-in maps of CBPT services

Figure 7-5: CBPT in the Alpine Space

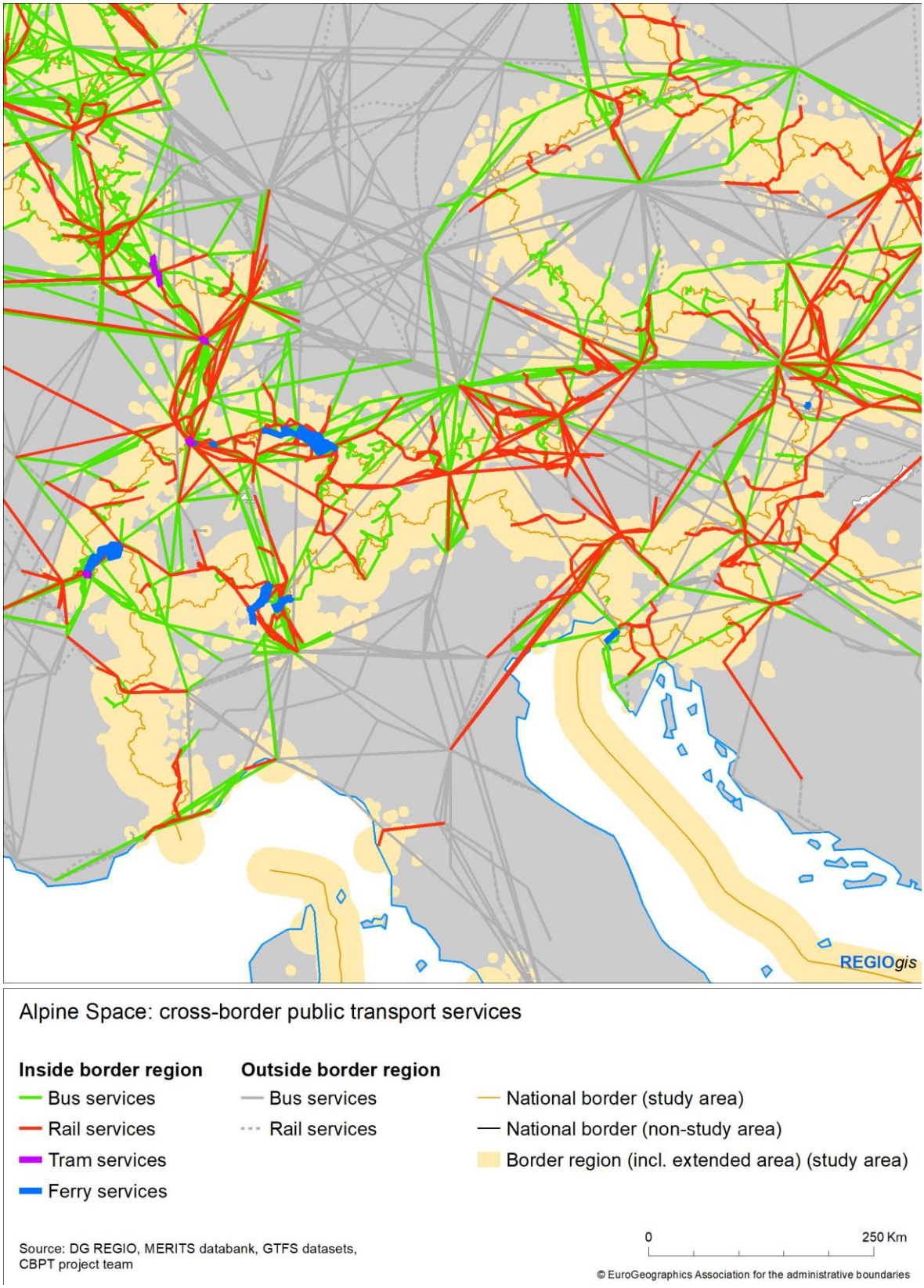


Figure 7-6: CBPT in the Baltic countries

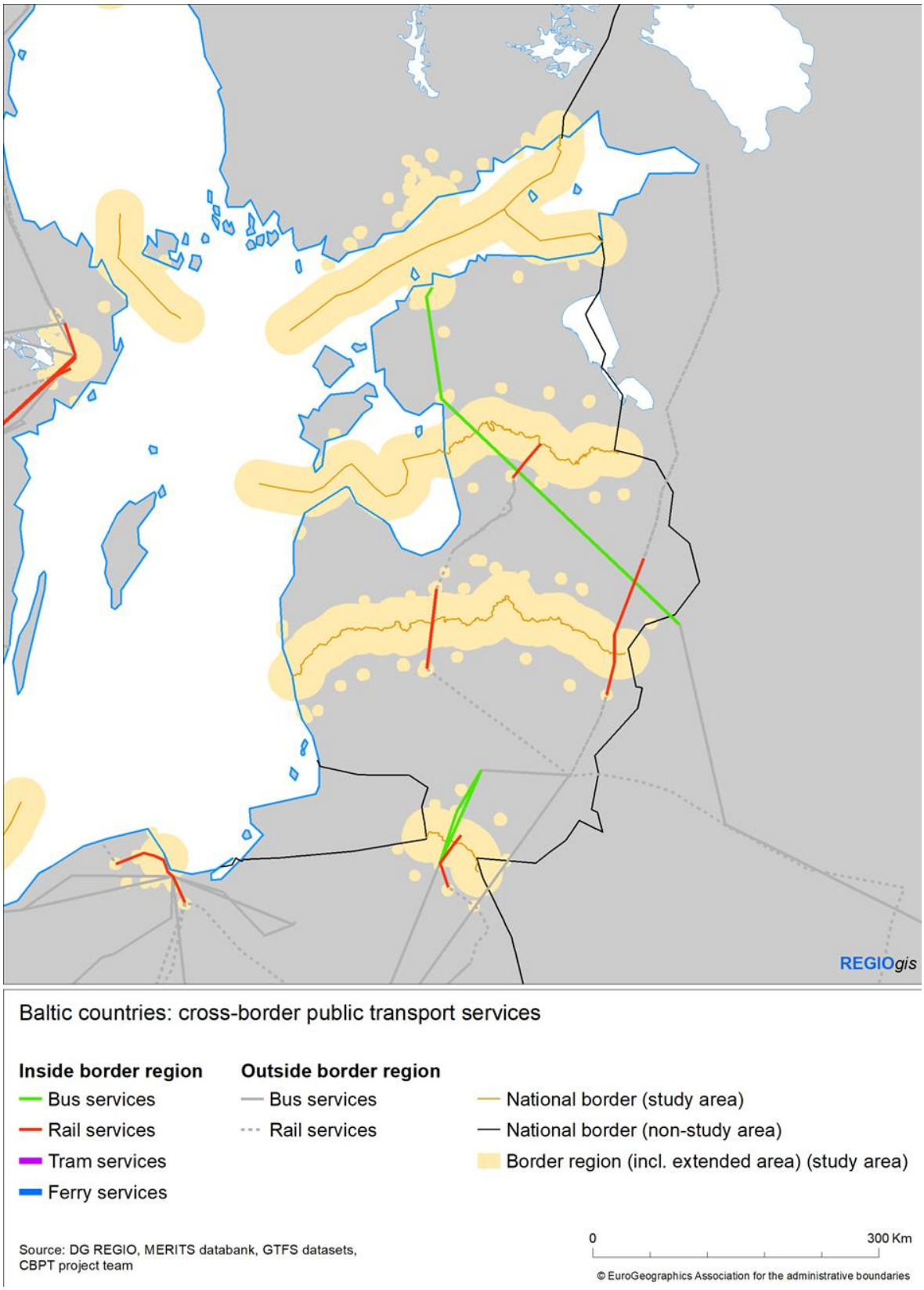


Figure 7-7: CBPT in the Benelux countries

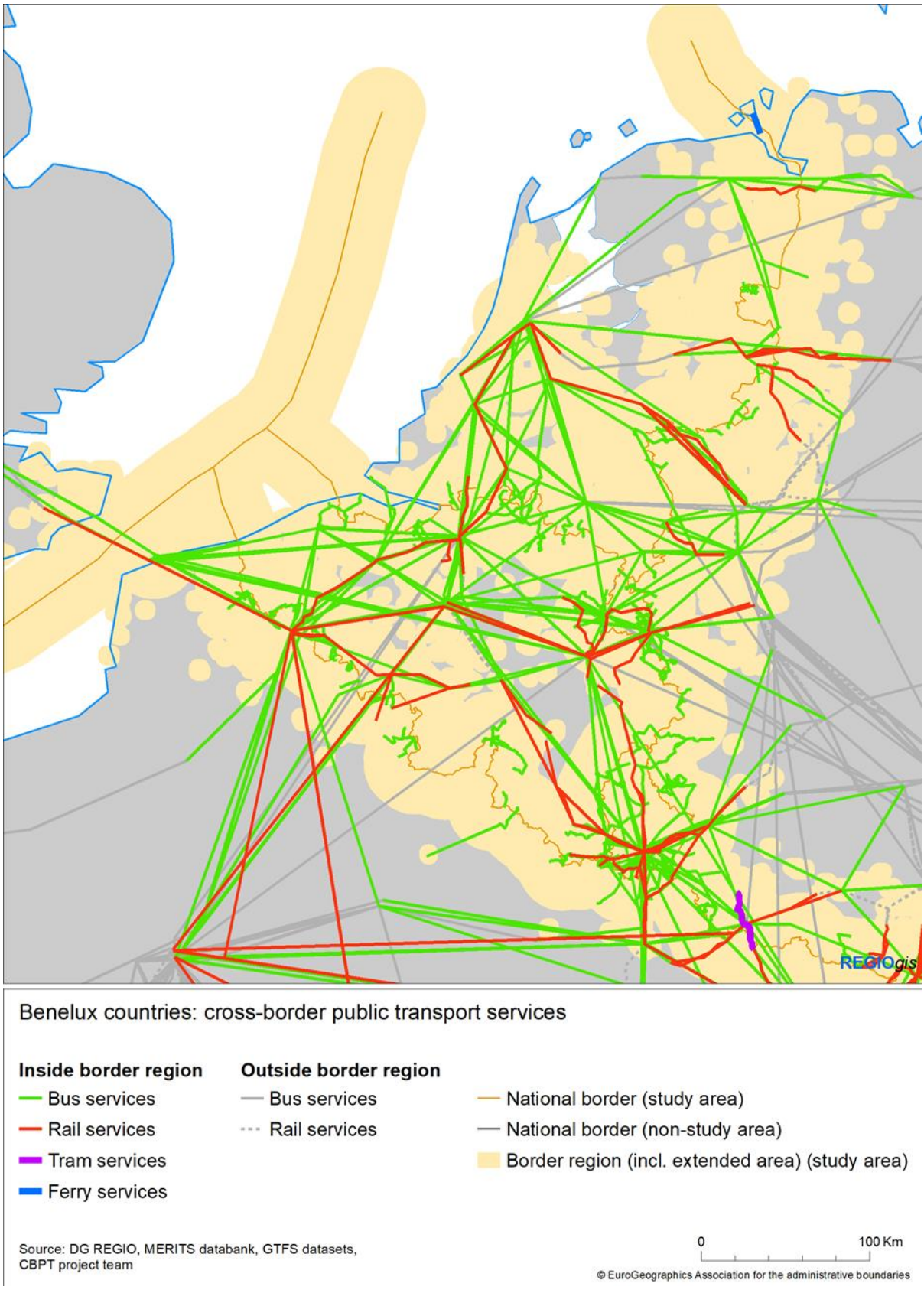
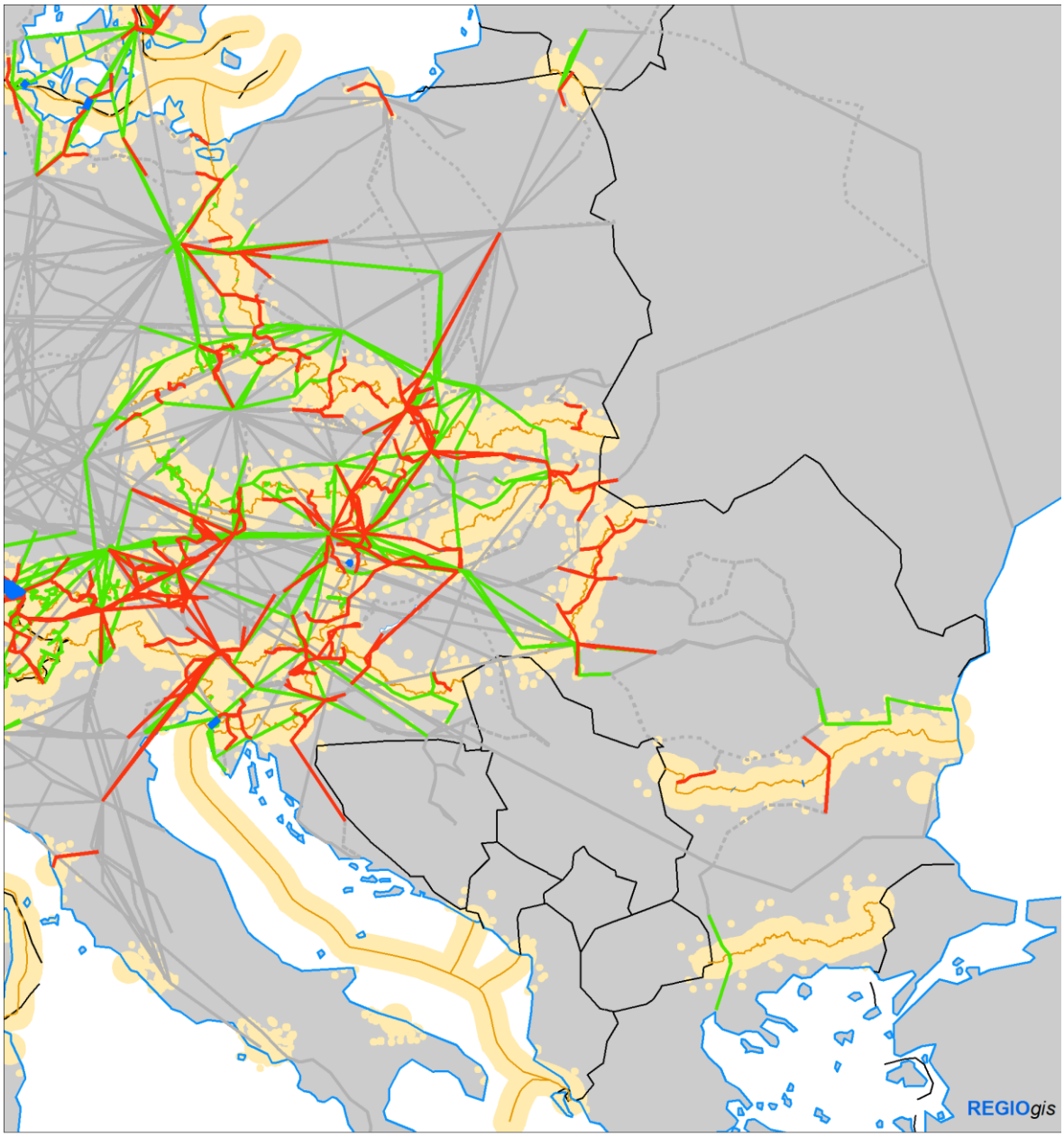


