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**EGTC tool and cross-border transport cooperation:
Case electric aviation in the Kvarken Region**

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ABSTRACT:

The European internal market and the Schengen Agreement have facilitated the movement of people and goods within the European Union (EU), but Europe's border regions are still experiencing injustice. Border areas are typically remote and poorly accessible. The EU is interested in developing border regions, with 40 border regions and around 30% of the EU population living in these regions. Typical cross-border cooperation (CBC) challenges are administrative, legal and political barriers.

The EU has developed an instrument called the European Grouping of Territorial Cooperation (EGTC) to promote CBC. This instrument is unique because it has a legal entity. The Kvarken region became the first fully Nordic region with EGTC status. In addition, the region is part of a cross-border transport project looking at electric aviation opportunities in the Kvarken region. This study's aim is to find out what an EGTC instrument is and its benefits and challenges and how the Kvarken region can use the EGTC instrument for implementing electric aviation.

The study is based on a literature review on cross-border regions, cross-border transport, EGTC and electric aviation. The empirical material was collected through expert interviews and an online survey. The results of the theoretical analysis and the case study were consistent; it can be assumed that the EGTC instrument is helpful for CBC and could potentially be used to implement electric aviation in the Kvarken region.

The EGTC instrument can meet typical cross-border barriers by creating a new joint management body for regional stakeholders. The EGTC instrument is also seen as helping to implement electric aviation in the Kvarken region. Furthermore, it will make CBC more coherent, engage the typical challenges of CBC and apply for more extended funding.

KEY WORDS: cross-border cooperation, cross-border transport cooperation, EGTC, electric aviation, Kvarken region

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TIIVISTELMÄ:

Euroopan sisämarkkinat ja Schengenin sopimus ovat helpottaneet ihmisten ja hyödykkeiden liikumista Euroopan Unionin (EU) alueella, mutta silti Euroopan raja-alueet kokevat epäoikeudenmukaisuutta. Raja-alueet ovat tyypillisesti etäällä ja huonosti saavutettavissa. EU on kiinnostunut raja-alueiden kehittämisestä, koska sen alueella on 40 raja-aluetta ja noin 30 % EU:n asukkaista asuu näillä alueilla. Tyypillisiä rajat ylittävän yhteistyön haasteita ovat hallinnolliset, lailliset ja poliittiset esteet.

EU on kehittänyt instrumentin nimeltä eurooppalaisen alueellisen yhteistyön yhtymä (EAYY), jonka tarkoituksena on edistää rajat ylittävää yhteistyötä. EAYY-instrumentti on ainutlaatuinen, koska se on oikeudellinen persoona. Merenkurkun alueesta tuli ensimmäinen pohjoismainen EAYY-statuksen omaava alue. Lisäksi alue on mukana rajat ylittävässä liikennehankkeessa, jossa tarkastellaan sähköisen lentämisen mahdollisuuksia Merenkurkun alueella. Tämän tutkimuksen tarkoituksena on selvittää mikä on EAYY-instrumentti ja minkälaisia hyötyjä ja haasteita siihen liittyy, sekä miten Merenkurkun alue voi hyödyntää EAYY-instrumenttia sähköisen ilmailun implementoinnissa.

Tutkimus perustuu kirjallisuuskatsaukseen rajat ylittävästä yhteistyöstä, rajat ylittävästä liikenneyhteistyöstä, EAYY-instrumentista sekä sähköisestä liikenteestä. Empiirinen aineisto kerättiin asiantuntijahaastatteluiden sekä sähköisen kyselylomakkeen muodossa. Teorian ja tapaustutkimuksen tulokset olivat yhteneväisiä ja voidaan olettaa, että EGTC instrumentti on hyödyllinen rajat ylittävään yhteistyöhön ja sitä voidaan mahdollisesti hyödyntää sähköisen ilmailun implementoinnissa Merenkurkun alueella.

EAYY-instrumentti voi vastata rajat ylittävän yhteistyön haasteisiin sillä se luo uuden yhtenäisen hallinnollisen elimen alueen toimijoille. EAYY-instrumentin nähdään myös auttavan sähköisen ilmailun implementoinnissa Merenkurkun alueella, koska sen avulla rajat ylittävän yhteistyön suunnittelua saadaan yhtenäisemmäksi, pystytään vastaamaan tyypillisiin rajat ylittävän yhteistyön haasteisiin sekä hakemaan monipuolisemmin rahoitusta.

AVAINSANAT: rajat ylittävä yhteistyö, rajat ylittävä liikenneyhteistyö, EAYY, sähköinen ilmailu, Merenkurkun alue

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Lyhenteet

CBC	Cross-Border Cooperation
CoR	Committee of Regions
EASA	European Union Aviation Safety Agency
EC	European Commission
EGTC	European Grouping of Territorial Cooperation
EU	European Union
UAM	Urban Air Mobility
VTOL	Vertical Take-Off and Landing

1 Introduction

The European Union's (EU) borders have changed entirely. The EU is known for the common internal market and free movement within the Schengen region. The EU strives to produce a more cohesive European region, yet its border regions typically experience discrimination. Border regions are typically remote and less accessible, and many are distant from political and economic centres. These challenge day-to-day services. Inhabitants living in border regions face challenges in everyday life, such as finding a job, accessing health care or a daily commute. Hence, border regions must cooperate across borders (Poulaki et al., 2020; Knippschild & Schmotz, 2018; Engl, 2016).

Sousa (2013) described the concept of CBC well.

In operational terms, cross-border co-operation can be defined as any type of concerted action between public and/or private institutions of the border regions of two (or more) states, driven by geographical, economic, cultural/identity, political/leadership factors, with the objective of reinforcing the (good) neighbourhood relations, solving common problems or managing jointly resources between communities through any co-operation mechanisms available. (Sousa, 2013, p. 673)

CBC is a relevant way to increase border regions' growth in different sectors. Keating (1998) described CBC as being based on common problems and opportunities. CBC creates opportunities, especially in the sectors of economy, culture and infrastructure. CBC creates opportunities for regions in different sectors. There are many examples in Central Europe of how the region has sought to build a better cross-border transport infrastructure that could facilitate the movement of people. An integrated and well-functioning transport infrastructure improves the movement of people and goods. Inhabitants can potentially find employment because accessibility increases across the border. In addition, companies can have skilled workers and offer products or services throughout the region (Ulrich, 2020; Basche & Spera, 2021).

Political, administrative and legal obstacles to cooperation are often a limitation or hindrance. Knippschild and Schmotz (2018) and Ulrich (2020) also shared this view and described cross-border problems as political, administrative and legislative. Overall, obstacles are due to differences. Political obstacles can be caused, for example, by differences

in the form of government. For example, the federal republic gives more power to the regions than a unitary state, and differences like this also directly affect administrative differences (Telle & Svensson, 2020). In addition, administrative actors in a cross-border region may have different rights to decide on regional resolutions, or there may be differences in decision-making speed (Knippschild, 2011). Lastly, legal barriers are due to differences in national legislation (Ulrich, 2002; Knippschild, 2011).

The EU is very interested in increasing CBC and wants to support this model of cooperation. The EU has a particular reason for this—the EU has 40 internal border regions, which represent 40% of the Union's territory and about 30% of the EU population lives in border regions. (EC, 2017).

In 2006, the EU set up an instrument called the European Grouping of Territorial Cooperation (EGTC). EGTC original regulation was created in 2006 and amended in 2013 to make it more approachable and effective (EC, 2018). The EGTC is the EU's tool for developing CBC. The EGTC has been a relatively common tool for CBC in Central Europe. Many studies on EGTC are based on the experiences of Central Europe (Engl, 2016; Ulrich, 2020).

During 2020–2021, the first Nordic EGTC region, the Kvarken Council EGTC, was established. The Kvarken Council is the largest EGTC region geographically. It is not just a positive thing. According to Knippschild (2011), the larger the area, the more expensive and time-consuming cooperation is. What is particularly time-consuming in the cooperation is that there are many different actors, and a joint decision must be reached with everyone. The EGTC tool provides answers to the theory put forward by Knippschild (2011). First, when an EGTC instrument is established in a region, the actors define the objectives and tasks of the region, so there is presumably more minor disagreement between actors in the region than those without EGTC status. Cooperation has been ongoing for decades in the Kvarken region; therefore, cooperation experience is advantageous to them (Kvarken history, 2021). Modes of transport are usually road or rail. However, the

Baltic Sea makes the area challenging because it is expensive and challenging to build a fixed land connection across the Sea. Therefore, the Kvarken Council EGTC, with its multiple stakeholders, is interested in exploring the possibility of implementing electric aviation in the region. FAIR (Finding Innovations to Accelerate the Implementation of Electric Regional Aviation) is the first step towards introducing sustainable electric aviation in the Kvarken region (Kvarken, 2021). Electric aviation is supported for many reasons. According to Thapa et al. (2021), electric aviation reduces emissions and is, therefore, better for the climate than traditional flight. Other benefits are that electricity is cheaper than jet fuel, and that electric airplanes produce less noise than conventional airplanes. These three benefits open new and exciting services for the aviation industry. For example, flights can potentially be brought closer to people's residential areas because they emit less noise. In addition, aviation becomes greener and cheaper, which means that operators can produce more flights per day. The geography of the Kvarken region supports electric aviation because traditional transport systems, such as railways or highways, are complex and expensive establishments because of the sea.

The region has a long history of cooperation; generally, Swedish and Finnish governments support green society. These types of green transport systems follow the Paris climate agreement (Kvarken history, 2021). In addition, the region has companies in the field of battery technology. The world's most environmentally friendly ship was built between Umeå and Vaasa (Kvarken Aurora Botnia, 2021). All these reasons support the implementation of electric aviation in the Kvarken region.

1.1 Structure of the thesis

The goal of this study is to find answers to the following research questions:

1. What is the EGTC instrument, and what kinds of possibilities and challenges relate to its implementation in supporting cross-border cooperation?