Figure 7-8: CBPT in Eastern Europe



East European countries: cross-border public transport services

Inside border region
- Bus services
- Rail services
- Tram services
- Ferry services

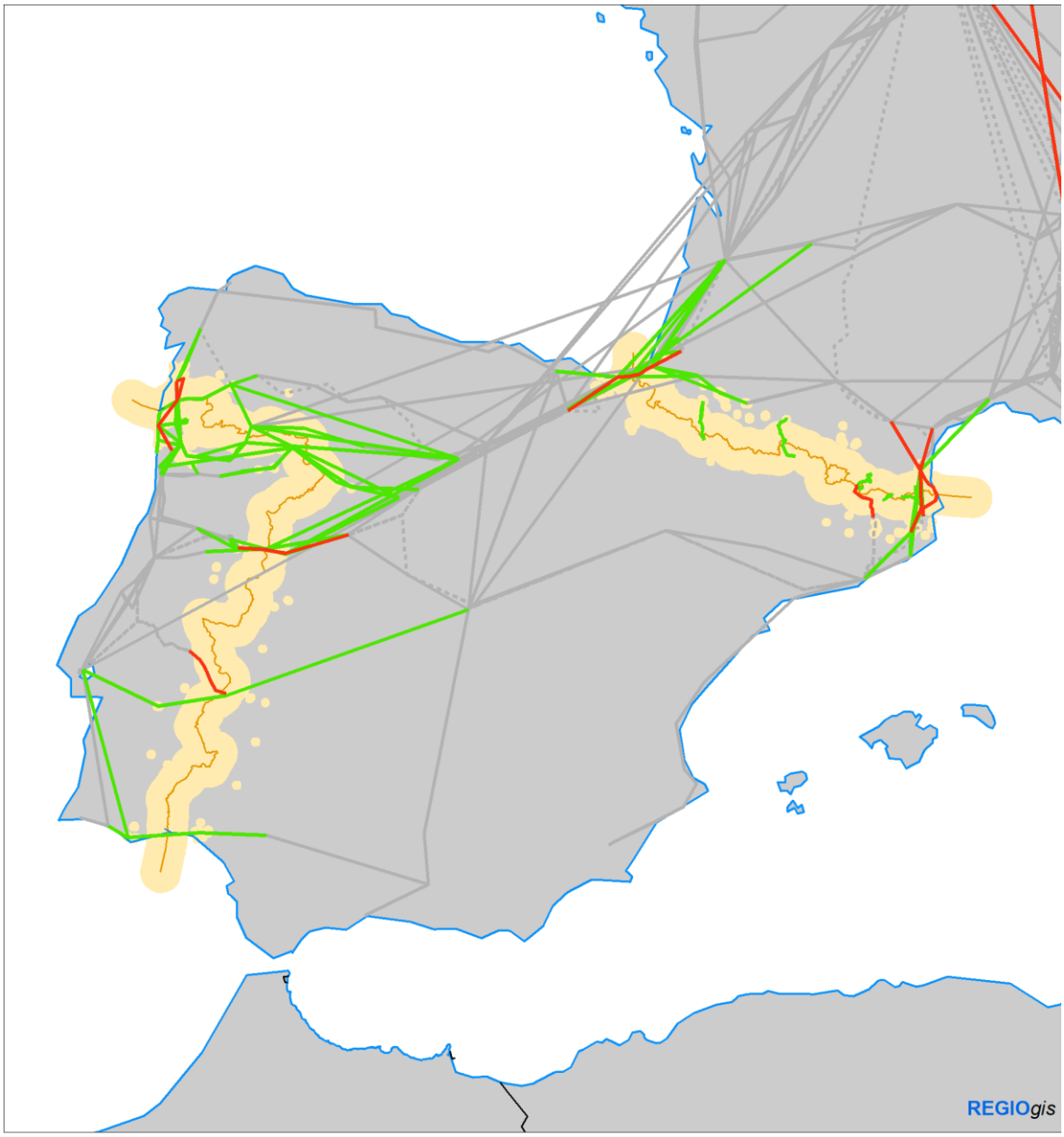
Outside border region
- Bus services
- Rail services

- National border (study area)
- National border (non-study area)
- Border region (incl. extended area) (study area)

Source: DG REGIO, MERITS databank, GTFS datasets, CBPT project team

0 400 Km

Figure 7-9: CBPT in the Iberian Peninsula



Iberian peninsula: cross-border public transport services

Inside border region
- Bus services
- Rail services
- Tram services
- Ferry services

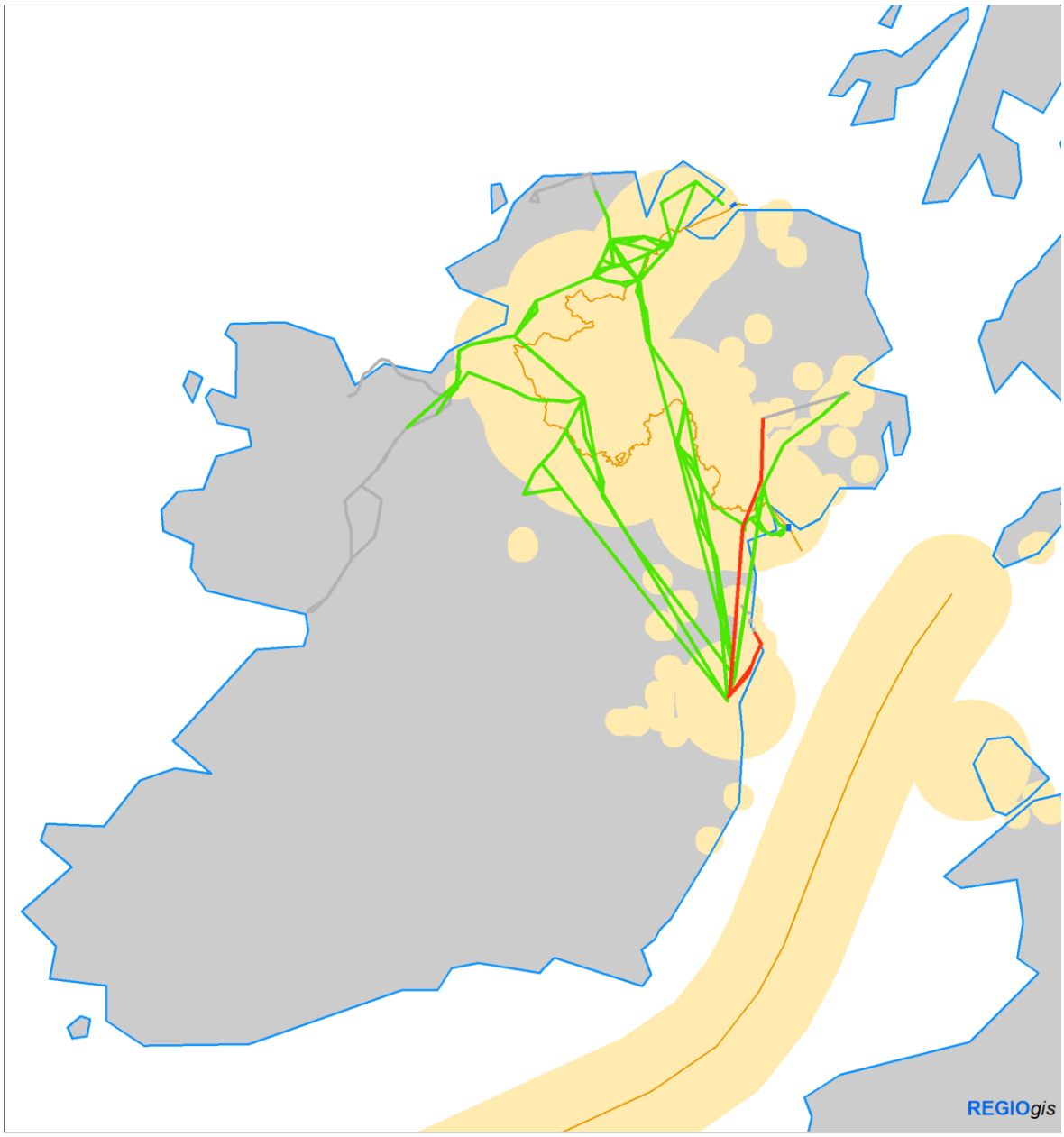
Outside border region
- Bus services
- Rail services

- National border (study area)
- National border (non-study area)
- Border region (incl. extended area) (study area)

Source: DG REGIO, MERITS databank, GTFS datasets, CBPT project team

0 400 Km

Figure 7-10: CBPT in Ireland and Northern Ireland



Ireland and Northern Ireland: cross-border public transport services

Inside border region
- Bus services
- Rail services
- Tram services
- Ferry services

Outside border region
- Bus services
- Rail services

- National border (study area)
- National border (non-study area)
- Border region (incl. extended area) (study area)

Source: DG REGIO, MERITS databank, GTFS datasets, CBPT project team

0 100 Km

Figure 7-11: CBPT in the Nordic countries

Nordic countries: cross-border public transport services

Inside border region
- Bus services
- Rail services
- Tram services
- Ferry services

Outside border region
- Bus services
- Rail services

- National border (study area)
- National border (non-study area)
- Border region (incl. extended area) (study area)

Source: DG REGIO, MERITS databank, GTFS datasets, CBPT project team

0 500 Km

7.4 CBPT inventory – Shapefiles: attributes

This Annex provides overview tables for the field structure of the eight shapefiles in the CBPT Inventory. Fields associated with the line or route shapefiles are presented in Table 7-1, fields associated with the stop, port or point shapefiles in Table 7-2. Note that not all fields are available for all modes.

Table 7-1: Fields associated with the lines and routes shapefiles

Field name	Field type	Content
LINEVARID or RouteID	Integer	Line/route number
LineName	Text	Line name
FStopID	Text	ID of origin, corresponds to STOP_ID of node shapefiles
FStopName, or ORIGIN	Text	Name of route origin
FStopCC, or FromCC	Text	2-digit ISO country code of the origin stop
TStopID	Text	ID of destination, corresponds to STOP_ID of node shapefiles
TStopName, or TERMINUS	Text	Name of route terminus
TStopCC, or ToCC	Text	2-digit ISO country code of the terminus
RTYPE	Integer	Type of service (according to Google classification)[47]
RTYPENAME	Text	Type of service (verbal expression)
SOURCE	Text	Name of data source
TIMETABLE	Text	Timetable where information was collected from (for instance, 'Winter 2019/2020')
WEBSITE	Text	Website url with further information
OPERATOR	Text	Name or abbreviation of service provider / operator
RouteName	Text	Official route name or number
GRouteID	Text	Route ID used in GTFS datasets
NoStops	Text	Number of stops (including start and terminus)
TYPE	Integer	Type of service: 1 = Urban / rapid transit train 2 = Regional train 3 = IC / EC high-speed train 4 = Urban and regional bus service 5 = Long-distance (express) bus service 6 = Special bus service (like tourist bus, school bus etc.) 7 = Tram service 8 = Car ferry 9 = Passenger ferry

[47] See https://developers.google.com/transit/gtfs/reference#routestxt and https://developers.google.com/transit/gtfs/reference/extended-route-types for a overview of codes available.