2. How can the EGTC instrument be utilised to support the implementation of electric aviation in the Kvarken region?

The aim is to find the answer to these research questions based on previous research and the empirical data collected. The research comprises theoretical and empirical part. The theory part tends to answer the first research question and the empirical part to the second research question. In answering the second research question, the theoretical findings of the work are also utilised, and their practical effects are reflected at the end regarding the empirical results.

2 EGTC Instrument

EGTC is the EU's territorial cooperation tool, especially promoting cross-border, transnational and interregional cooperation. The EGTC regulation entered into force in 2006, Regulation (EC) No 1082/2006 of the European Parliament and the Council of 5 July 2006 on EGTC. In 2013, a new Regulation No. 1302/2013 was introduced to clarify, simplify and improve the establishment and operation of the EGTC. Especially the amendment of the EGTC regulation was to help issues related to staff, convention and statutes, and membership from third countries. Although there is no clear evidence that the changes have facilitated the EGTC, they can now be used extensively and have impacted legal and financial challenges. Changes to the convention and statutes have made application for EGTC membership and EU funding easier. (EC, 2018.) According to CoR (2020) (European Committee of the regions), there are 77 EGTC regions. EGTC is an opportunity to take institutional CBC to the next level, allowing new legal entities to be created across Europe.

2.1 Basics of EGTC

The European Commission has established a few essential principles for an EGTC. The first principle relates to the members of the EGTC and what kind of public bodies can apply for EGTC status. Only EU member states and public bodies can apply for the EGTC. To apply for EGTC status, there must be public bodies in the region from two or more member states. EGTC members can be member states, regional or local authorities, associations and any other public body (CoR, 2007).

Generally, CBC is described as common among the political elite. The EGTC enables multi-level cooperation involving representatives at different levels. Different levels mean political, administrative and civil society representatives. Diversity and cooperation between different levels have been strengths of EGTC, bringing together other stakeholders in the region and the political elite (Boman & Berg, 2007; De Sousa, 2013; García-Alvarez & Trillo-Santamaría, 2013).

In principle, an EGTC can only be set up between municipalities, but this does not handle all the benefits of the EGTC. One good example of this type of successful EGTC is a European campus, an alliance of five universities in Central Europe (Eucor, 2020; Cor, 2017). EGTC legislation only stipulates that those certain public actors must be from at least two Member States but do not regulate actors' level. EGTC legislation leaves many opportunities for the members themselves, but this can also be a disadvantage if members do not take full advantage of the EGTC and do not admit stakeholders from different levels (CoR, 2017).

The first principle, when an EGTC region is established, EGTC members must have a convention that must list certain matters. The convention will provide general information on the EGTC, the headquarters, objectives and tasks. According to EGTC regulation, the convention must include the name of the EGTC and its headquarters, the list of members, the area it covers, objectives, missions and duration (CoR, 2017).

The second principle, with the EGTC instrument, the region will have a legal personality. Its objectives and tasks are set out in the statutes, and working on them is the main task of the EGTC (Cor, 2007). According to the European Committee of Regions (2007), EGTC is established mainly to perform the following three tasks: 1) managing the structural funds, 2) conducting strategic cooperation and 3) if appropriate, acting as a vehicle for the operational implementation of a cooperation project (CoR, 2007, p. 8). For example, TransOderana EGTC, located on the German–Polish border, set out its convention objectives as follows: 1) to expand and deepen German–Polish cooperation, 2) to reduce existing social and economic disparities and 3) to conduct joint projects and other activities within the scope of members' competences, to develop a modern, economically attractive region with a competitive economy, high-quality education and working conditions, and innovative solutions in public services (Ulrich, 2020, p. 17).

The third principle of EGTC is that there must be at least two bodies: the assembly and the director (CoR, 2017). According to Engl (2016), the structures of an EGTC can vary.

Different setups are one of the strengths of EGTC. The economic, geographical and administrative situation of each region is different. Therefore, it is essential that the EGTC be flexible and tailored to the region's needs. Setting up EGTC involves much regulation, but only two organs are mandatory: the assembly and the director. More organs can be created on top of these, making EGTC even more effective. It is, therefore, pointless to start comparing EGTC regions with each other because they are different and built to serve the benefits of their specific region. Engl (2016) fully described that there are different EGTC areas. For example, the EGTC Ister-granum on the Hungarian–Slovak border has 82 members, while the Euroregion's EGTC Pyrenees Mediterranean has only four members.

According to Engl (2016), each EGTC is unique. The number of members and bodies varies. Of course, the budget determines several EGTC opportunities. However, the budget is not everything because cooperation's opportunities and successes are greatly influenced by how actively the EGTC stakeholders operate and seek their intended objectives. Engl (2016) conducted a study using four case studies. The EGTC has significantly changed the legal basis for CBC, as it will make the region a legal entity. In these four cases, the strategy and objectives were narrowly designed, and the stakeholders' involvement was low. It is important that the EGTC stakeholders are active and actively seeking to create regional development projects and keep the activities within the EGTC so that cooperation does not decrease (Engl, 2016).

What makes an EGTC such a unique instrument is that they are legal entities, and all members operate jointly as an EGTC region (CoR, 2007). The Cambridge Dictionary (2021) defines a legal entity as follows: 'a company or organisation with legal rights and responsibilities, for example, the right to make contracts and the responsibility to pay debts'. EGTC status provides new structures for CBC. In practice, regional stakeholders can work together as EGTC. A legal entity is essential from the region's funding viewpoint. Assisted by a judicial body, the EGTC region can create its cooperation agreements annual budget and apply for funding as a single body (Engl, 2016).

Knippschild (2011) emphasised the importance of funding in CBC. According to Knippschild, CBC should produce and obtain support independently through various cooperation agreements without relying on national government funding and EU funding. The EGTC makes this type of activity easier because it can operate coherently under EGTC status.

2.2 Setting up EGTC

The EGTC, as an instrument, involves much ambiguity. Domestic law plays an important role in setting up and operating an EGTC. What makes this challenging is that domestic law varies from state to state. The EGTC regulation refers to domestic law extensively and makes this unclear, as each member state has its own domestic law (CoR, 2007).

There are different experiences in setting up an EGTC. Some experienced it as an easy and quick setting-up process. Some EGTC stopped while in the setting-up process. This is partly due to obstacles in the drafting of statutes and conventions. Stopping the EGTC process is due to complexity or difficulties when seeking support from national authorities. Other challenges relate to the closure or delay of the EGTC due to external causes. External causes are administrative reforms or changes in policymakers (CoR, 2020).

Although the establishment of the EGTC is perceived as challenging, it has improved since the changes made in 2013. In 2013, the EGTC regulation was amended, which particularly impacted its establishment. The 2013 regulation is considered valuable because, based on the data, the process of setting up an EGTC is shorter than before. According to a study conducted in 2018, the average duration of the setting-up process has reduced (EC, 2018).

Although efforts have been made to facilitate EGTC establishment, challenges remain. Ulrich (2020) provided good evidence, for example, of the EGTC regulation's ambiguity,

which has slowed down the establishment of a TransOderana EGTC region on the German–Polish border. There may be barriers to EGTC implementation between countries. Germany is a federal state, and each state has the decision-making power to implement EGTC regulation. E.g., in the German region of Brandenburg, EGTC regulation is mentioned in two paragraphs. On the Polish side, there are much more comprehensive and precise regulations on the EGTC instrument, containing 23 articles. Polish domestic law states that EGTC members have limited liability. In contrast, in the Brandenburg region, the regulation has left plank, and it can be said that Brandenburg is liable for the actions taken by the entire grouping. The Brandenburg region's lax attitude towards EGTC implementation has slowed down projects in the region (Ulrich, 2020).

Since EGTC is being set up and its regulations are being implemented in a completely different way, this starting point cannot be excellent for CBC in TransOderana set up (Ulrich, 2020). Although the EGTC is legally vague and complex to understand, it remains a useful tool for CBC because local, regional and state stakeholders can act together as official legal entities of the EU, regardless of national borders (EC, 2007).

There are many EGTC regions between Germany and France, and Ulrich (2020) took one into account. EGTC SaarMoselle has a slightly different experience setting up an EGTC than TransOderana EGTC between Germany and Poland. There has been a long common history between Germany and France like other supra-regional institutions. Thus, the EGTC transition was an inherent continuum, as the legal entity brings added value to CBC. In CBC, good relations, a common history and common objectives and tasks are vital. There will always be challenges in CBC, but for SaarMoselle, nothing insurmountable was found in setting up the EGTC, and the cooperation has been fruitful since then (Ulrich, 2020).

There are always administrative, legal or political challenges in CBC. Past cooperation and common goals support CBC and EGTC establishment. If we compare EGTC TransOderana and EGTC SaarMoselle, then there are significant differences in the history

of cooperation that affect EGTC establishment. German–French cooperation began in the 19th century, but modern cooperation began after World War II. In the 1990s and 2000s, CBC was also fostered throughout Europe by INTERREG funds. Many cross-border institutions were created; Euroregions and Eurodistricts were created in this period (Ulrich, 2020).

The Polish and German border is the so-called 'post-conflict' border (Wassenberg et al., 2015). In 1990, the Iron Curtain was dropped, and since then, cooperation has been possible. A significant change occurred in 2004, when Poland joined the EU and thus became part of the common internal market and the Schengen Agreement. Before TransOderana EGTC in the region, there has been one supra-regional institution that was founded in 2006. For example, some studies have shown that common history and culture support and create a better basis for CBC (Boman & Berg, 2007; Malloy, 2010).

According to Svensson (2015), the legal body of EGTC is not a necessary condition for CBC. According to Svensson, no indications have been found that this change has strengthened national or international social capital. Interestingly, Ister-Granum EGTC changed status from the Euroregion to the EGTC, and 20 former members decided not to join the new EGTC. Although the members were not very active actors, in any case, the stakeholders in the region decreased. Thus, it is felt that a legal entity does not seem to be the reason for lost members. Svensson (2015) also stated that the reason for abstinence can be influenced by motivation and objectives.

There are much researches on setting up an EGTC. A previous study has found. e.g., cases that have experienced adverse effects, such as the departure of members, and the whole set-up process have taken a long time for various reasons (Ulrich, 2020; Svensson, 2015). There were also cases where everything from planning to implementation has gone smoothly (Ulrich, 2020). A previous study showed that the experience of setting up an EGTC is polarised. There are many reasons for these experiences, and they are not due to the EGTC instrument. Setting up an EGTC is different because each EGTC is unique and

its establishment is influenced by many things that are separate from the EGTC (Engl, 2016). Of course, EGTC legislation can cause problems and slow-down projects; however, there are examples in Europe where the EGTC has progressed very quickly from the planning stage to the convention signing (Ulrich, 2020). Based on previous research, it can be deduced that the establishment of an EGTC instrument is more related to the region's challenges than to the EGTC establishment process itself.

2.3 Cross-border cooperation and EGTC

As we already know, the EU is highly interested in reducing barriers among EU member states and seeks to possibly provide a good framework for CBC. The purpose of the EGTC is to increase institutionalising CBC. The EGTC does not create new cooperation, but increases opportunities for existing regional cooperation. Few EGTC regions are set up from scratch without previous forms of cooperation, but regions with a common attainable objective and history of cooperation are the generally successful EGTC regions (Engl, 2016; Ulrich, 2020; Evrard, 2016).

CBC can occur on behalf of an association, Euroregion and other cross-border tools. However, the EGTC is the most effective way of cooperation, as it can have a legal entity. CBC is valuable for the border regions, while bringing some challenges in many sectors. Durá et al. (2018) described CBC as follows:

There is no standard cooperation agreement, and the cross-border governance structure is usually informal, flexible and without a legal personality. It is mainly a political agreement among territorial entities whose enforcement level depends on political momentum and interpersonal relations (Durá et al., 2018, p. 27).

The difference between the EGTC and the Euroregion is precisely the legal personality. Euroregions are institutions of CBC without independent financial or administrative resources. The EGTC is a more precise and more stable institution due to its legal personality and administrative, financial and other bodies enshrined in the treaty. The Euroregion is better suited to the initial phase of CBC, while the EGTC creates a better and larger framework for the cooperation (Durá et al., 2018). According to Knippchisild's

(2011) experience, the Euroregion as cross-border institutions has not promoted cooperation. These experiences are from the German–Polish, alongside German–Czech borders. The views of Knippschild (2011) and Dura et al. (2018) are similar. According to Knippschild, the Euroregion has not improved CBC, reflecting Dura et al. views. The Euroregion does not have independent financial or administrative resources, which reduces its influence. The legal body of the EGTC can contribute to this perceived problem.

2.4 Cross-border cooperation challenges

CBC faces many challenges. Based on previous research, there seems to be a clear consensus on the types of challenges that CBC generally faces. According to Knippschild (2011), Ulrich (2020) and Keating (1998), the challenges can be divided into a few major categories: 1) Linguistic and cultural, 2) Political, administrative and legal framework, and 3) Infrastructure-related.

Lack of cooperation between stakeholders is also a challenge. According to Engl (2016), EGTC regions with better and active cooperation got better results than regions with inadequate cooperation. However, this relates to all cooperation, not only CBC. Adding to the results of Knippschild (2011), Ulrich (2020) and Keating (1998), the European Commission has conducted a survey that also shows that economic disparities and sociocultural differences create obstacles in CBC (Medeiros, 2019).

The first problem relates to linguistic and cultural challenges. Medeiros (2019) provides an excellent example of linguistic challenge. CBC occurs between two or more states. The Euroregion Meuse-Rhine (EMR) is an EGTC region involving three states: Belgium, the Netherlands and Germany. A cross-border train connection is planned for the EMR, which means that staff must provide services in three languages. This might induce additional costs for the region, as skilled staff needs to be employed or provide education, especially for regions where multilingualism is uncommon. Linguistic and cultural differences are considered a problem for CBC, but less can be assumed in theory (Knippschild & Schmotz, 2008). Linguistic differences can cause problems, but a common language and culture increase and facilitate CBC.

Wróblewski (2020) drew similar conclusions. Cultural and linguistic issues can challenge or benefit CBC. Some people living in border regions may experience the scars of state border history and evoke a certain negative stereotype. However, the benefits of culture and linguistic issues come to the fore if similar language is spoken in the region and shares a common positive history (Wróblewski, 2020).

The second problem relates to the politics and legal issues hampering CBC between states. The problems are not necessarily related to border region's problems, but are rooted at the state level. For example, a state can be a federal republic or a unitary state. Telle and Svensson (2020) observed that federal states give more authority to the regions than a unitary state, leading to different decision-making opportunities. They believe that EGTC instrument establishment is less between two federal states than between a unitary state.

Knippschild (2011), Ulrich (2020) and Keating's (1998) findings on political obstacles are supported by Ulrich's (2020) experience with the TransOderana EGTC region. The EGTC is a supranational institution that involves stakeholders on both sides of the border. This is the advantage of the EGTC in that stakeholders can work together through the EGTC as a single institution. Between Germany and Poland, the process of setting up the EGTC seemed to be progressing well before the local and parliamentary elections emerge in Poland. Due to the election, the Polish mayor was changed, which slowed down EGTC creation.

According to Knippschild's (2011) findings, administrative challenges slow down CBC because the administrative staff is not well equipped for such processes, requiring flexibility, a willingness to take risks and creativity.

Administrative problems can be defeated, but more obstacles will arise on the human resource side. Although small administrations respond better to change, act faster and are flexible, the obstacle for small municipalities and administrations is a lack of staff.

The third problem raised by Knippschild (2011), Ulrich (2020) and Keating (1998) was infrastructure related. Cross-border transport needs a coherent network. Physical infrastructure is essential for vehicles to run smoothly across borders. Previous studies have shown that cross-border transport can face challenges because, for example, rail and train technology can be different on both sides of the border. Adding to the physical transport infrastructure, a joint data system is needed to ensure the equipment's security and condition. A joint data system needs a high-quality ticket and travel information system (Christmann et al., 2020; Medeiros et al., 2021). This is particularly important in cross-border transport. In Central Europe, there are cases where different data systems and travel cards between countries hinder cross-border transport (Medeiros et al., 2021).

The EGTC does not provide direct answers to the problems raised by Knippschild (2011), Ulrich (2020) and Keating (1998). However, it does create new opportunities for cooperation in the region. In principle, the EGTC provides a new platform that regional and national stakeholders can use for CBC. Stakeholders can build a new supra-regional institution to support the construction and development of the region. The EGTC is usually used as an operational tool and rarely aims to raise awareness of projects in the region. The greater region, SaarLorLux, used the EGTC instrument to support the implementation of cross-border strategy, visible to the citizens (Evrard, 2016).

CBC involves many stakeholders at different levels. Stakeholders can be found at the EU level, national level and local level. The EGTC can bring all these to one table, which makes communication and joint spatial planning easier. At the local level, the EGTC will create a new kind of cooperation within the region and relaunch the patterns of cooperation that have ended in the region. In principle, cross-border projects' effects go beyond the powers of the border regions involved, so the EGTC must work closely with all national governments. The EGTC must cooperate with bodies at the EU level, such as the

European Commission, the European Committee of the Regions and the European Parliament members. Cooperation with these bodies will benefit the projects (Medeiros et al., 2021). CBC needs to be planned at many levels. This is why the EGTC is a great tool, as it can keep the dialogue open between actors at different levels.

3 Cross-border transport

Cross-border mobility can be roughly divided into people and goods. The movement of people is considered in this study. The movement of people can be divided into private and public transport. Cross-border transport plays a significant role in the region's activities (Chilla & Heugel, 2018; Ebster & Schmidt, 2019).

Quality of life of individuals or groups is directly related to satisfaction resulting from social, economic, psychological and health conditions. Border regions are in a problematic situation. According to Knippschild and Schmotz (2018), border regions suffer disadvantages in quality of life and competitiveness. The main reason is the region's remote location. Cross-border transport is one key aspect of a good quality of life in border regions (Ceder, 2020). In principle, the public sector generates joint cross-border transport systems like bus and train routes across the borders. According to the Cambridge English Dictionary, (2021) public transport is defined as 'A system of vehicles such as buses and trains operate regularly on fixed routes and are used by the public'

Cross-border mobility has been on the rise in recent decades and firmly because the Schengen agreement and the EU's internal market are likely to allow the free movement of people and goods across borders (Knippschild & Schmotz, 2018; Winder et al., 2001). Although cross-border transport within Europe has risen, as demonstrated by Winder et al. (2001), journeys are increasingly made through cars, as people own cars, roads have improved, and the regions offer poor public transport services. Thus, border regions must seek to strengthen cross-border public transport. The region needs high-quality and efficient cross-border public transport so that the cross-border region's inhabitants can benefit from services regardless of borders. One good example is that it is cheaper to live in one country and a better wage is paid in another, which is why people move across borders. Notably, the better the public transport services in the region, the fewer the inhabitants will use private cars or motorcycles, which will reduce emissions and help

green transition, which is the EU's vision for the future (Winder et al., 2001; Cavallaro & Dianin, 2020).

From previous research, a few key things can be presented that are needed for successful cross-border transport. First, successful cross-border transport requires a sufficiently comprehensive and high-quality public transport network. High quality means that the fleet is quite new, and public transport operators will offer enough different routes and the necessary timetables for the region residents' benefit (Basche & Spera, 2021). For example, Euroregion Meuse-rhine cross-border public transport includes 26 cross-border buses and three cross-border railway lines as of March 2021. Second, is that the region needs a certain kind of population that makes public transport practical. For example, Euroregion Meuse-Rhine is 10.741 km² with a population of 3.998 million in 2020 (Eurostat 2021; Basche & Spera, 2021; Cbs, 2021; Kriele, 2005). These figures mean that the area is densely populated and therefore public transport is more economically viable here than in many other rural areas (Basche & Spera, Vogel 2002).