FREQ	Integer	Frequency of service: 1 = Several daily services on every day of the week 2 = Several daily services only on weekdays 3 = Several daily services only on weekends 4 = One service every day 5 = One service on weekdays 6 = One service only on weekends 7 = Several services per week (but not every day) 8 = Information n.a.
RunsDay	Integer	Number of runs per day (1 to X) -99 = Information n.a.
TARGETS	Text	Assessment of main target group of the service: BUSINESS = Business travellers COMMUTERS = Cross-border workers LEISURE = Visiting recreational/sport parks LOCAL/REGIONAL TRANSPORT PUBLIC = General public PUPILS = School children SHOPPERS = Visiting city centre / shops STUDENTS = Students TOURISTS = Tourists TRUCKS = Cargo transport *A service may target more than one group. Multiple groups separated by commas.*
BorderNo	Integer	Unique ID of border segment where the service crosses a border (corresponds to ID of border shapefile)
TEN_NET	Text	Flag to indicate whether the border crossing is on a TEN corridor: NO = Not located on a TEN corridor YES = Located on a TEN corridor
RelBord	Integer	Number of border crossings that correspond to criteria
VALID	Text	Flag to indicate the validation status: DISTRIBUTED = Service obtained from distributed, not central data source GTFS = Service obtained from GTFS feed MERITS = Service obtained from MERITS database VALIDATION 1 = Service validated by stakeholders *Different flags may be combined, for instance 'MERITS, VALIDATION 1' means that a stakeholder has confirmed a service that was obtained from the MERITS database*

CaseStudy	Integer	Flag to indicate whether service is a case study: 0 = No case study 100 = Service is a case study
GEOGRAPHY	Text	Geographical specificity of the border crossing: Blank = no border specificity AGGLOS = Border cuts through agglomerations BORDER_RIVER = Border is formed by a river MARITIME = Border consists of a large water body (lake, sea) MOUNTAINS = Border in a mountain area RURAL = Border in rural area RUR_URB = Disparities in population density with rural area on one side and urban area on the other side of the border. SPA = Border in sparsely populated area TWINS = Border cuts twin cities *Different combinations of these classes are possible. For example, 'BORDER_RIVER, TWINS' is where a border river cuts through a twin city.* *Annex 7.2 maps the border specificities.*
CC1_2	Text	Combination of two ISO country codes indicating where the service crosses a border. *For example, 'AT DE' = Austrian-German border* *Country codes separated by blank and ordered alphabetically*
OrigDest	Text	Combination of the two ISO country codes indicating the country of origin and country of destination.

For services which cross only one border, the country codes of the origin and terminus correspond to the country codes of the border crossing; for these, fields CC1_2 and OrigDest are identical. However, for long-distance services crossing multiple borders, the country codes of the origin and terminus differ from the individual border crossing.

Table 7-2: Fields associated with the point shapefiles

Field name	Field type	Content
STOP_ID	Text	Unique ID of the stop. Corresponds to FStopID and TStopID fields of route shapefile
STOP_NAME, or NAME1	Text	Stop, station or port name
NAME2	Text	Alias name

Field name	Field type	Content
STOP_LAT, or LAT	Double	Latitude of stop location
STOP_LON, or LON	Double	Longitude of stop location
COUNTRY, or CC	Text	2-digit ISO country code where the stop is located
LOCODE	Text	Official port location code (only for selected ports)
TYPE	Integer	Stop type: 1 = Train station 2 = Bus stop 3 = Tram station 4 = Ferry port

7.5 Web viewer application user manual

The interactive web viewer application visualises the CBPT Inventory and selected results of its analyses (project outcomes). The application was also used by stakeholders to validate the inventory.

The web viewer was published on 25 January 2021 at www.crossbordertransport.eu.

On top of a base map provided by the European Commission, it displays information on CBPT services for all four modes in the inventory.

Working with the layers

The application has two main parts. On the left is a pane providing the list of layers and the legend. The rest is the interactive map.

Visibility of layers by mode can be turned on and off in the layer pane to show or hide the services (see Figure 7-12 – Figure 7-15).

Different base maps can be selected while fixed layers show the borders, the border region (25 km buffer from the border line) and the 'extended border region' (including towns and cities whose distance from the border region is less than 25 km).