Table 1. Types of factors that influence cross-border cooperation in public transport (Basche & Spera, 2021, p. 4).

Type of factor	Main features of obstacles	Main features of success factors
Legal	Differing laws and regulations	Extensive legal empowerments
Administrative	Diverging responsibilities at identical institutional levels	Institutionalised cross-border focus at PTAs and PTOs
Mental	Public transport planners limited perception of occurrences 'their' state border	Pronounced knowledge about and interests in cross-border counterparts

Cultural	Lack of knowledge of foreign languages	Public transport planners share common first language
Political	Cross-border issues of significantly less importance than domestic issues	Marked willingness to (financially) promote cross-border public transport
Financial	Limited availability of funds for cross-border projects	Abundant (non-temporary) funds for cross-border projects
Technical	Diverging technical standards information systems	Harmonised ticketing, tariffs and timetables

As table 1 shows, the challenges of cross-border public transport are the same as Knipp-schild (2011) and Ulrich (2020) mentioned earlier. Regarding transport, it has been shown that barriers can be very challenging and are in solid symbiosis with each other. Considering transport, technical differences between regions are highlighted. Of course, there can be various technical problems among regions, but many previous studies have explicitly mentioned different ticketing systems and different sizes of railways are problems (Basche & Spera, 2021; Medeiros et al., 2021).

3.1 Cross-border spatial planning

Spatial planning is a key element in cross-border transport cooperation. The European Commission (1997, p. 24) described spatial planning as follows:

Spatial planning refers to the methods used largely by the public sector to influence the future distribution of activities in space. It is undertaken with the aims of creating a more rational territorial organisation of land uses and the linkages between them, to balance demands for development with the need to protect the environment, and to achieve social economic objectives. Spatial planning embraces measures to co-ordinate the spatial impacts of other sectoral policies, to achieve a more even distortion of economic development between regions than would otherwise be created by market forces, and to regulate the conversion of land and property uses.

Although harmonisation policies between European Member States have evolved, CBC still faces significant challenges in spatial planning. One of the challenges is that the EU's transport regulation is in its infancy. This means that the regulation of movement and transport is made nationally, which leads to differences between countries and may slow down cooperation. For this reason, the region must have similar visions and goals for its development, as it facilitates discussion. Moreover, an active dialogue facilitates cross-border spatial planning by addressing the other side's legal, political and administrative challenges (Fabbro & Haselsberger, 2009; Durand 2014; Guillermo-Ramirez, 2018; Hagen & Andersen, 2018; Ulrich, 2020; Knippschild & Schmotz, 2018).

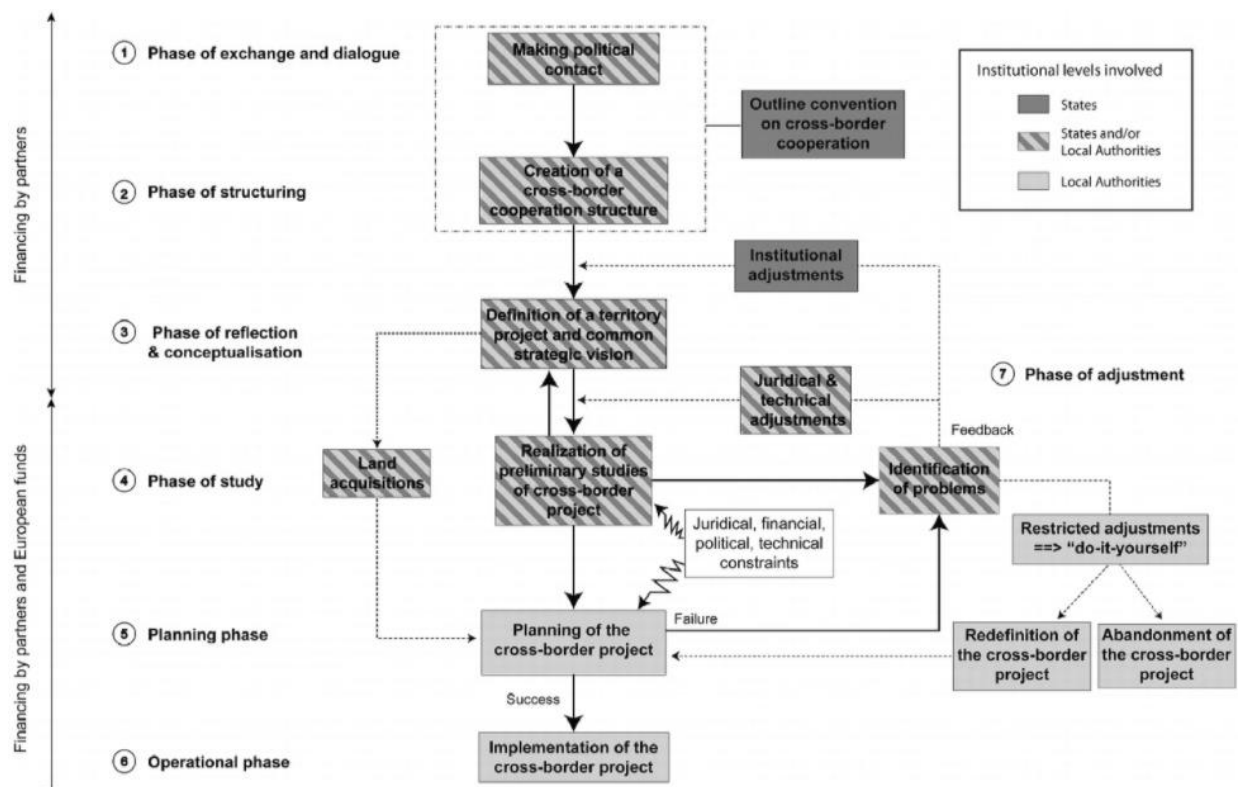


Figure 1. Model of cross-border spatial planning implementation (Durand, 2014, p. 125).

As Figure 1 shows, cross-border spatial planning implementation involves many actors at the state and local levels, and shows how complicated and multi-phase the implementation of cross-border projects is. The spatial planning strategy of an individual state must focus on the national and cross-border level. Local organisations and politicians are responsible for ensuring a clear understanding between regions—about the regional policy of another state and what kind of spatial planning strategy is being performed on the other side of the border (Durand, 2014).

An EGTC instrument could potentially remove some levels of administration and make planning work more flexible. EGTC instrument can bring regional stakeholders to the same table, where different levels have direct discussion connections (Cor, 2007; Engl, 2016). In addition, the instrument will create a coherent strategy in the region, which will undoubtedly facilitate regional planning once it can be done coherently among the stakeholders in the region.

3.2 Cross-border transport and EGTC

The EGTC instrument serves as a tool in cross-border transport. EGTC is useful when stakeholders have same shared vision for the region's development. The challenge is that the stakeholders in the region have different visions and plans for developing the region. This relates to all cooperation and not only to the EGTC instrument. The EGTC instrument's benefit is that common objectives must be enshrined in the convention when it is established (Jacobs, 2014; Engl, 2016).

The EGTC enables a more efficient planning process. A joint management structure allows for overcoming national bureaucracy and making decisions on projects within a legal entity, thus enabling a coherent project to be planned across borders. Obstacles appear at the stage when the project is taken to the national level. The challenges are not related to the EGTC tool itself but to the national level, as differences at the national level can affect the project development. The differences at the national level may be related to the infrastructure, the administration and law. The EGTC will facilitate plan

work and increases cooperation. However, at the general level, the typical challenges of CBC will remain. The EGTC creates a new legal framework for CBC but does not solve all the CBC challenges.

Table 2. Cross-border public transport main obstacles, respective challenges and solutions (Adapted from Medeiros et al., 2021, p. 297).

Type of obstacles	Challenge	Potential Solution
Legal and administrative	<ul style="list-style-type: none"> -Schedules -Prices -Lack of information -Lack of cross-border planning 	<ul style="list-style-type: none"> - Create legal and administrative standards or systems when operating cross-border transport. - Normalise schedules - Reduce ticket prices and integrate ticketing systems Provide higher levels of information to the public via a multilingual information process. - Transport networks and services and transport infrastructure need to be jointly planned. - Make use of the European cross-border mechanism draft regulation.
Institutional	<ul style="list-style-type: none"> -Lack of joint management structures 	<ul style="list-style-type: none"> - Implement joint management structures to facilitate the establishment and operation of genuine cross-border transport - They can take the form of an EGTC

		<ul style="list-style-type: none"> - Have a single (private or public) legal body with its own budget that can operate equally on both sides of the border in managing cross-border public transport.
Infrastructure	<ul style="list-style-type: none"> - Lack of interoperability - Different ticketing systems - Lack of reduced presence - Reduced speed 	<ul style="list-style-type: none"> -Reinforcing the harmonisation and modernisation of ticket rules and systems alongside technical standards. - Implement new cross-border connections of cross-border public transport (including the expansion of railway lines) or increase their frequency along the day. - Modernise transports to increase speed and implement direct routes.

Table 2, Medeiros et al. (2021) presents challenges and potential solutions of cross-border transport. The challenges of cross-border transport are multidisciplinary. Challenges include cross-border planning, harmonisation of legal and administrative procedures and joint management structures.

Cross-border planning: transport networks and services, alongside transport infrastructure, need to be jointly planned. This includes all operational aspects of transport to connect both sides of the border: ticketing systems, understandable information sources

and time schedule (Medeiros et al., 2021, p. 293). One of the biggest challenges of cross-border public transport has been the various ticketing services between countries. Due to digitalisation, this has become easier to deal with. In the last few years, an innovation card called the European Travellers Club (ETC) has been under development. This card will create a common platform for public transport throughout Europe. This innovation is still in its infancy, but if successful, it will certainly create added value. If this type of innovation emerges, what benefits will the EGTC instrument bring to cross-border transport? (Elsmann & Quitmann, 2019)

Harmonisation of legal and administrative procedures: there is a need to create legal and administrative standards or systems when operating cross-border transport. In this regard, mutual recognition or limited derogations from national rules can be considered on a case-by-case basis (Medeiros et al., 2021, p. 293).

Joint management structures: their use can facilitate the establishment and operation of genuine cross-border transport. These structures can take the form of an EGTC (Evrard & Engl, 2018; Medeiros et al., 2021, p. 293).

The challenges of cross-border transport are enormous, and the individual impact of key factors is difficult to quantify. Challenges can be technical problems, but this is not just a technical problem, as political and economic barriers strongly influence it. Although the challenges can be broken down into, for example, political, legal and technical, they are still in solid symbiosis with others, and it can be very complex to solve these challenges.

Medeiros et al. (2021) illustrated how the EGTC instrument can solve these problems. For example, as a legal entity and joint management structure, EGTC can create a unified ticket platform that can operate equally on both sides of the border. The ticket system is a keen barrier to cross-border public transport. Each state has its own public transport

network, and they operate heterogeneously rather than collectively. This poses problems for cross-border mobility due to the lack of a unified platform for public transport in the region.

The EGTC instrument has proved helpful in cross-border transport projects in Central Europe. The Euroregion Meuse-Rhine EGTC has solved the problem by creating a single ticket network for a region that supports public transport operations. The integrated ticketing network particularly supports residents studying or working on the other side of the border.

The Eurodistrict, Strasbourg–Ortenau, changed EGTC in 2010. This change proved to be very successful regarding the bus connection between Strasbourg and Ortenau. The project was aimed at facilitating the employment of French workers in German companies.

According to Medeiros et al. (2021), the main advantages of using the EGTC as a central platform to manage this cross-border transport project (Strasbourg–Ortenau) were:

- The fact of having a legal structure and an own budget allowed one to 'fill gaps', where other actors were not willing or able to act together.
- The capacity to act as a coordinator and mediator between German and French parties, as facilitator and accelerator alongside the pilot for experimental mobility projects;
- The capacity to understand both national and regional contexts, legal bases and attitudes.
- The fact that all its members have the competence for a common topic, for instance, bus transport, makes it possible to centralise and create by delegation to the EGTC (Medeiros et al., 2021, p. 294).

The EGTC instrument also faces challenges in cross-border transportation. When an EGTC platform is created, its strategy and objectives must be stated in the convention.

At this stage, the emphasis is on common goals and the previous history of cooperation. The EGTC usually chooses between two strategies (Medeiros et al., 2021):

- Concentration on one or a few clearly defined missions and choice of its members, according to the competences needed for the missions.
- Definition of a wide panel of topics to respond to the distinctive needs of daily cross-border life.

(Medeiros et al., 2021, p. 294).

In many cases, the EGTC has created added value in cross-border transport. A joint administrative body and a legal entity will bring new cross-border transport opportunities, such as applying for joint funding and creating a common transport platform. Importance to the EGTC tool's success is that members are on the same line in development work. Moreover, members must seek to increase the dialogue between members. It is the cornerstone of all CBC (Engl, 2016). According to Rietveld and Stough (2004), national policies do not sufficiently address cross-border transport, which is why the EGTC tool can be considered excellent in the transport sector, as it allows for better access to funding.

4 Electric aviation

In this chapter, the current state of electric aviation and the background on empirical research, as the case study relates to the promotion of electric aviation in the Kvarken region, are explained. Electric aviation is part of the future of aviation, and according to Smedberg et al. (2021), electric aviation will take place within 5–10 years. Electric aviation is possible both technically and infrastructurally. Especially if electric flights are planned for short local flights, then in 5–10 years, it might be possible for 50 people to fly 300 kilometres. At present, the technical side is no longer seen as a problem in the aviation sector. The bigger problem at the moment is the electric aircraft certification process, which is time-consuming (Smedberg et al., 2021).

Currently, aviation produces a small share of global greenhouse gas emissions. Aviation produces about 2% of human-made CO₂ emissions. If similar aviation continues, then the percentage will rise to 3% in 2050. Electric aviation produces zero emissions if electric energy is produced from renewable sources. Besides this, traditional aviation will cause other emissions that will affect the region's global climate and air quality (Airbus, 2020A). Electric aviation is an important part of the EU's 2021–2027 cohesion policy. The objectives of the cohesion policy are to create a greener and carbon-free Europe and a more interconnected Europe. Electric aviation will make aviation a green transport and increase the accessibility of remote regions. (EC, 2020).

Electric airplanes are powered by an electric motor powered by a hydrogen fuel cell or battery. Currently, battery energy storage is not optimal for flying because the battery can store little energy and weighs a lot. Battery technology poses the biggest challenges of today in electric aviation, but once they are overcome, there will be new challenges. These challenges refer to the need for highly efficient motors and energy converters (Thapa., et al, 2021).

As Thapa et al. (2021) showed that jet fuel currently allows the aircraft to receive much more energy than the battery. If we want to get the same amount of energy from the battery, we need to add more batteries, approximately 50 batteries, to the plane. The problem is that batteries weigh more than fuel, which means when batteries are added, the aircraft becomes weightier, and weight is crucial when flying. Currently, the batteries' energy is not enough for very long journeys, and they lag behind traditional aircraft. It is not possible to fly long distances with a single charge. This is not likely to be an obstacle in the Kvarken region due to its small geographical area (Thapa et al., 2021).

Battery technology is not a necessity for electric and green flying. Fuel cell technology has been proposed as a replacement for battery technology. Due to its lightweight nature, fuel cell technology has become a significant competitor. Hydrogen fuel cells have been suggested as an alternative for long flights, but there are also challenges. Chemical storage of hydrogen must occur under high pressure or as saturated liquid hydrogen that must be stored about -253°C and requires large, well-insulated tanks (Airbus, 2020B).

It is often said that electric aviation is a cheaper option than traditional aviation, but no more precise figures have been obtained (Garret-Glaset, 2020; Thapa et al., 2021).

This is certainly because there have been no electric airplanes in the market. Ganzarski, the CEO of MagniX, a manufacturer of electric motors for flying, said that electric aviation reduces operating costs by 40–80%. Their thirty-minute test flight consumed 6 USD worth of electricity, while jet fuel would have cost 300 USD. The test flight was performed on a MagniX eCarava aircraft. According to Ganzarski, aviation is experiencing a new kind of opportunity with electric aviation. The test flight was cheap, but the plane was also described as extremely quiet. Cheapness and silence are the two strengths with which electric aviation is advertised. (Garret-Glaset, 2020). Thapa et al. (2021) also argued that the cost of energy is cheaper in an electric aircraft. With an electric plane, 160 kilom costs about 25 USD. The same trip costs with a traditional plane about 150–200

USD. Although the use was different for airplanes, in both cases, electric-powered airplanes were significantly cheaper to fly than traditional internal combustion engine airplanes. Of course, aviation involves many other costs, but electric is cheaper to fly if the comparison is purely made between electric and internal combustion engines.

Electric aviation may be a revolutionary mode of transport in the future. Its basic principle is that it is a green and sustainable form of movement. However, if electricity is produced from fossil fuels, that also affects the sustainability of this transport mode. Of course, emissions also come when considering all types of flight tests. Even electric ones need to consider brake wear, tyre abrasion, and road surface erosion, as these also cause particulate emissions. Electric aviation opens new possibilities for human accessibility because it is quieter, greener and the fast acceleration feature eliminates the need for long runways. However, electric aircraft require as much space for landing as conventional aircraft. In addition, electric planes are quieter, so aviation can be brought closer to human residents in practice. Finally, electric aircraft produces fewer emissions than conventional aircraft. Hence, operators can produce flights on a frequently busy schedule because it is a sustainable mobility model (Garret-Glaset, 2020, Thapa et al., 2021).

Urban air mobility (UAM) or air taxis are innovations that are currently gaining attention. Tax services are not a new concept in the aviation industry, but now, flying produces emissions. Short haul flying becomes relevant as aviation becomes electric. (Thapa et al., 2021). The concept would utilise vertical take-off and landing (VTOL), especially EVTOL (electric vertical take-off and landing) aircraft. This type of transport is utilised in different cities, but the transport takes place in traditional helicopters. The development of technology, in general, has opened new possibilities for human transport. Battery technology, sensors, data collection and artificial intelligence together will enable future flying without pilots. The UAM concept is in its infancy, but it will be part of the future of aviation. The UAM concept is gaining credibility because the global company UBER is

interested in this transport model. Straubinger et al. (2020) summarised UBER's plan well.

UBER stipulates a design mission range about 95 km and a reserve range of almost 10 km at minimum cruise speed 240 km / h. Cruise attitude is set to 300 m above ground level. (AGL) A required payload of 500 kg is specified for four passengers (Straubinger et al., 2020, p. 3).

The European Union Aviation Safety Agency (EASA) has received many inquiries about VTOL aircraft type approval. EASA does not have type approval certification specifications for this vessel, so specific methods were developed for VTOL aircraft. VTOL aircraft brings new features to human aviation. VTOL technology brings new issues because it is designed to take off vertical without a runway. This technology differs from those previously used in conventional rotorcraft or fixed-wing aircraft. This new technology is not yet used in aircraft, so it must undergo an accurate certificate process (EASA, 2021).

Taxi services and VTOL solutions are in the beginning and will involve many challenges as the concept develops. Safety, price, weight and efficiency are crucial elements when translating a concept from theory to practice (Thapa et al., 2021).

5 Methodology

Research can be divided into qualitative and quantitative methods. This study was mainly conducted using qualitative methods, but a quantitative sample was also used with the questionnaire. Quantitative research uses precise and computational methods. While qualitative utilises people's experiences. The purpose of qualitative research is to understand the phenomenon considered in the research. Usually, research is viewed through people's experiences, thoughts, observations and feelings. Admittedly, it is challenging to get inside another person's world of experience and experience things as they experience them. For this reason, many methods have been created to approach and analyse the issue (Puusa & Juuti, 2020).