Figure 7-12: CBPT ferry services

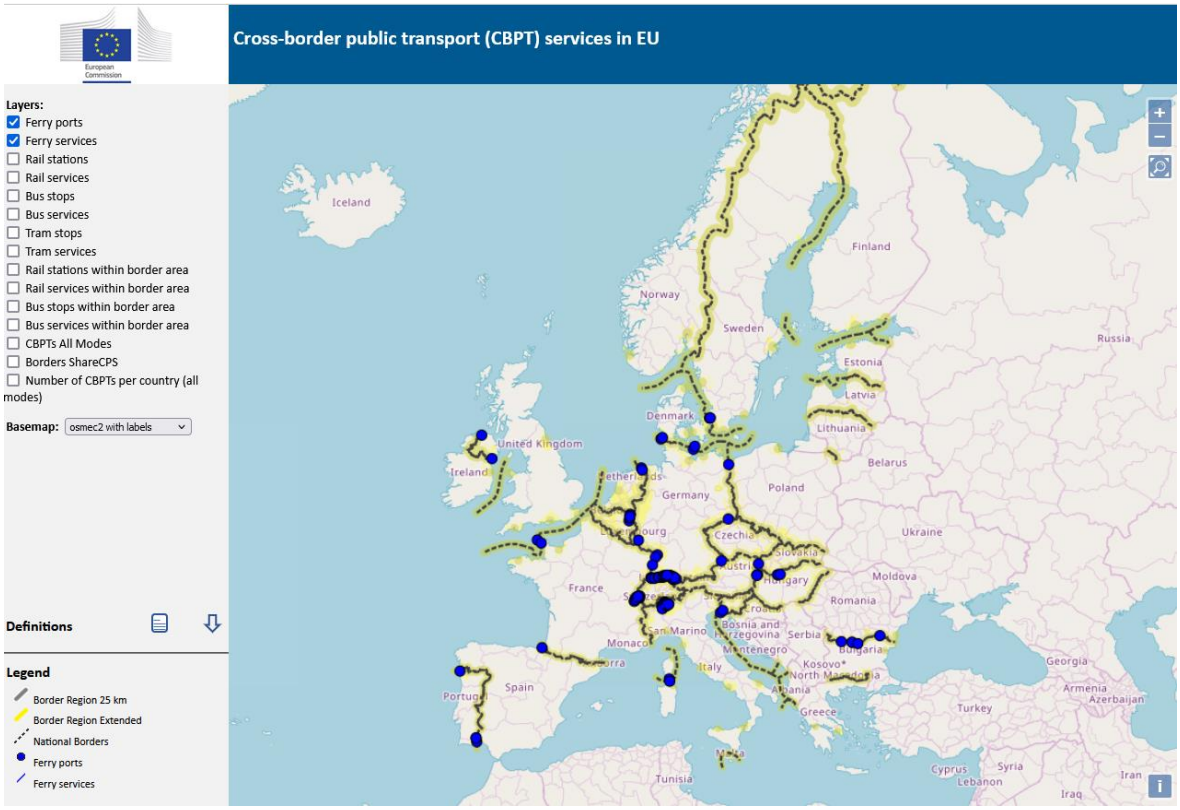


Figure 7-13: CBPT tram services

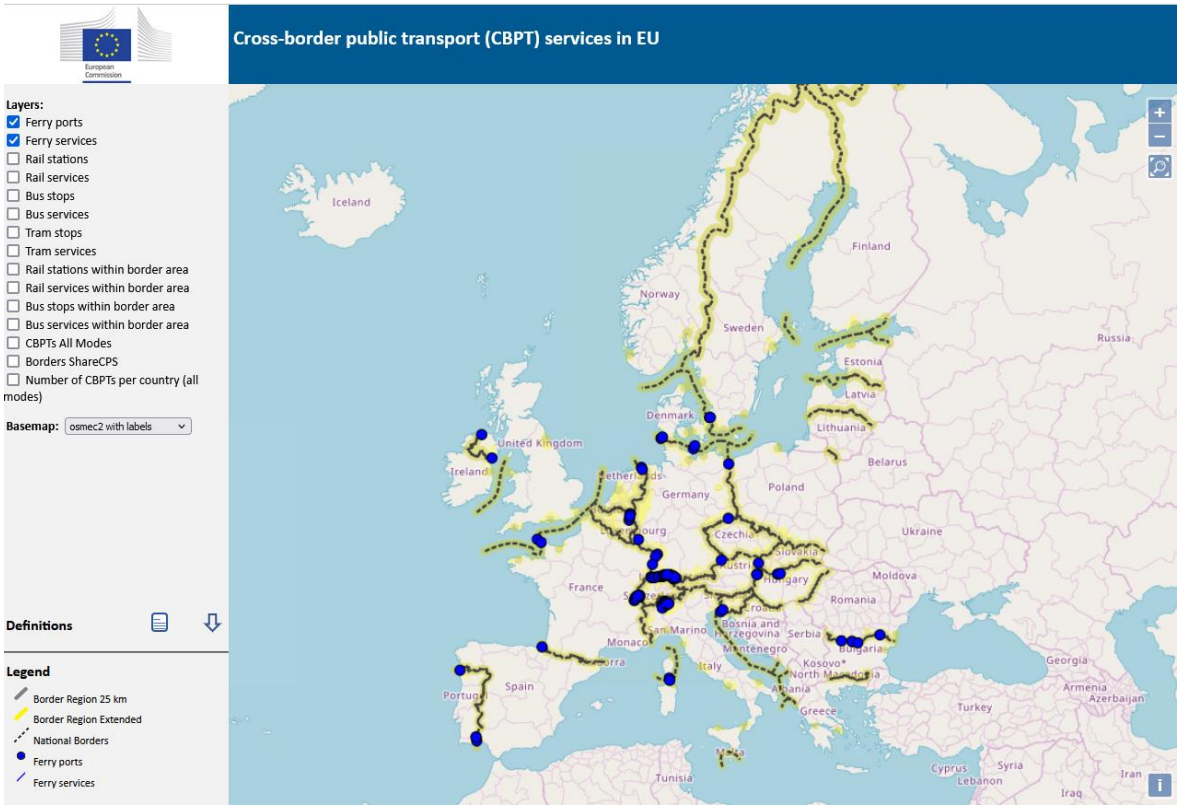


Figure 7-14: CBPT rail services

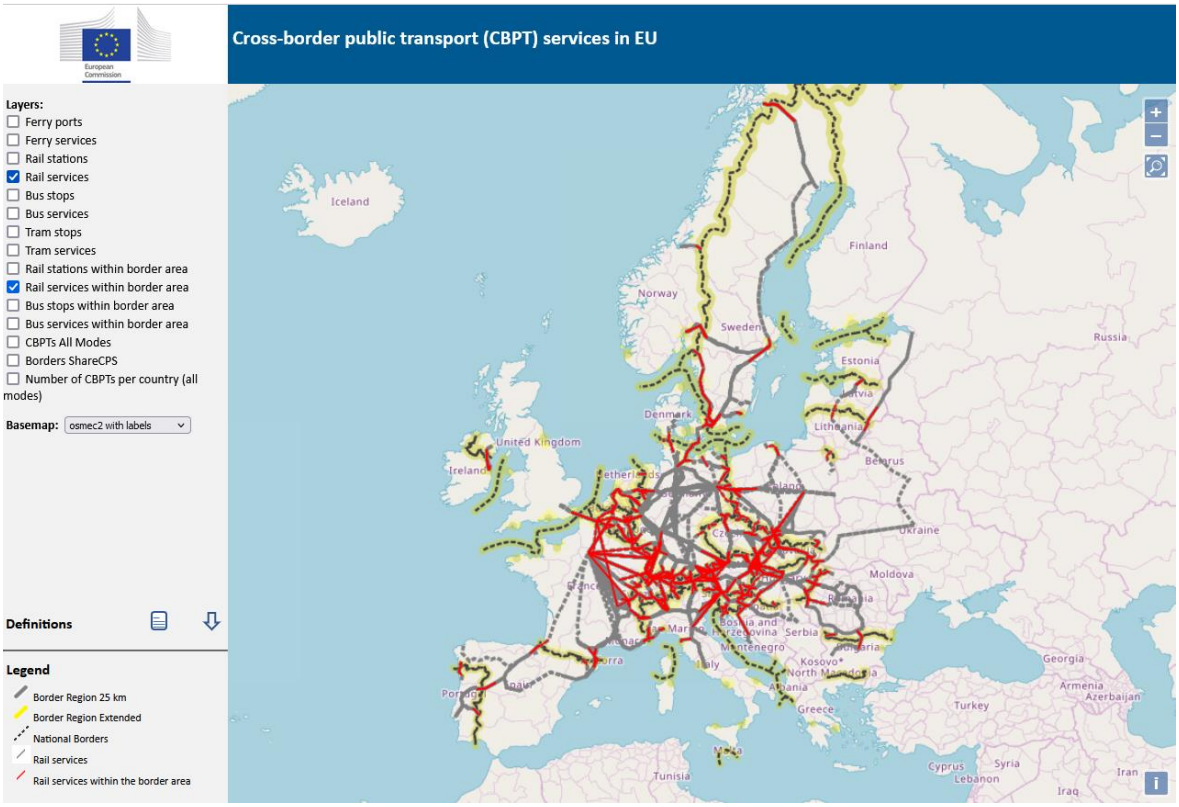
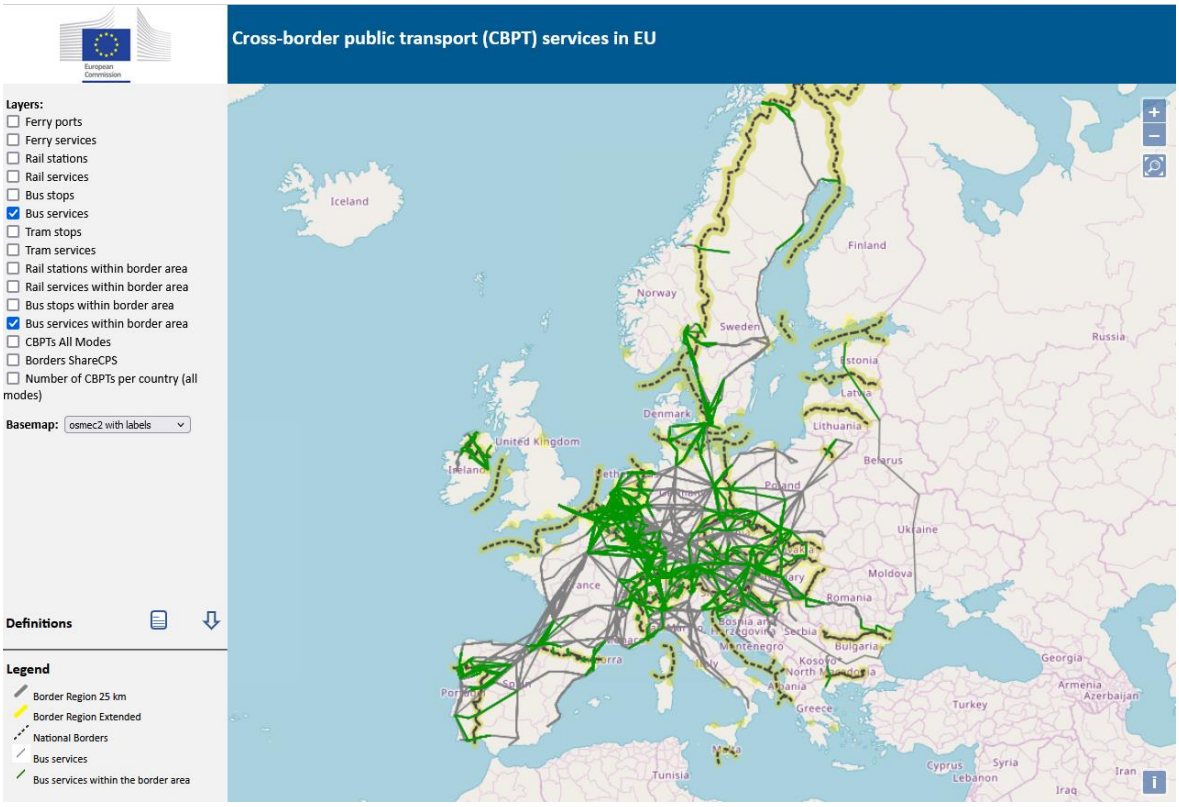


Figure 7-15: CBPT bus services



A special feature of the bus and rail services is that long-distance services are also included in the inventory. By definition, these do not only operate in a border region, but usually cross two or more borders and border regions. The sections of the services in the border regions

are represented by red (rail) and green (buses) lines, respectively, while sections of the services that outside the border regions are in grey.

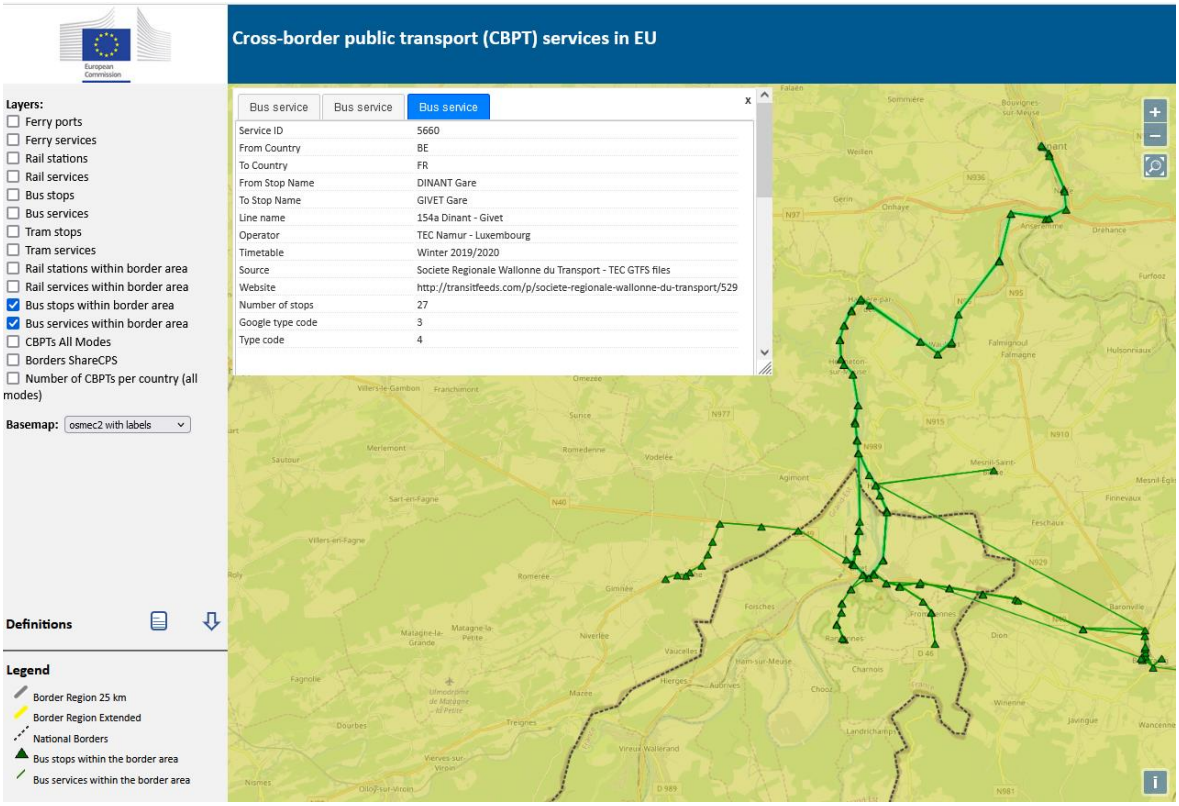
Therefore, for bus and rail services, the application provides two groups of layers each. **Bus** and **rail services** (as well as the corresponding **bus stops** and **rail stations**) show the whole service, i.e., its entire stretch inside and outside border regions, while the layers **bus (rail) services within border area** (with the corresponding stops and stations) provide only those stretches inside the border areas.

The dropdown list next to **Basemap**, offers eight different background maps including both coloured and black-and-white maps. The user may also remove all background maps, if desired.

Retrieving attribute information and help

By clicking on a link or node, tables open to provide information on the service and the station (Figure 7-16). To enable users working with the application smoothly, the layer pane provides a definition document (next to **Definitions**), which can be opened and downloaded by clicking on the icon in the layer/legend bar. The pdf file describes all parameters in the attribute tables of services and stops.

Figure 7-16: Information on CBPT service



Analysis results

The web-viewer displays aggregated results of the CBPT analysis as well, namely:

- the number of CBPT services (all modes) per country (Figure 7-17)
- the number of CBPT per border segment (all modes) (Figure 7-18);
- the borders' permeability calculated as the share of border segments with CBPT on the entire border length between two countries (Figure 7-19).

Again, the user can switch on/off visibility of these layers. It is also possible to visually overlay these layers with all, or selected link and node layers.