Case studies are diverse and utilised in many disciplines. This makes it difficult to provide such a comprehensive definition. Generally, a case study investigates a specific case or cases. A case study is described as more of a research approach or approach strategy than a research method. Research methods can be divided into qualitative and quantitative. This study is a qualitative study utilising a case study strategy. Case studies are common in the social sciences and should be taken to investigate if one or more conditions are met (Eriksson & Koistinen, 2005; Saaranen-Kauppinen & Puusniekka, 2006A).

- The 'what', 'how' and 'why' questions are central.
- The researcher has little control over the events.
- There has been little empirical research on this topic.
- The object of research is something in the living life of this time
- Phenomenon

(Eriksson & Koistinen, 2005, p. 5).

Case studies can be utilised in many different studies. Researchers have given different criteria for what may be a case. In this study, the case is electric aviation in the Kvarken region.

A case study is a broad concept and can be divided into even more specific styles. This research is an intensive case study. An intensive case study means frequent description, interpretation and understanding of a case. The goal is to produce contextualised information about one or, at most, a couple of cases. This means that the case was investigated in a social and physical environment. The intention is not to generalise, but to find how this detailed case works. Intensive and classical case studies have often been criticised for poor data analysis and lack of evidence. Intensive case study's challenge is combining theoretical concepts and ideas for carefully done empirical analysis in a way that would inspire its readers to learn and act (Eriksson & Koistinen, 2005)

5.1 Research material

Typical case study materials include interviews, statistics and surveys. (Eriksson & Koistinen, 2005). A thematic interview refers to a conversational interview that progresses on pre-planned themes. Themes, help questions and keywords should be planned before the interview. These will help in conducting the interview. Therefore, the thematic interview should not be about asking petty questions in the exact order from the paper. The themes and their sub-themes are discussed quite freely. A thematic interview is a suitable form of an interview, for example, when a researcher wants information about lesser-known phenomena and issues than a semi-structured and structured interview (Saaranen-Kauppinen & Puusniekka, 2006B).

Two data collection methods were used in this study: expert interviews and a questionnaire. The research material was originally collected for the FAIR project. The FAIR project will be presented later in this study. The expert interviews were conducted anonymously and the GDPR (General Data Protection Regulation) regulation was applied to collect the data. The interviews included seven local-and national-level experts from Ostrobothnia and Finland. Interviews were conducted using the zoom service and were recorded for research purposes. The interviews lasted 30–90 min. The interviews had to

be translated from Finnish to English, which cannot be done word-for-word, but the main message remains. The purpose of the interviews was not to obtain precise information, but rather to provide broader information on the possibilities of electric aviation. The expert interviews were thematic, semi-structured and focused on a few key themes, CBC, electric aviation and the EGTC instrument.

Adding to the expert interviews, the data were collected through an online survey. A survey is a data collection method that can be conducted in many ways. Different research requires a survey, and there is no precise formula for how it should be implemented. Several factors in the design and implementation of a questionnaire can affect responses, response rates and the survey's overall validity and reliability. The survey is an important way of gathering and looking at information about, among other things, various societal phenomena, human activities, opinions, attitudes and values. These types of interests are both multidimensional and complex (Vehkalahti, 2008).

The online survey was open during 16–30.11.2020. The link was sent to a list of 189 persons, which consisted of the FAIR contact list and additional persons who were considered important to gain relevant regional views about electric aviation. The response rate to the survey was 24.8% (47 responses) and was considered a relatively good result, as it was targeted at experts. In this study, all research results are not utilised since they are not relevant to this study. The answers to questions 1, 6, 8 and 9 are used in the study. The survey comprises multiple-choice sections, alongside open-ended questions (see Mäenpää et al. 2021).

5.2 Thematic content analysis

All analytical methods of qualitative research can be utilised in a case study. In this study, the thematic design was used as the method of analysis. Themes are usually formed based on material, and themes are repeated in the material (Eriksson & Koistinen, 2005;

Saaranen-Kauppinen & Puusniekka, 2006 C). The themes of this study were founded on both the thematic interviews and the themes observed in the theoretical framework. Alternatively, in principle, CBC and, more specifically, cross-border transport face certain challenges, according to the theory. The larger challenge entities described in theory, such as infrastructure or policy, were met in the thematic interview with experts. The thematic analysis combined the general challenges of CBC with the challenges of implementing electric aviation in the Kvarken region, aiming to answer how the EGTC instrument can be used in the Kvarken region. The empirical part is divided into two parts, and the first one presents the results obtained from the EGTC instrument using a questionnaire. The second part is divided into themes and presents the opinions of the experts. At the end of each theme, how the EGTC can benefit from each theme is presented.

6 Case study: Electric Aviation in the Kvarken region

6.1 Background

The Kvarken region includes areas from Finland Ostrobothnia, Southern Ostrobothnia and Central Ostrobothnia. In Sweden, the county of Västerbotten and the municipality of Örnsköldsvik. Its narrowest point is in the Gulf of Bothnia. There are about 80 kilometres between the coasts, but only 25 kilometres between the outermost islands and its narrowest point in the Gulf of Bothnia (Kvarken History, 2021).

It is difficult to build traditional rail or road networks in the region, and the shipping link has also been slow, especially regarding CBC, because the journey takes time. Electric aviation is a natural alternative for the region, precisely because of geographical reasons. The Kvarken region is involved in a cross-border development project to develop electric aviation conditions in the region. Funding has been received through Interreg Atlantica-Botnia. FAIR (Finding innovations to Accelerate the Implementation of electric Regional aviation) is a two-year project and aims to support electric aviation in the region and find potential business models for making it possible (Kvarken FAIR, 2021)

Multiple energy companies in the Kvarken region share a common set of values for a green and sustainable world. Global energy companies, such as Wärtsilä, ABB, Danfoss and Northvolt, alongside the largest energy technology hub in the Nordic countries, Energy Vaasa, and the manufacturer of electric aircraft, Heart Aerospace. Actors like this support electric aviation in the region. For example, Heart Aerospace has signed a letter of interest agreement with the aircraft company Finnair, and Finnair may acquire electric aircraft created by Heart Aerospace in the future (Mäenpää et al., 2021)

The Kvarken Council was founded in 1972. In 2008–2020, the Council's operations were administered by a non-profit association registered in Finland, with activities on both sides of the Kvarken. However, the history of the collaboration extends further. The history of the region began in the 14th century. The study does not go that far. In the

1830s, steamship traffic began across the North Sea. The Kvarken Council was discovered at the first Kvarken Conference in 1972. In 1979, it became an official association as part of Nordic cooperation. There has been CBC in the Kvarken region for a long time, but the EGTC aims to promote CBC. The Kvarken Council is involved in disposing of the Nordic border barriers. The Kvarken Council has been actively involved in CBC and has been involved in over 100 cross-border projects over the last 50 years and projects in the area have received funding of approximately 13 million euros since 2011 (Kvarken history, 2021).

One good example of such successful projects is a new ship connection established between Vaasa and Umeå. The voyage is made on the Aurora Botnia ship, advertised to be the most environmentally friendly in the world. This project supports electric aviation's potential, as the region wants to be a pioneer in environmentally friendly transport (Kvarken Aurora Botnia, 2021).

6.2 Setting up the Kvarken Council EGTC

The Kvarken Council EGTC will become Europe's largest EGTC from a geographical perspective and likely also due to its number of members. (Kvarken EGTC, 2021). The Kvarken Council EGTC comprises 10 founding members, also to which four members with voting rights and four members in the 'other members' category have joined. Members are municipalities, cities and regional associations.

Table 3. Members of Kvarken Council EGTC (The Kvarken Council, 2021).

Founding members of Kvarken Council EGTC	New main members (with voting rights)	Other members
Region Västerbotten	City of Kurikka	Vindeln Municipality
Umeå Municipality	Korsholm Municipality	City of Nykarleby
Örnsköldsvik Municipality	Storuman Municipality	City of Närpes
The Regional Council of Ostrobothnia	Lycksele Municipality	Nordmaling Municipality
The Regional Council of South Ostrobothnia	City of Kurikka	
The Regional Council of Central Ostrobothnia	Korsholm Municipality	
City of Vaasa	Storuman Municipality	
City of Kokkola	Lycksele Municipality	
City of Seinäjoki		
City of Jakobstad		

The Kvarken Council sets out on its website the reasons they applied for EGTC status. The council describes the EGTC as a powerful body for the development of the region. The region will be identified and increased visibility at the EU level. The change from EGTC makes the council structure more robust with legal personality, alongside guaranteeing lobbying through the EGTC platform and facilitating the implementation and joint management of cross-border projects. The setting up process was straightforward and smooth. The founding meeting was held in October 2020, and the Kvarken Council EGTC has begun its operations at the turn of the year 2020–2021 (Kvarken EGTC, 2021)

According to the Kvarken Council, EGTC status brings various benefits to members. It is seen as increasing members' information, and as practical help in applying for funding for new cross-border projects. In addition, the Kvarken Council suggests that the EGTC

will bring similar benefits as previous studies have shown, i.e., less bureaucracy, making it easier to apply for funding. One good aspect of the benefits of an EGTC is that the membership fee for the municipality in the Kvarken Council is a small investment on an annual basis compared to hiring an external consultant, although assisting in preparing project applications. (Kvarken become member, 2021).

6.3 Experts' views on electric aviation in the Kvarken region

Expert's views were collected through survey. The survey was originally conducted for the FAIR project. In this study, all research results are not utilised, since they are not relevant to this study. The answers to questions 1, 6, 8 and 9 are used in the study. (Mäenpää et al., 2021). Respondents had the opportunity to answer on a scale of 0–5 (0 = Strongly disagree, 5 = Strongly agree and there was also possibility, 6 = do not know).

The first question relates to regional effects. The average score of individual responses ranged from 4.2 to 4.6, and the average score of all responses is 4.4. Based on the results, it can be stated that electric aviation is welcomed in the Kvarken region and is seen as having a positive impact on the region's development. The strongest score (4.6) is that electric aviation makes the Kvarken region a pioneer in that field. At the lowest score of 4.2, it is seen to benefit the Kvarken environment. The positive atmosphere in the region feeds the establishment of cross-border projects. The more accepted the project is in the region, the easier it will be to implement.

Based on the responses, electric aviation has a positive impact in many different sectors. It is believed to increase accessibility to small cities and, especially, rural regions, which is the purpose of cross-border transport. Being a pioneer in this industry would be vital for the region.

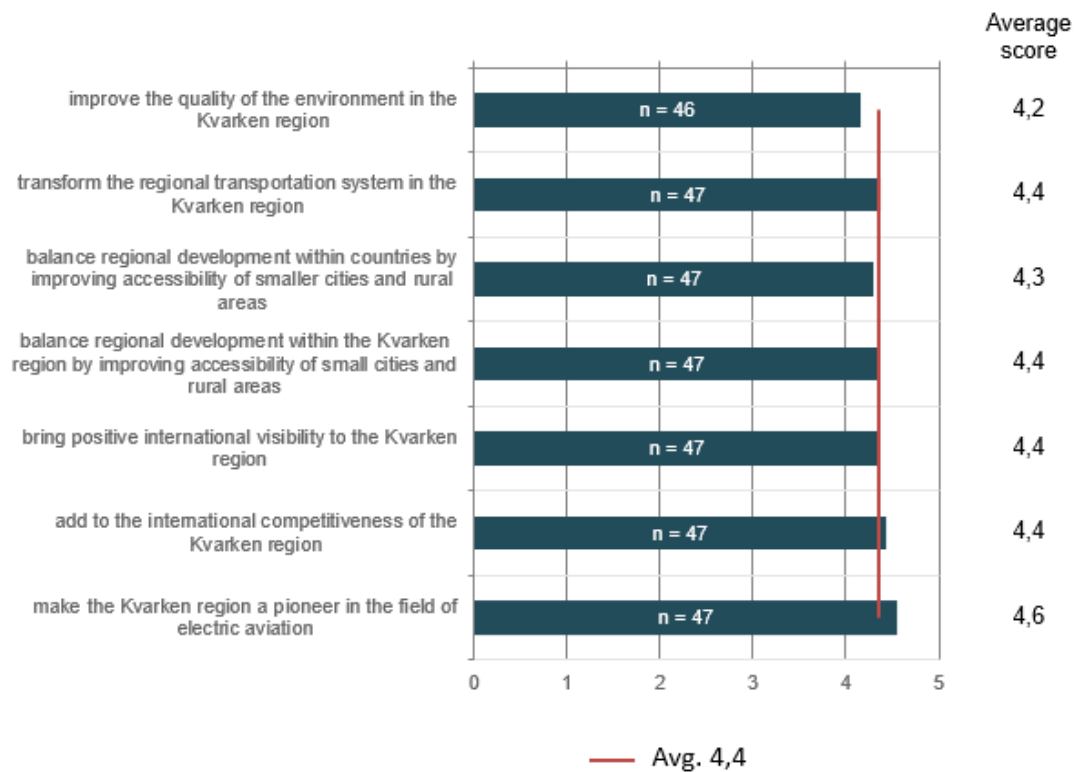


Figure 2. Assumed effects of electric regional aviation. (Mäenpää et al., 2021, p. 8).

Next, this study utilises survey question number 6 answers. The question was: *How do you think that an implementation of electric regional aviation would affect cooperation?* Answers were quite positive, as an average result was 4.5 and very close to number 5, so experts strongly agree that electric aviation will help the cooperation. In the Kvarken region, the results are 4.7. Between Kvarken and national level results are 4.4. Between the Kvarken region and international level results are 4.2. In general level, electric aviation is seen to affect positively on cooperation. Especially, it is seen to increase cooperation inside the Kvarken region, but it is seen to affect positively at all levels, local, national and international.

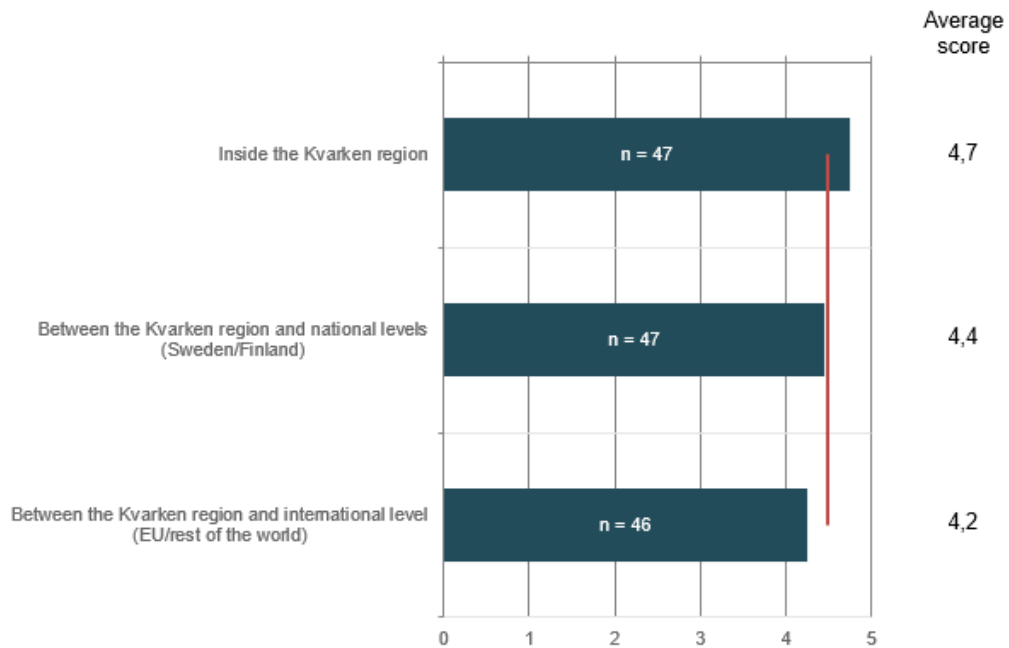


Figure 3. Effects of electric regional aviation on cooperation. (Mäenpää et al., 2021, p. 13).

Next, the study utilises survey question number 7. Question was *How do you think that an implementation of electric regional aviation will change cooperation within the Kvarken region, concretely?* The answers were given openly with no answer options. Many responses indicated that it is seen as increasing accessibility.

'Large improvement on accessibility'.

'Easier access is always beneficial for business opportunities or other potential cooperation'.

'Higher accessibility and more frequent cooperation.

Opportunity for smoother contacts between smaller cities in the Kvarken region'.

'It is also seen as promoting the quality of cooperation. '

'Easier access to partners results in better cooperation. Face-to-face meetings creates trust'.

'New routes that enable people to cooperate in new ways'.

'There will be more meetings and appointments => people will get to know each other as the interaction increases => the beginning of doing things together is needed; otherwise, the connection between the countries will dilute, as it does between the regions

if they are not maintained. However, together we get more done and the impact is greater, and we don't get stuck in too small details either'.

The next question relates to the EGTC instrument and whether respondents know it is coming in the Kvarken area.

The EGTC instrument is unknown in the Kvarken region, although it became the first Nordic and European largest EGTC geographically. Furthermore, only 16 people could answer what opportunities the EGTC brings to electric aviation implementation. It is believed to help implement electric aviation and emphasise that it will make it easier to seek funding from the EU.

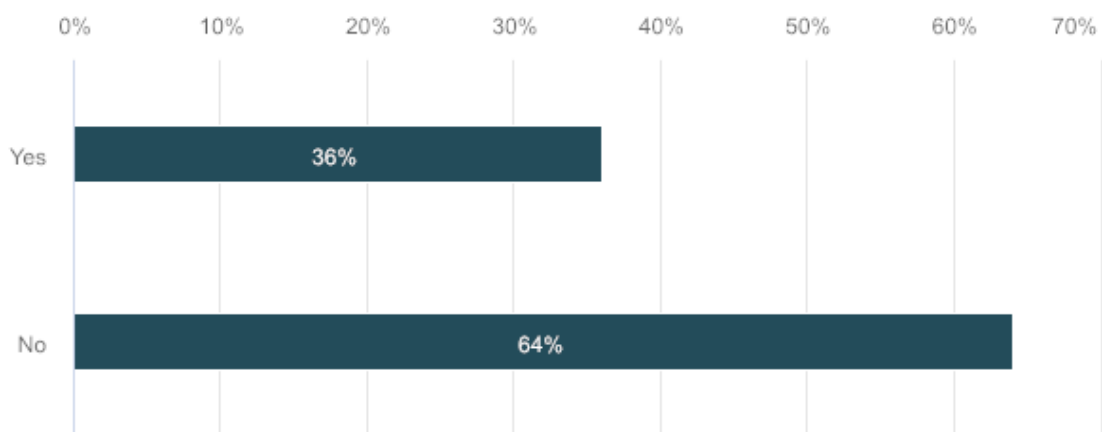


Figure 4. The Kvarken region will soon become the first Nordic EGTC, which is a European legal instrument designed to facilitate and promote cross-border cooperation. Did you know about this? (Mäenpää et al., 2021).

The following part of the study was conducted as an open-ended response.

How do you think that the new EGTC affects the region's possibilities to promote electric regional aviation?

'EGTC will increase the possibility for promoting electric aviation, receiving EU funds, as EGTC is a known legal entity within EU'.

'Yes. The EGTC can play a vital role in facilitating an early implementation of electric aviation in the Kvarken region'.

'It will be easier to obtain funding and contact the EU. Working together in a larger region increases the weight of the region, so we may also be better listened to'.