Figure 7-17: Number of CBPT per country

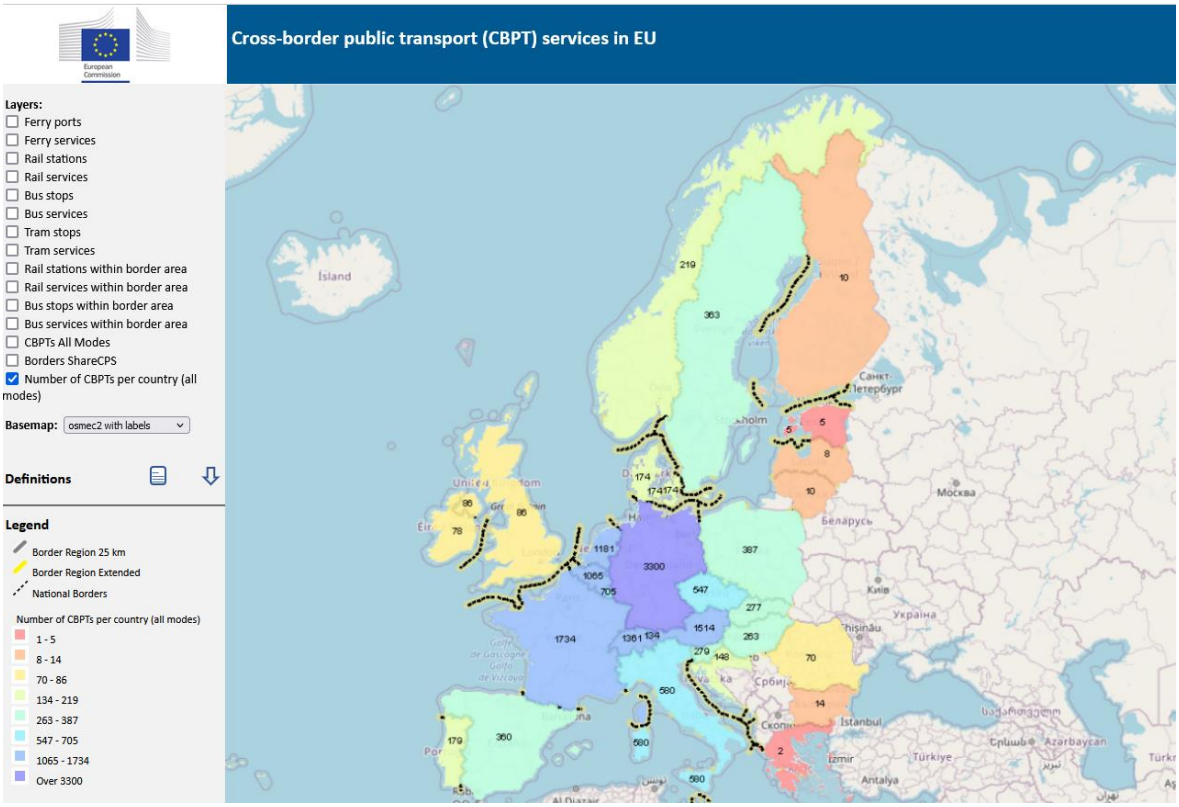


Figure 7-18: Number of CBPT crossing a border segment

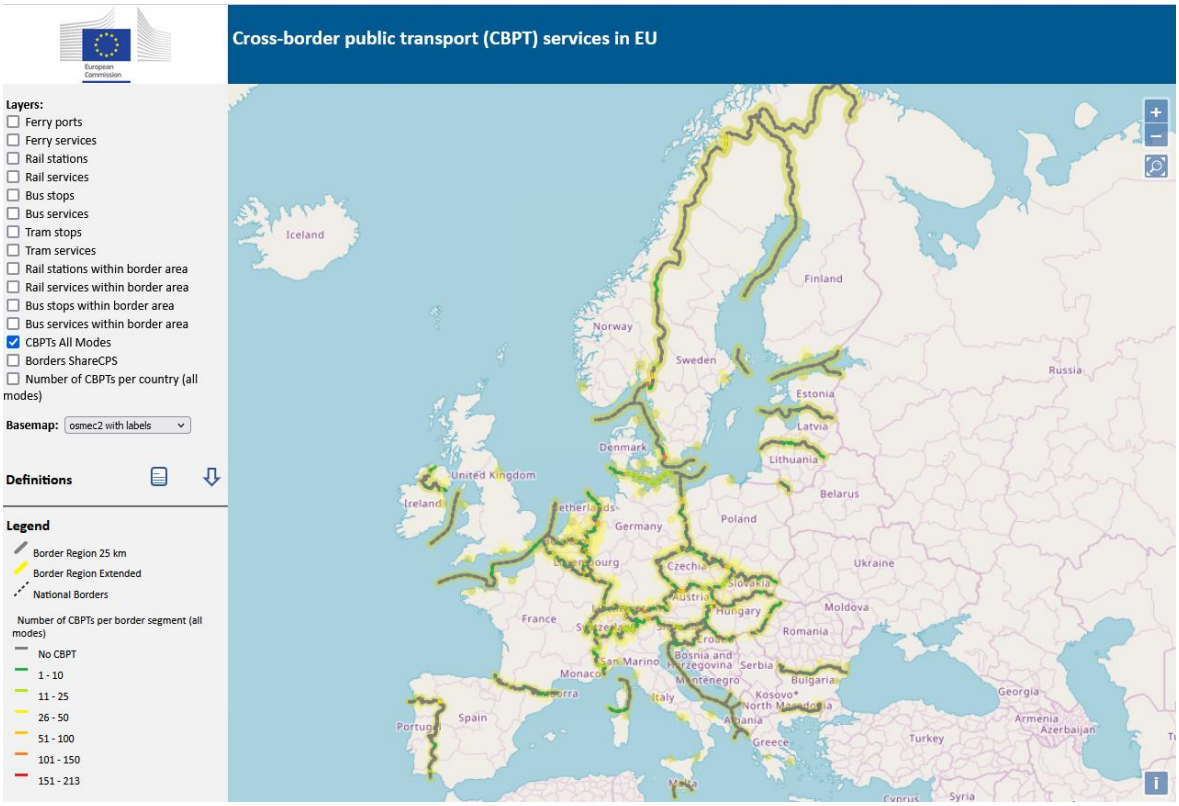
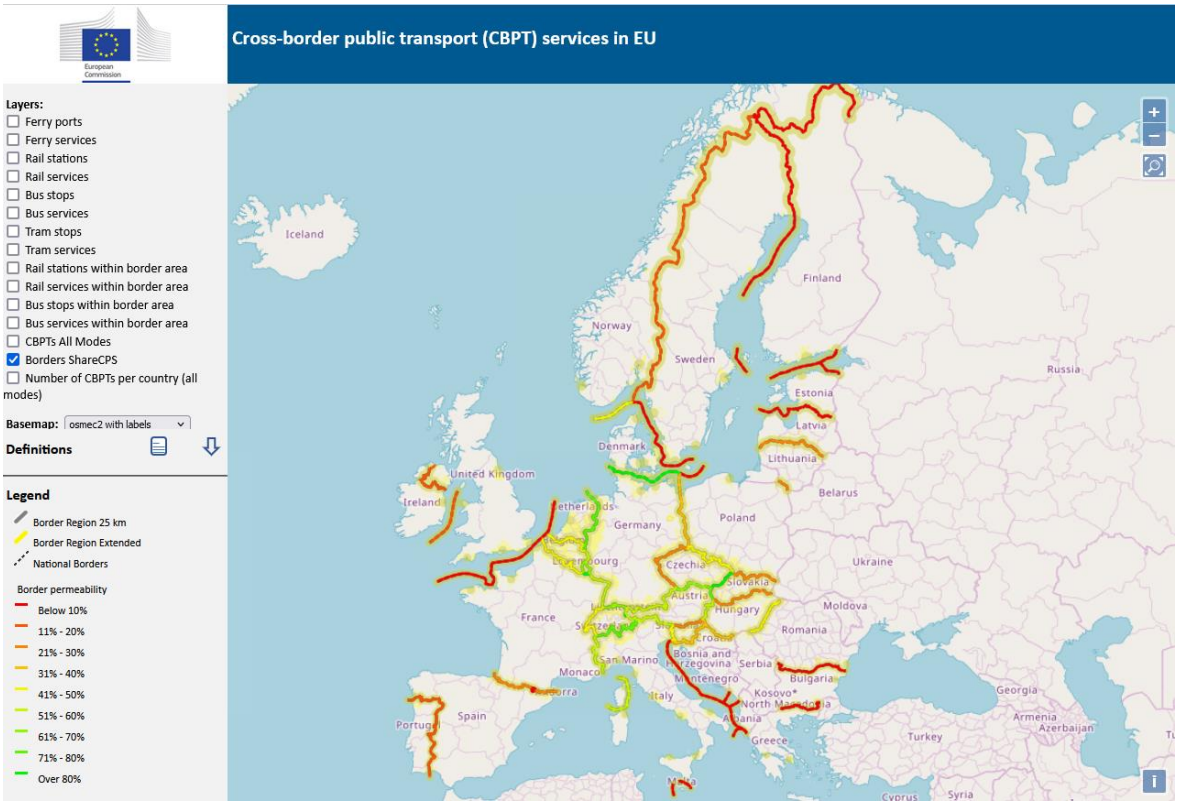


Figure 7-19: Permeability of European borders by public transport



7.6 Demand and permeability analyses: input data and method

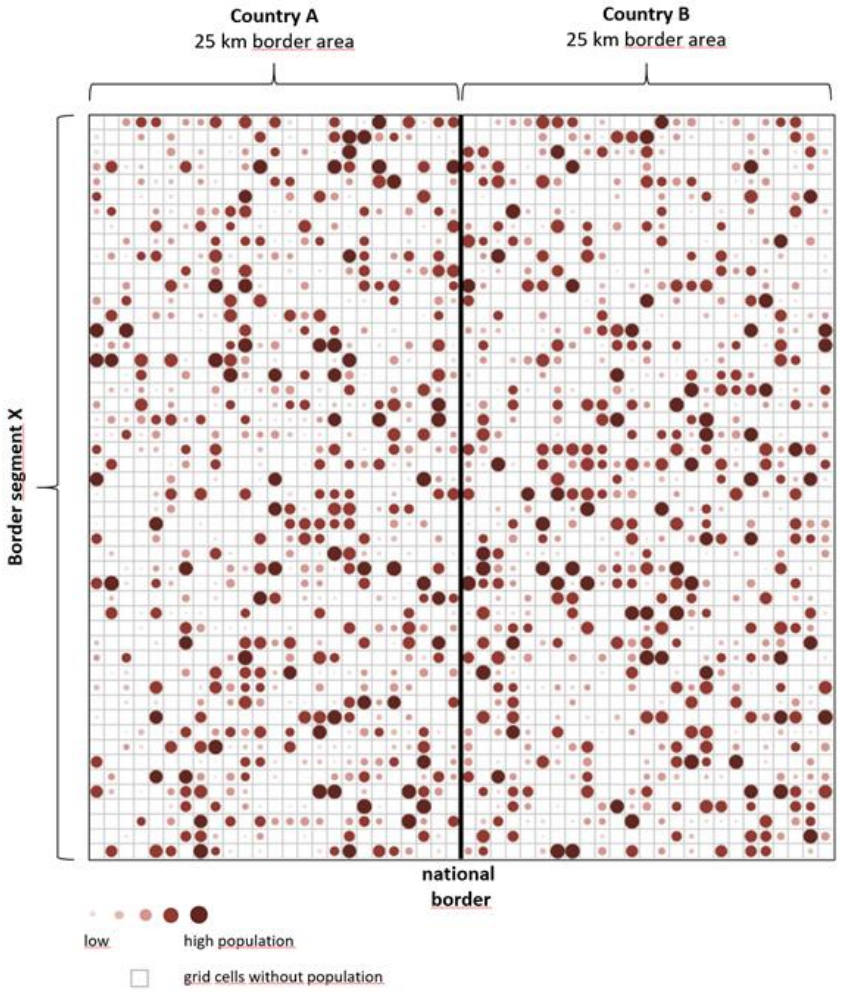
Input data

The demand analysis is based on population size, density and development. Since such figures are not available in official statistics for border segments, the following method was applied to assign these figures to each border segment:

A grid dataset of population per grid cell for 2011 and 2017 developed by ESPON (ESPON BRIDGES Outreach Activity, 2020) was used. This dataset provides the number of inhabitants per grid cell for different years, where each cell is 1x1 km. For each border segment, the population figures of all cells within a 25 km distance of the national border have been summed, differentiated by country A and country B (see Figure 7-20). A distance of 25 km matches the delineation of border areas in the project.

Based on these totals, the population density and population development 2011-2017 have been calculated by border segment (in total and individually for countries A and B). The result is the total population, population density (both for 2011 and 2017) and absolute and relative population development for 2011-2017 in country A and country B for each border segment.

Figure 7-20: Calculating population density for border segments



The figures for country A and B may differ (sometimes significantly), depending on the local conditions for each border segment. Figure 7-21 illustrates the population density for 2017, and Figure 7-22 the population change between 2011 and 2017. The latter shows that not only the population decrease/increase differs, but sometimes even the sign (country A may experience increasing population, while country B experiences decreasing population). Also, the figures may change significantly along one border, depending on where the segment is located.

Demand analysis

The analysis of CBPT demand is based solely on population and population development. Unlike the permeability analysis, the presence or absence of CBPT is not included in this analysis. Similarly, the border specificities have not been taken into account. A high demand for CBPT is assumed if the following three cases apply:

Table 7-3: High demand for CBPT

Case	Label	Description	Operationalisation
1	Two-sided high demand	High demand for CBPT can be assumed with large populations on both sides of the border.	2017 Population of 250,000 inhabitants or more on each side of the border segment.

2	Unbalanced demand	High demand for CBPT may occur if one side of the border has a large city or agglomeration, while the other side is rural, i.e., attracting people from the rural area to the city.	Ratio of 2017 population density of country A to country B is larger than 4.
3	Growing demand	Future or growing demand for CBPT can be expected if the population in the border area (both sides) increases significantly.	Population increase of +5% or more from 2011 to 2017 (and cases 1 and 2 do not apply).

There is two-sided high demand for CBPT if both sides of the border have large populations in a dense network of agglomerations, cities, and towns. With unbalanced demand, a large population is only on one side of the border while the other side is predominantly rural or even sparsely populated. Finally, growing demand for CBPT can be found where the population along the border segment is growing disproportionally.

The thresholds are the results of different tests.

Figure 7-21: Population density along national borders

Population density along national borders (2017)

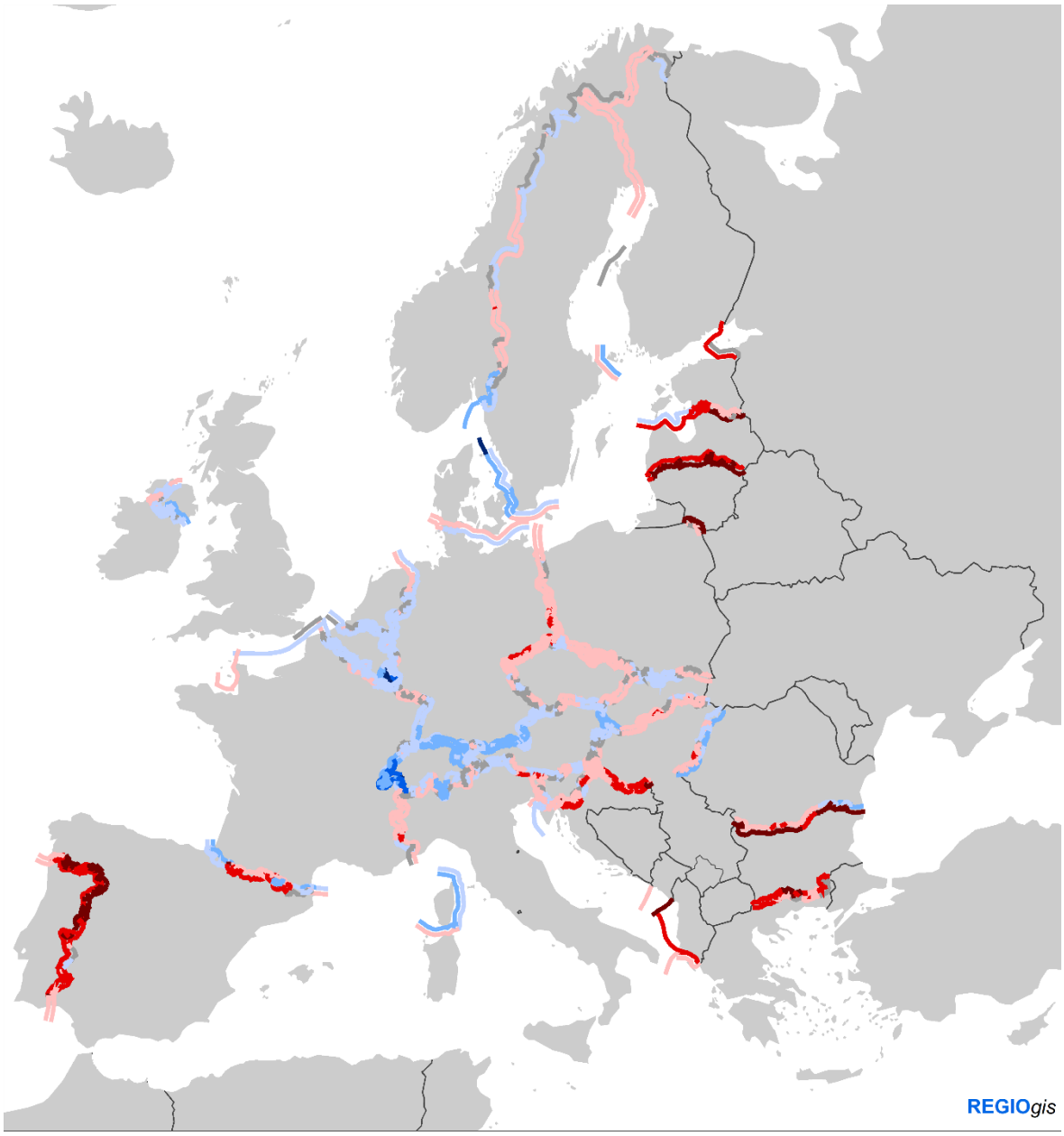
Population per sqkm

0 - 50	750 - 1,000
50 - 100	1,000 - 2,500
100 - 250	2,500 - 5,000
250 - 500	5,000 - 10,000
500 - 750	10,000 < ...

Note:
Population density calculated within border area of 25 km from the national border based upon grid population figures. Density calculated separately for both sides of the border.
Source: TCP International based upon ESPON BRIDGES Outreach (2020).

0 500 Km

Figure 7-22: Population development 2011-2017 along national borders (relative change)



Transport permeability index (TPi)

Different approaches and methods of permeability analyses were reviewed and compared (Medeiros, 2019; Kolejka et al., 2015; Christodoulou et al., 2019; Nathalie and Martino,

2006; Varol and Söylemez, 2017 & 2018). The Inception Report recommended adapting the approach developed by Medeiros (2019).

In this, TPi includes supply (transport supply index – TSi) and demand (transport demand index – TDi), where TPi is the ratio of the two (TPi= TSi / TDi) (Figure 7-23). The higher the ratio, the higher the permeability of a border segment.

Figure 7-23: Transport permeability index by Medeiros

TP: CB Transport Permeability index.
TSi: CB Transport Supply index (0-1)
TDi: CB Transport Demand index (0-1)
B: Buses CB intensity (0-1)
T: Trains CB intensity (0-1)
C: Commuters CB intensity (0-1)
P: Population density in the border region (0-1)
D: Demand for CB transports (0-1)
TSi = (B + T)/2; TDi = (C + P + D)/3; TPi = (TSi/TDi)

Source: Madeiros, 2019

In the above formula, two of the three factors influencing the transport demand index come from surveys, so they are subjective factors which are not necessarily available and representative for all border areas and, moreover, are not available for the whole European area covered by this study. Consequently, the formula was adapted to cope with the present data situation.

The numerator of Medeiros' formular (the TSi consisting of bus and train CB intensity) was slightly modified by including trams and ferries as additional modes. In contrast, the denominator (i.e. the TDi) was modified more as we did not have access to survey data. The denominator then only consisted of the demand for transport (measured by population density) and population development.

The numerator was calculated as follows:

TSi = (B + R + T + F) / 4 with B = bus services, R = rail services, T = tram services and F = ferry services,

and the denominator as:

TDi = (D + C) / 2 with D = demand (population) and C = change (population change 2011-2017)

Since the dimensions of all variables of the numerator and denominator largely differ, all variables were standardised (0-100), where 100 is the highest (or best) and zero the lowest (or worst).

Information on bus, rail, tram, and ferry services per border segment were taken from the CPBT inventory, while the same grid-based information on population and population development (Figure 7-21 and Figure 7-22) was used as in the demand analysis.

The permeability index was calculated for each border segment. The higher the transport permeability index, the better the match between supply and demand, and vice versa. Border sections with extremely low TPi (values towards zero) then have the highest demand for additional services.

To calculate a multimodal permeability index, an approach based on border segments as describe above is mandatory. Other authors advocate approaches based on individual border crossings (for example, Worth, 2021); however, these can then only take individual modes into account because only the analysis of single modes can precisely identify individual border crossings.

Although oriented towards a multimodal analysis, the approach here can also be applied to individual transport modes based on border segments with only minor modifications in the numerator. As the travel restrictions, especially on cross-border transport services, during the Corona pandemic have made painfully clear, it is urgently necessary to regularly calculate a permeability index based on current transport offers. This approach can be a starting point for such an initiative.

Results

The analysis results are provided in six shapefiles (Table 7-4):

Table 7-4: Shapefiles providing analyses results

#	Name	Feature class	Analysis results
1	Countries_CBPTs	Polygons	Number of CBPT per country, by mode and in total
2	Borders_CBPT	Lines	Number of CBPT per border segment, by mode and in total
3	BorderCrossings_CBPTs	Points	Number of CBPT per national border, by mode and in total
4	Borders_ShareCBPTs	Lines	Share of national border covered by CBPT (in %)
5	Borders_Demand	Lines	Results of demand analysis
6	Borders_PermIndex	Lines	Permeability Index

Table 7-5: Fields associated with Countries_CBPTs shapefile

#	Field name	Field type	Description
1	CNTR_ID	Text	2-digit ISO country code
2	CNTR_NAME	Text	Country name
3	NAME_ENGL	Text	Country name (English)
4	CBPT_Total	Integer	Total number of CBPT (all modes)
5	CBPT_Rail	Integer	Number of CBPT rail services
6	CBPT_Tram	Integer	Number of CBPT tram services
7	CBPT_Ferry	Integer	Number of CBPT ferry services
8	CBPT_Bus	Integer	Number of CBPT bus services

Table 7-6: Fields associated with Borders_CBPTs shapefile

#	Field name	Field type	Description
1	CC1_2	Text	2-digit ISO country codes of the two countries on the border (codes separated by blank)
2	BorderNo	Integer	Unique ID of border segment

#	Field name	Field type	Description
3	BorderType	Text	Border between groups of countries: EU-non EU EU13 internal EU14 internal EU14-EU13 Non EU – non EU
4	GEOGRAPHY	Text	Geographical specificity: AGGLOS = Border segment in agglomerations BORDER_RIVER = Border river or lake MARITIME = Maritime border MOUNTAINS = Border in mountain area RURAL = Border in rural area RUR-URB = Rural area on one side of the border, urban area on the other SPA = Border segment in sparsely populated areas TWINS = Border segment in twin cities *A border segment may have one or several specificities*
5	CBPT_Total	Integer	Total number of CBPT (all modes)
6	CBPT_Rail	Integer	Number of CBPT rail services
7	CBPT_Tram	Integer	Number of CBPT tram services
8	CBPT_Ferry	Integer	Number of CBPT ferry services
9	CBPT_Bus	Integer	Number of CBPT bus services

Table 7-7: Fields associated with BorderCrossings_CBPTs shapefile

#	Field name	Field type	Description
1	CC1_2	Text	2-digit ISO country codes of the two countries on the border (codes separated by blank)
4	CBPT_Total	Integer	Total number of CBPT (all modes)
5	CBPT_Rail	Integer	Number of CBPT rail services
6	CBPT_Tram	Integer	Number of CBPT tram services
7	CBPT_Ferry	Integer	Number of CBPT ferry services
8	CBPT_Bus	Integer	Number of CBPT bus services

Each national border is represented in this layer by just one point, which is located at the geometrical middle of the border.

Table 7-8: Fields associated with Borders_ShareCBPTs shapefile

#	Field name	Field type	Description
1	CC1_2	Text	2-digit ISO country codes of the two countries on the border (codes separated by blank)
2	BorderType	Text	Border between groups of countries: EU-non EU EU13 internal EU14 internal EU14-EU13 Non EU – non EU
3	ShareCBPT	Decimal	Share of national border covered by CBPT (in %)

Table 7-9: Fields associated with Borders_Demand shapefile

#	Field name	Field type	Description
1	CC1_2	Text	2-digit ISO country codes of the two countries on the border (codes separated by blank)
2	BorderNo	Integer	Unique ID of border segment
3	BorderType	Text	Border between groups of countries: EU-non EU EU13 internal EU14 internal EU14-EU13 Non EU – non EU
4	GEOGRAPHY	Text	Geographical specificity: AGGLOS = Border segment in agglomerations BORDER_RIVER = Border river or lake MARITIME = Maritime border MOUNTAINS = Border in mountain area RURAL = Border in rural area RUR-URB = Rural area on one side of the border, urban area on other SPA = Border segment in sparsely populated areas TWINS = Border segment in twin cities *A border segment may have one or several specificities*
5	PopDen17C1	Double	Population density 2017, country 1 (population/km^2)

#	Field name	Field type	Description
6	PopDen17C2	Double	Population density 2017, country 2 (population/km^2)
7	PopDevC1	Double	Population development, 2011-2017, % change, country 1
8	PopDevC2	Double	Population development, 2011-2017, % change, country 2
9	Demand	Text	Demand Case 1 = Two-sided high demand Case 2 = Unbalanced demand Case 3 = Growing demand No = No particular demand for CBPT

Table 7-10: Fields associated with the Borders_PermIndex shapefile

#	Field name	Field type	Description
1	CC1_2	Text	2-digit ISO country codes of the two countries on the border (codes separated by blank)
2	BorderNo	Integer	Unique ID of border segment
3	BorderType	Text	Border between groups of countries: EU-non EU EU13 internal EU14 internal EU14-EU13 Non EU – non EU
4	GEOGRAPHY	Text	Geographical specificity: AGGLOS = Border segment in agglomerations BORDER_RIVER = Border river or lake MARITIME = Maritime border MOUNTAINS = Border in mountain area RURAL = Border in rural area RUR-URB = Rural area on one side of the border, urban area on other SPA = Border segment in sparsely populated areas TWINS = Border segment in twin cities *A border segment may have one or several specificities*
5	PermIndex	Integer	Permeability index (all modes): 0 = No permeability

#	Field name	Field type	Description
			1 = very low permeability 2 = low permeability 3 = … 4 = … 5 = medium permeability 6 = … 7 = … 8 = high permeability 9 = very high permeability 10 = extremely high permeability

7.7 Inventory of obstacles

The inventory of legal and administrative obstacles was drawn up in an Excel database that analyses obstacles in relation to 'main themes' and related 'sub-themes', while using a wide range of 'assessment topics' under each. These theme-specific assessment topics included pre-elaborated aspects to ensure that information on obstacles can later be filtered and cross-analysed within the database.

The inventory has three layers (Table 7-11).

Table 7-11: Structure of the inventory of legal and administrative obstacles

	Theme 1	Theme 2	Theme 3	Theme 4	Theme 5	Theme 6	Theme 7	Theme 8
	3 Sub-themes	3 Sub-themes	3 Sub-themes	3 Sub-themes	2 Sub-themes	3 Sub-themes	2 Sub-themes	3 Sub-themes
	Assessment topics for two sub-themes and one commenting field	Assessment topics for two sub-themes and one commenting field	Assessment topics for two sub-themes and one commenting field	Assessment topics and commenting fields for each sub-theme	Assessment topics and commenting fields for each sub-theme	Assessment topics for two sub-themes and one commenting field	Assessment topics for one sub-theme and one commenting field	Assessment topics for one sub-theme and two commenting fields
Case title	(…)	(…)	(…)	(…)	(…)	(…)	(…)	(…)
Case title	(…)	(…)	(…)	(…)	(…)	(…)	(…)	(…)
Case title	(…)	(…)	(…)	(…)	(…)	(…)	(…)	(…)

The first layer of the Excel database consists of eight horizontally arranged 'main themes'. These are the analytical logic of the inventory and specify the focus:

- Type of obstacle and its relation to specific legal matters or administrative practices (theme 1),
- Geographical extent and border-specific location of the obstacle (theme 2),
- Mode and type of CBPT affected by the obstacle (theme 3),
- Problems for CBPT set-up and ongoing operation (theme 4),
- Negative direct or secondary effects of the obstacle (theme 5),
- Solutions for overcoming or alleviating negative effects of the obstacle (theme 6),
- Key stakeholder suitable to initiate a solution (theme 7),
- Similar obstacle cases (wider relevance) and relation to other elements of the CBPT study (theme 8).

Theme 1 is important because it established a basic classification (taxonomy) of the observed and subsequently described obstacle cases. This filterable classification was also essential for identifying the most frequently recurring obstacles to be addressed by the cross-analysis of obstacles.

The second layer of the Excel database has 22 sub-themes, which further details the main themes. The analysis under each sub-theme is based on a larger number of specific but pre-elaborated assessment topics. For aspects not foreseen by these topics, an option 'other' was added. Also, most sub-themes included 'commenting fields' to capture supporting information from the literature or from survey responses.

The third layer of the database covers individual obstacle cases (database entries). At this level, a case number and a short title as well as brief identification of the problem was elaborated for each case.

Based on this general structure and its analytical approach, each obstacle case identified by the literature review (45 cases) or the online survey (12) was then described and assessed in the inventory.

The literature review for this study included documentary and online sources in various languages (i.e., English, German, French, Spanish and Dutch). The review covered all sources on CBPT that were in the long literature list included in the inception report for this study, but also sources discovered during the review process. The review process often had to struggle with the quality of information on legal or administrative obstacles. Some sources presented comprehensive analyses of CBPT in various countries and at different borders, while many other sources included superficial obstacle descriptions or even no detailed analysis of the causes for problems. Therefore, only cases with good quality descriptions in one or more sources were included in the inventory. For some non-included cases, even after additional web-search the information was not sufficient to use most assessment parameters set out in the inventory.

The study also conducted a Europe-wide survey on CBPT and received 129 responses from different types of stakeholders. More than half the respondents provided information and valuable insights on obstacles that adversely affect CBPT. In addition, responses also clearly confirm the continuing actuality of more than half the obstacles found via the literature review. Nevertheless, survey information detail was not sufficient for a full assessment within the inventory. This is the main reason why the number of inventory cases coming from the survey is comparatively low.

7.8 Survey

An online survey of local and region authorities at national borders, border entities and public transport providers was launched at the end of January 2021 served three objectives to:

1. validate the draft inventory on operational CBPT,
2. complement missing information for this inventory, and
3. collect information on legal and administrative obstacles and solutions in the implementation of CBPT.

Up to 17 March 129 responses were collected. These provide insights into the perceived demand for CBPT, obstacles and the impact of obstacles and their possible solutions. In addition, a verification of CBPT services in the web viewer and identification of missing services was allowed. Thus, all three objectives have been addressed as intended.

Dissemination

The survey was widely disseminated to stakeholders of the above-mentioned target groups. A link to the survey was shared with Interreg programme authorities and local authorities along EU internal borders by DG REGIO. The European Association of Border Regions (AEBR) shared and promoted the survey among border organisations and their members.

In addition, Spatial Foresight, TRT, TCP and Eureconsult promoted the survey in their networks. Among others, the French Transfrontier Operational Mission (MOT) and the Central European Service for Cross-Border Initiatives (CESCI) shared the survey.

The survey was also promoted via the Border Focal Point Network platform and social media. Spatial Foresight and partners regularly promoted the survey via these channels encouraging potential respondents to share their experiences on CBPT and share the survey in their networks. Spatial Foresight posted for example nine messages on twitter in five different languages (English, German, French, Italian and Spanish). Three posts were published on the Border Focal Point Network platform.

Response rate

The 129 responses provided insights on demand for CBPT across Europe and the awareness of survey respondents of obstacle types, impacts and potential solutions. Moreover, 67 of the responses provided detailed insights on obstacles experienced when establishing CBPT services.

In addition, the survey helped identify more than 35 CBPT. These have been further reviewed against the existing inventory of CBPT and the web viewer to assess whether the connection was already included, whether it needed to be added to the inventory, or whether it concerned a desired connection.

Representativeness of survey replies

The 129 responses provided insights at a European level, reflecting views from at least 30 bilateral border areas and some areas involving three countries. Responses also covered all modes of public transport. At the same time, a detailed analysis per border, or type of border is not possible. In addition, not all respondents clearly indicated the cross-border service they referred to, making it hard to link the response to a border area and/or mode.

Responses are imbalanced across Europe. Most answers concerned Hungarian CBPT, notably to Slovakia and Austria. Also, public transport along the French-Spanish, German-Polish, Austrian-German and Austrian-Czech borders is well represented in the responses. Borders with relatively many connections, such as the French-German, German-Dutch, Dutch-Belgian or in the Greater Region are relatively less represented. Nevertheless, the responses provide additional insights into the demand and obstacles on each border, supplementing findings from document studies. Moreover, the number of responses enables a general picture of demand for CBPT and most common or most visible obstacles in Europe, even if the response rate differs per question and is generally lower towards the end of the survey or if the service could not be clearly identified.

The responses supported this study by helping to validate some of the existing services, supplementing the inventory of obstacles based on desk research, and thereby also helping with case study selection. At the same time, the survey remained open until mid-April for late replies. Some stakeholders indicated possible survey fatigue among local and regional authorities in border regions due to multiple surveys running in parallel. Final conclusions of the survey were considered for the Draft Final Report.

7.9 Case studies

The case study analysis of task 3.1 covered 31 cases. According to the Terms of Reference, the main source for the sample was the CBPT inventory developed for task 1.

Selection criteria

The sample of 31 case studies covers different transport modes as well as geographical, political and institutional contexts. To structure the selection, seven features were defined, some of which were further specified through sub-features.

(1) Modes of transport (4 values): The four transport modes covered are bus, rail, tram and ferry. In total, about 6,900 CBPT were identified in task 1. The detailed distribution by transport mode is as follows:

- Bus: About 5,300
- Rail: About 1,400
- Tram: About 30
- Ferry: About 180

(2A) Geography – spatial coverage (5 values): The border segments along the borders of the EU27 without Cyprus and Malta and non-EU (Liechtenstein, Norway, Switzerland, United Kingdom) countries were grouped in five larger geographical areas.

- Northwest Europe (9 border segments): BE-FR, BE-NL, BE-LU, BE-DE, DE-LU, DE-NL, FR-DE, FR-LU, FR-UK, IE-UK;
- Northern Alpine and Upper Danube (9 border segments): DE-CH, FR-CH, AT-CH, AT-DE, AT-LI, CH-LI, AT-CZ, AT-SK, AT-HU;
- Northern Europe and Baltics (8 border segments): DK-DE, SE-DK, SE-NO, FI-SE, FI-NO, EE-LV, LV-LT, LT-PL;
- Western Mediterranean, Southern Alpine and Adriatic (8 border segments): ES-PT, ES-FR, IT-FR, IT-AT, IT-CH, IT-SI, AT-SI, HR-SI;
- North-Central Europe and Southeast Europe (11 border segments): DE-PL, PL-SK, CZ-DE, CZ-PL, CZ-SK, HU-HR, HU-RO, HU-SI, HU-SK, BG-EL, BG-RO.

(2B) Geography – border types (7 values): The spatial structure in the border area influences the demand and focus of CBPT as well as the main passenger groups. We distinguish between seven characteristics which are not mutually exclusive, i.e., one CBPT can fulfil more than one characteristic:

- Rural area,
- Twin city
- Border river,
- Agglomeration,
- Mountain range,
- Maritime border,
- Sparsely populated area

(2C) Border context (3 values): This is a combination of two dimensions. Specific physical conditions like large rivers or mountain ranges restrict the possibility of border crossings. We distinguish between a high impact for specific physical conditions and low impact for no such conditions (high / low). The second dimension refers to any interstate agreement for local/regional cross-border cooperation (yes / no) as an indication for a generally higher awareness for, and interest in, cross-border development. EU instruments like EGTC are not considered. Four combinations of these two dimensions can be grouped in three categories:

- Favourable border context: Low impact from specific physical conditions plus an interstate agreement;
- Medium: High impact from physical conditions plus an interstate agreement; OR no impact from specific physical conditions and no interstate agreement;
- Unfavourable: High impact from specific physical conditions plus no interstate agreement.

(3) Commissioning date (3 values): To reflect that players in some border regions benefit from long-standing experience in CBPT, we distinguish between three periods for the commissioning date:

- Before 1990: As CBPT have been operating for more than 30 years, the players are more experienced with challenges and can reflect on the evolution over time;
- 1991-2010: CBPT developed and implemented during the first generations of the EU initiative and funding instrument Interreg which supported the development of CBPT;
- 2011-2020: CBPT developed and implemented recently.

(4) Ownership (5 values): CBPT operators can be public (e.g., local or regional transport associations, national transport companies) or private businesses, which is especially relevant for bus services. In some cases, operators from both sides of the border join forces and provide a CBPT in cooperation. Consequently, five types of operation can be distinguished:

- Single public operator;
- Single private operator;
- Cooperation of public operators;
- Cooperation of private operators;
- Cooperation of public and private operators.

(5A) Financing system – income (2 values): In addition to revenues from tickets and activities such as advertising, renting buildings, parking fees, rights-of-way and other fees, public subsidies are important for the provision of transport services. We distinguish between:

- high levels of subsidies and
- low levels of subsidies.

(5B) Financing system – fare system (3 values): Some CBPT operate without integration in fare systems while others are part of such a system, in some cases even of a cross-border fare system. For this, we distinguish between:

- An individual line without further integration;
- Integration in a fare system on one side of the border; and
- Integration in a joint cross-border fare system.

(5C) Financing system – expenditure (2 values): On the expenditure side, the costs for continuous and regular service provision are most important. This includes salaries for personnel, taxes and social security contributions as well as costs for infrastructure maintenance and use, vehicles and buildings. We distinguish between:

- High costs for building, operating and maintaining infrastructure etc., and
- Low costs for building, operating and maintaining infrastructure.

(6) Market structure (2 values): CBPT can be operated under public service obligation (PSO) contracts or free market conditions. Hence, we distinguish between these two.

(7) Size and scale (3 values): The size and scale of CBPT can vary considerably, ranging from an individual cross-border bus line between two smaller municipalities that transports a limited number of passengers per day, to a cross-border conventional rail or light rail service operating in a cross-border urban area that is used by thousands of passengers every day. An important aspect in this regard are the main user groups (e.g., cross-border commuters, occasional cross-border travellers, tourists, students, etc.). We distinguish between a focus on:

- regular travellers such as commuters, students, pupils/students;
- occasional travellers, e.g. for shopping, leisure and tourism (arrival/departure);
- seasonal travellers, especially in tourist areas.

The selection process

Based on these features and sub-features, selection followed a two-step approach. In a first step, CBPT were reduced to a long list of 70 potential case studies. In a second step, the long list was used to define a draft short list of 31 case studies.

The final process slightly deviated from the process described in the inception report, mainly because it was not feasible to collect information on all features for all potential case studies on the long list. This regards in particular information on financing (5A, 5B, 5C) and the market structure (6). Information on these were collected during the in-depth analysis of the case studies. Information on the transport mode (1), the larger geographical area (2A), the type of territories connected through the CBPT (2B), the border context (2C), commissioning date (3) and ownership (4) was collected for all CBPT on the long list. Information on the size and scale of CBPT (7) was taken into consideration implicitly, e.g. for CBPT with a strong focus on tourists or commuters, respectively. More specifically, the two steps of the selection process from the base population to the draft short list were conducted as follows.

From the basic population to the long list

First, the entirety of the four mode-specific CBPT inventories (rail, bus, ferry, tram) was taken as the base population and filtered. This filtering was based on information on the transport mode (1), the larger geographical area (2A) and the type of territories connected through the CBPT (2B). In addition, information on the border type (e.g. border river, mountain range, twin cities, agglomeration areas, SPA) was taken into consideration which overlaps with the geographic specificities (2C) as well as the coverage of the relevant EU and non-EU countries. During the selection process, internal exchanges between members of the project team discussed alternatives and supplementary insights from the inventory of obstacles (task 2 of the project). All considerations aimed at covering as many combinations of the mentioned features as possible. This process led to a long list of 70 CBPT.

The analysis of the long list showed that the project team achieved a balanced coverage of different facets of each feature as well as different combinations of the various features.

From the long list to the draft short list

Based on the long list and features 1, 2A, 2B and 2C, complementary information was collected, especially on the commissioning date (3) and the ownership structure (feature 4). This enabled first insights on the size and scale of the CBPT to consider different contexts, e.g. seasonal CBPT, a focus on tourists or a focus on commuters (feature 7). 31 potential case studies were identified for the draft short list.

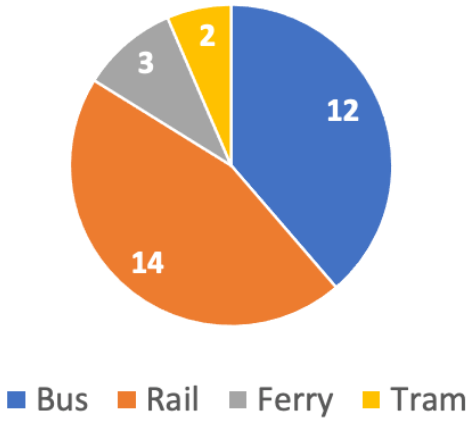
Looking more specifically into each feature used to select the draft short list shows that the project team achieved a balanced coverage of different facets of each feature as well as different combinations of the features as detailed below. Following this analysis, further

small amendments in the selection considered specificities only visible after starting the case study analyses.

Coverage of transport modes (feature 1)

The draft short list of 31 potential case studies covers the four transport modes in a balanced way. The overall relations between the transport mode are similar to the long list, with many potential case studies for bus and rail services and fewer for ferry and tram services (Figure 7-24).

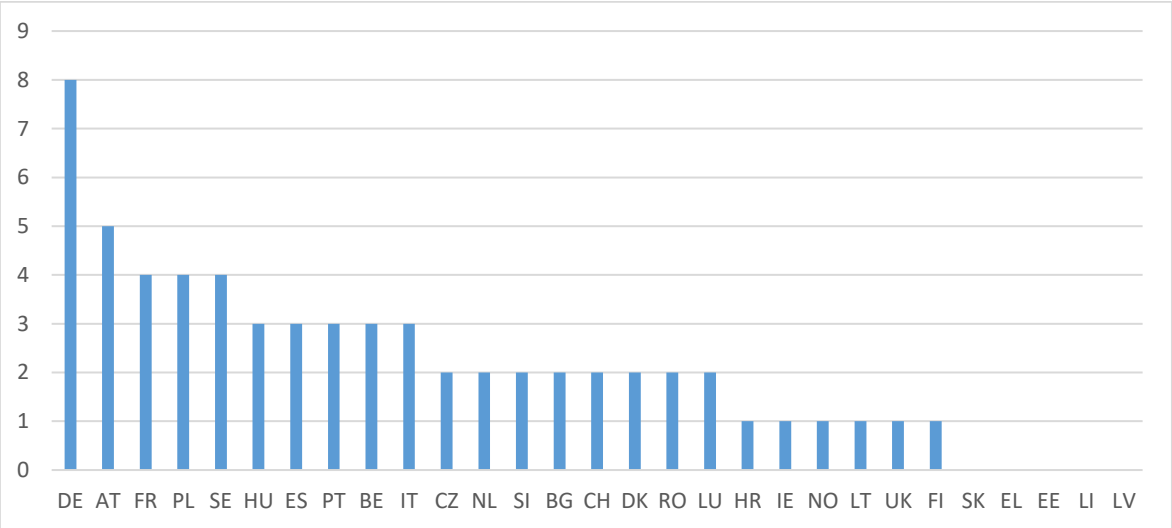
Figure 7-24: Coverage of transport modes – draft short list



Coverage of countries and large geographical areas (feature 2A)

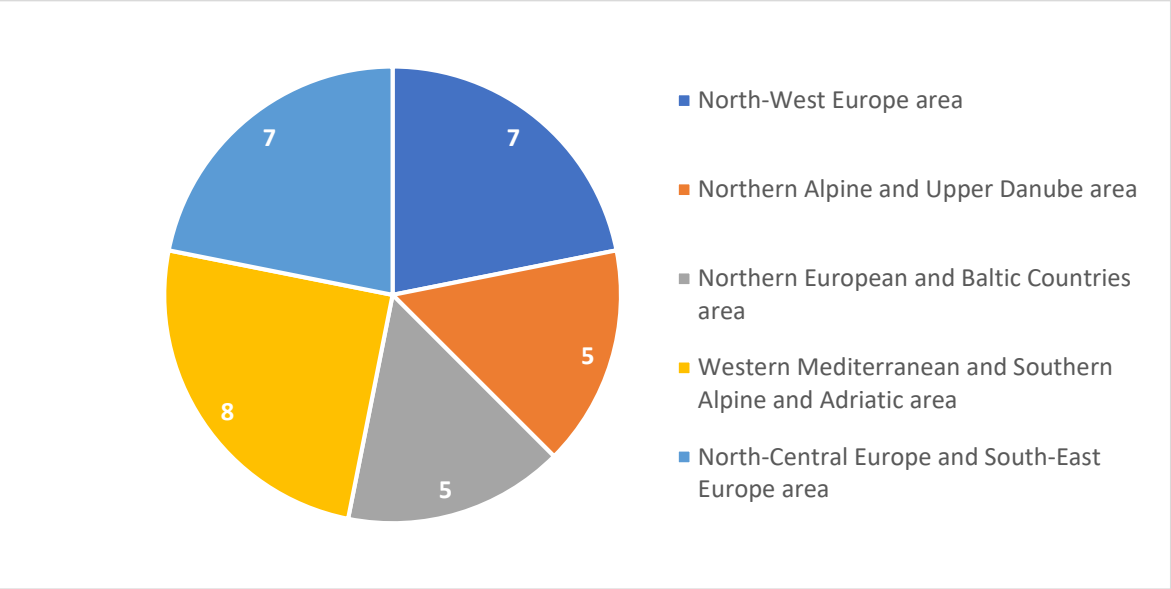
The draft short list reflects the division of countries from the draft long list. Large countries and countries with many neighbouring countries are more represented than others (Figure 7-25). Most countries were considered for at least one potential case study though Estonia, Liechtenstein and Latvia (see previous section for a short explanation), also Slovakia and Greece are not covered by the draft short list. This reflects on the very low number of CBPT at Greek borders (i.e. one bus service) and the lack of interesting cases with public sector involvement in Slovakia (i.e. dominance of market-oriented services provided from other countries such as Flixbus).

Figure 7-25: Coverage of countries – draft short list



Following the approach of larger geographical areas shows a balanced representation across the five large areas with five to eight potential case studies for each. For the long list, the two larger areas with the fewest potential case studies on the draft long list, namely Northern Alpine and the Upper Danube area and Northern Europe and the Baltic countries area, have fewer potential case studies than the other three large areas, which indicates that the draft short list reflects the draft long list (Figure 7-26).

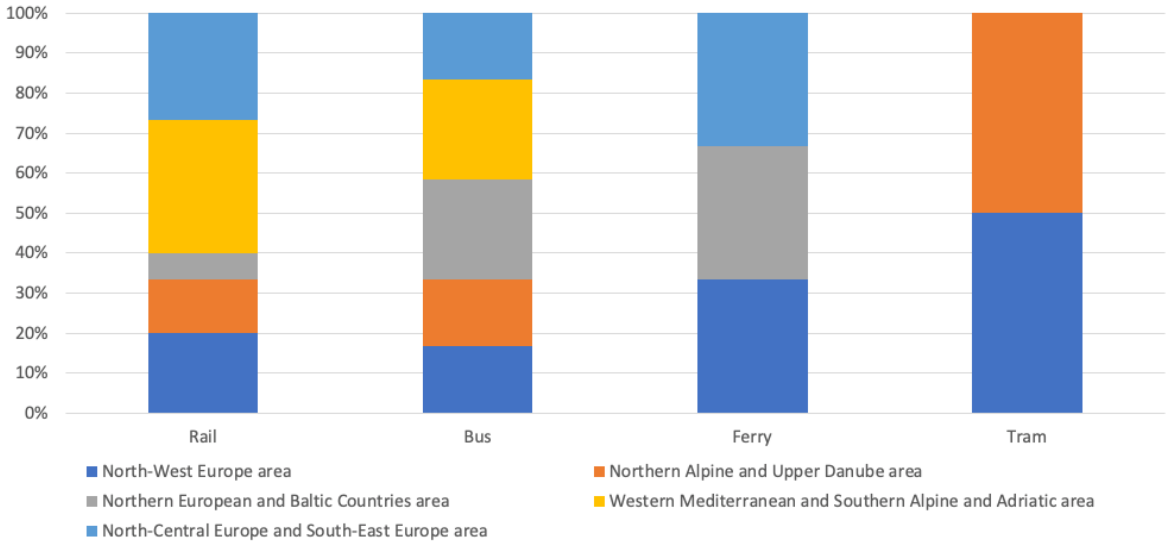
Figure 7-26: Coverage of large geographical areas – draft short list



Coverage of transport modes by large geographical areas (feature 1 and 2A)

Cross-checking the distribution of large geographical areas by transport mode confirms the balance across the five large geographical areas. For rail and bus services all five large areas are well covered (Figure 7-27). Also for tram services, the two larger areas are still covered. For ferry services, however, the draft short list with three cases covers only three larger areas, compared to all five larger areas on the long list. From an overall perspective, it seems important, however, to have a wide variety of bus and rail services to reflect the variety of these two main transport modes. Hence, the prioritisation is well justified.

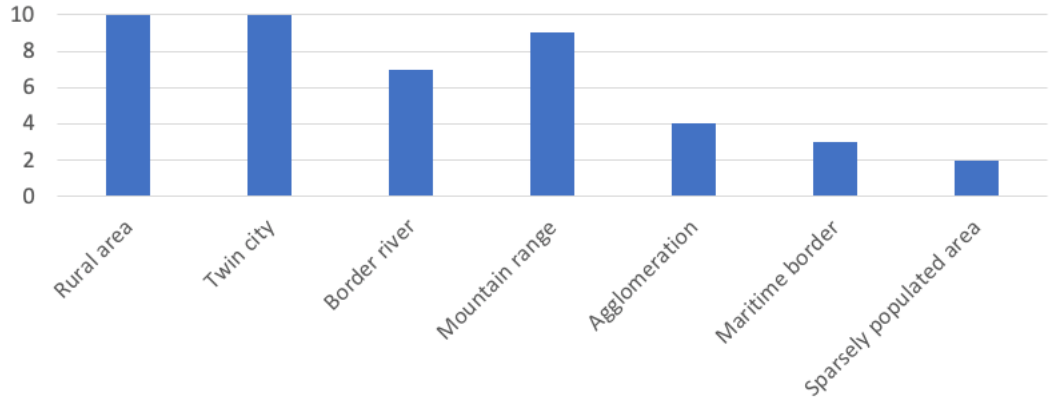
Figure 7-27: Coverage of transport modes by large areas – draft short list



Coverage of border types (feature 2B)

The 31 potential case studies of the draft short list cover all border types which are not mutually exclusive (Figure 7-28). Overall, the potential case studies reflect a wide variety of border regions, some separated by rivers or in mountainous landscapes, others well connected and integrated agglomeration areas or twin cities.

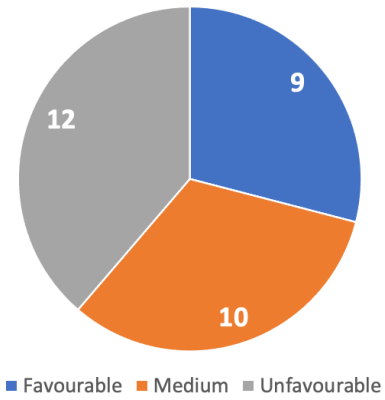
Figure 7-28: Coverage of border types – draft short list



Coverage of border contexts (feature 2C)

The next feature partly builds on the previous one. It is a combination of the impact of physical conditions that can pose restrictions for cross-border development and interstate agreements that facilitate cross-border cooperation at local and regional level. This feature shows a good balance, almost equally between favourable, medium and unfavourable preconditions for cross-border development (Figure 7-29). Hence, it functions well as a proxy to capture different contexts and settings to develop and implement CBPT.

Figure 7-29: Coverage of border contexts – draft short list



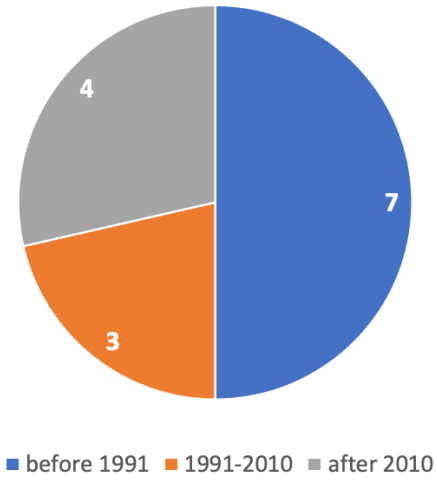
Coverage of time periods (feature 3)

To reflect differences in the experience and history of CBPT in Europe, the commissioning date was taken into consideration. The short list shows that many CBPT were established before 1991 (Figure 7-30). This is of particular relevance for services by rail as railway infrastructures was often built decades or even centuries ago. It is important to consider that the political circumstances were significantly different when the railway system was developed. Various train connections in the Austrian-Hungarian Empire, for example are nowadays cross-border connections but were domestic connections in the past. Furthermore, various services have not been continuously operated but were stopped for

some time and then restarted some years or decades later. Overall, the potential case studies on the draft short list show differences in the history of CBPT.

It is also important to highlight that for many CBPT it was not possible to identify the exact commissioning date, especially for bus services, more specifically for 39 out of 70 potential case studies on the long list and for 17 out of 31 potential case studies on the draft short list.

Figure 7-30: Coverage of time periods – draft short list



Coverage of ownership structures (feature 4)

Another important feature in the selection process is the ownership structure, i.e. whether a CBPT is offered by a public or a private operator. If the provider is subject to private law, it can nevertheless be a public operator if the provider is fully or mainly owned by public bodies.

CBPT selected as potential case studies are mainly operated by public providers (Figure 7-31). CBPT based on cooperation between public and private operators are not explicitly included in the draft short list nor were they identified for the long list.

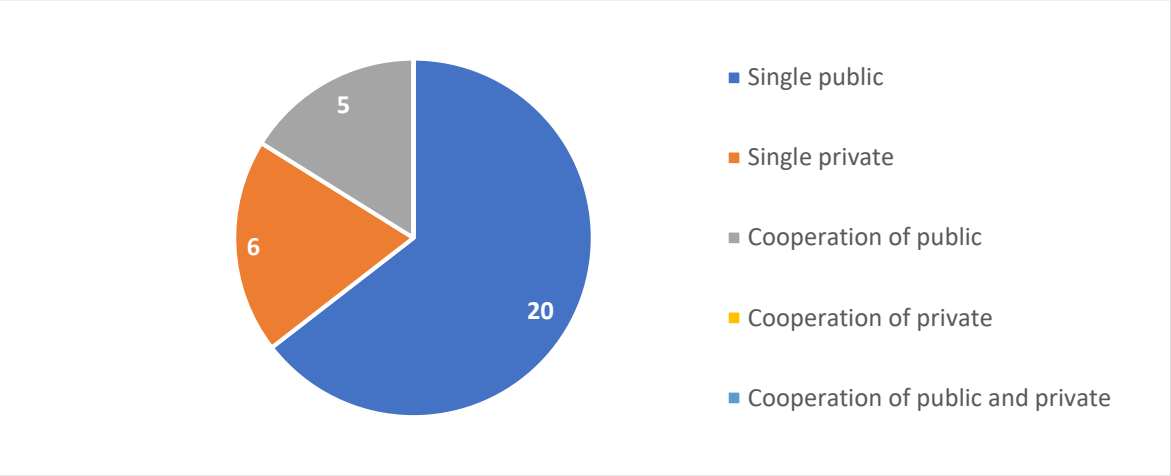
However, some cases show cooperation elements. The Swedish-Norwegian bus connection between Lulea and Narvik, for example, is operated by The Arctic Route which offers bus connections in the Arctic region. The Arctic Route is a collaboration between three players: Bussring, a private bus operator from Norway, Vygruppen AS, a public transport operator from Norway, and Eskelisen Lapin Linjat, a public bus transport company from Finland. As the bus connection between Lulea and Narvik is only operated by Vygruppen AS, the potential case study was categorised as operated by a single public operator.

Other examples are cross-border rail connections. Information from the database often indicates that the service is operated by public railway operators from both countries although that is not the case in practical terms. The train connection between Dortmund and Enschede, for example, is only operated by German trains provided by Deutsche Bahn (DB). Still, the database indicates that the Dutch railway company NS Reizigers BV is also involved.

These examples illustrate the complexity of the ownership structure. During the case study work, more detailed information was collected to gather further insights into the different stakeholder structures and their impact on service provision. Due to these limitations in

insights of further cooperation structures, Figure 7-31 does not list two of the five potential categories, although they were expected to be covered implicitly.

Figure 7-31: Coverage of ownership structures – draft short list



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