Although only few responses were received to this section, they are parallel with theory. The EGTC is seen to promote electric aviation and improve funding opportunities. It may still be difficult to say any concrete ideas on how the EGTC will benefit in imitating electric aviation, but it can play an important role in reflecting on previous cross-border projects. The last comment notes that the Kvarken will become bigger, and its status will be more significant in the EU's direction.

6.4 Experts' views on the EGTC and how it supports the implementation of electric aviation in the Kvarken region

6.4.1 EGTC and education

Electric aviation is new, and pilots will probably need new education in electric aviation in the future. Airport staff also need re-education because the electric aircraft needs a new kind of infrastructure for the airport and the staff needs training to use it.

The purpose of electric aviation is to increase accessibility in rural regions, and this potentially means that more flights and more pilots are needed. In Finland, the problem is the price of flight training. It is expensive compared to other countries, such as Sweden. In other countries, flight training is VAT free.

'In my opinion, that flight training is the first where these should be introduced more widely'.

'If a person starts from scratch and makes traffic pilot papers in Sweden the price of this training is about 85,000 euros in Finland the corresponding training is 125,000'.

'Of course, there may also be differences in corporate margins'.

Notably, flight training is more expensive in Finland than in Sweden. Pilot training plays an important role, as electric aviation is expected to increase the volume of flights, which is why more pilots are needed. Joint management creates new opportunities for flight training. If pilot education is seen as problematic for electric aviation, then the EGTC could potentially solve this. The EGTC can enter into agreements with private organisations. EGTC could create a platform for cooperation with the Swedish side for flight training. There are also other possibilities for using the EGTC instrument as an education platform. For example, educational cooperation has been established between Germany, Switzerland and France. EUCOR is an alliance of five universities from three different countries. The Alliance comprises universities from Basel, Freiburg, Haute-Alsace, Strasbourg and the Karlsruhe Institute of Technology (KIT). Universities wanted to improve their cooperation and left applications for EGTC status. Universities maintain their own autonomy, but they can act more collectively under the name of EUCOR. EGTC–EUCOR gives different opportunities for universities compared to solo activity (EUCOR, 2020).

6.4.2 EGTC and technology

The main challenge is the battery technology. Currently, battery technology is in development, and the most efficient peak has not yet been seen. In addition, the battery is hefty and does not store very much energy. Batteries weigh too much and can store little energy, which results in the need for more batteries in the aircraft which makes it too heavy to fly.

'If we put large planes with the necessary amounts of batteries, there wouldn't be much else to do. So, to say the least, I say so, but those batteries are so heavy that that part of the payload would drop'

'In the smallest aircraft, however, it is only okay when battery technology develops, and their storage capacity increases in such a way that it can store that energy more efficiently and effectively. Yes, that battery technology is where we start and then probably bigger machines in a certain period will be that fuel cell technology'.

'The battery takes up a lot of space; they weigh and can store a little energy, so that makes this a dilemma about it. That is why the development of battery technology is crucial, then, in electric aviation—how to make them lighter'.

The impact of EGTC on battery and technology development is quite minimal. The EGTC would make it possible to create cooperation opportunities between universities and companies working in the field of electric aviation.

Electric aviation is an appealing theme, and it can open new possibilities for people's mobility. It is mainly green mobility if the electricity is produced from renewable energy sources. Of course, the effects on climate are the most important thing, but an electric airplane also produces less noise than a traditional airplane, which opens new possibilities.

'The aircraft noise is lower, which may have an impact on the land use around the airport, where the residents can be brought closer to the runway. This means that the runway could perhaps be moved closer to the city centres than before. '

6.4.3 EGTC and Infrastructure

In several cases, it is said that cross-border transport is a challenge for regions with different infrastructures. In electric aviation, the challenge of infrastructure is more related to airports and airfields. New types of charging points need to be developed that can be used to charge electric aircraft. When it comes to cross-border transport and infrastructure challenges between states. States might need to build new railways, country roads. There is no such big problem in aviation, yet states need an airport or airfield with the necessary charging infrastructure.

'Finally, the construction and maintenance of railways incur high costs and high emissions, while at the airport the need for infrastructure is much lower, only the airport is needed and between these airports, this atmosphere is the necessary infrastructure and nothing else, maybe then satellite infrastructure for navigation'.

'All these new forms of energy are then associated with that distribution system, that is, it has a kind of triangle: vehicle, fuel and distribution system'.

'Then when we take a new kind of fuel that needs a kind of distribution infrastructure and produces that kind of engine technology, then you don't have those two triangles with other vertices swinging immediately'.

'If you think about the physical conditions or the infrastructure, then we have so many activities in such a small area, there are so many people, there are also a lot of small airfields'.

Planning cross-border transport usually requires the interconnection of transport modes between countries. This can mean railways, roads and ticket services. The EGTC provides a platform for designing an integrated transport network. The Kvarken region needs to ensure enough charging points for electric aircraft and aerodromes to increase the accessibility of rural regions. The EGTC enables it to apply for funding coherently at the national and international levels and establish cooperation with private companies. The legal entity of the EGTC allows for such cooperation.

Infrastructure does not always mean a physical railway or charging stations, but it can also mean a technical infrastructure, i.e., a ticketing system. As Table 2 shows, cross-border ticketing services are challenging in cross-border transport because they are different in different countries. Therefore cross-border ticketing systems must be produced together and in a modern way (Medeiros et al., 2021).

One expert explained a good concept of what type of ticketing system for electric aviation could be developed in the Kvarken region.

'Why do we not have a passenger account that works the same way? You can upload credits or money there, you can use them to travel, you will be identified through it, and you can use them to identify you on a flight or trip. Why can't that be the case when you buy that plane ticket or something like that when you might be able to take advantage of it in the form of that security aspect, especially if the trip is domestic. If the travel account is for Finnish citizens, it is pretty good. The backgrounds are known'.

However, experts are uncertain and cautious because there are always cyber threats regarding user data and platforms.

'There is a threat, especially if it acts as an identity tag; then it is a matter of reliability'.

'I would assume or prefer it to be some commercial player who would go to make that platform'.

'Whatever platform, then cyber hacked it'.

6.4.4 EGTC, regulations, policy and governance

The theoretical part discussed about the differences between the state's laws, policies and governance and how it affects cooperation. When it comes to aviation, regulation challenges relate more to general aviation regulation than to challenges between states and domestic issues. The policy objectives support electric aviation development, as the green transport supports the new cohesion policy and the Paris Climate Agreement. The Finnish and Swedish governments are also serious. Sweden has set a goal of zero emissions by 2045.

'I guess there is nothing else but bureaucracy and regulations. If there are obstacles somewhere then yes, it is bureaucracy or regulations, but I don't think there will be obstacles either'.

'Electric aviation is an important topic for both Finland and Sweden, because it is kind of green or clean transport system. It is therefore believed that states and the EU will take this project forward'.

'This is what the EU wants to keep air transport clean and regions accessible'.

'Electric flying, which sits perfectly, of course, Vaasa's Nordic energy city regarding energy and environmental profile'.

It is still difficult to say what kind of political, legal and administrative obstacles will be encountered. However, the Kvarken EGTC region includes many stakeholders who can help promote the implementation of electric aviation. As stated earlier, if there are common desires and goals in the region, even greater barriers can be resolved.

It has often been mentioned that there may be regional barriers to governance between countries. Finland and Sweden are no exception, and there are also obstacles or slow-downs in the Kvarken region.

'Decision-making is different in cities or regions. In Umeå, there are politically elected people who are, in practice, the city's rulers, and again in Finland, we have the mayor's traditional operating model'.

'Whenever you want to talk to people from Umeå, they have political responsibility, and in Vaasa, they are administrative officials'.

Nevertheless, with the EGTC, the region will have a unified governance structure, which will ease differences in administrations.

'That EGTC can actually make this easier'

Many national and supranational agreements regulate aviation. Regulations control the operations of air transport, airlines and airports. Regulations concern aviation, air travel safety, the environment, pricing of services, and staff competencies and qualifications.

In 2002, the EU adopted Regulation No. 1592/2002, which led to establishing European Union Aviation Safety (EASA). EASA is trying to promote and achieve the highest common safety and environmental protection standards in civil aviation to ensure people have the safest possible flight. EASA has played a significant role in aviation and provides the EU with technical, legal and regular tasks. EASA is responsible for reporting and standardisation inspections. The aim is to maintain the harmonised action of the EU member states in aviation and make recommendations to the European Commission. For example, it takes time for new aircraft to enter the market, because they must be sure that they will stay in the air. After all, if something happens to an aircraft in the air, it is a dire situation. Before it enters the market, it must have been certified by EASA.

In 2020, EASA granted certification for the first electric airplane model. The Pipistrel Velis Electro is the first aircraft to run entirely on electricity. The aircraft is a two-seater and is designed for pilot training. Completion of this project was necessary for electric aircraft. EASA got its first contact with electric flying, electric motor, battery technology and its management (EASA, 2020).

6.4.5 EGTC and funding

The survey and the experts provided very general and extensive answers to the questions related to the EGTC. The EGTC's main benefits are seeking funding from the EU and gaining visibility.

'However, in practice, that organisation will act as a person with a legal personality in the EU's direction, which will then again enable the launch and financing of transport and other projects in the direction of the EU. The challenge in this may only be whether the state as a party, as an organisation, then commits funding in any way'.

'Alternatively, we can get funding from a wider body than from our own municipalities'.

'That is only a positive thing, because it also raises the profile of the region there at the EU level'.

'It brings us completely different muscles in the direction of Brussels'.

The EGTC is seen as facilitating, increasing and diversifying the funding application. It is entrusted that the new status will arouse interest in the direction of the EU.

6.4.6 EGTC and cooperation

The establishment of an EGTC does not mean that cooperation and activity can end. The reduction and cessation of voice, or so-called activity, is seen as one of the biggest challenges for CBC and the EGTC instrument.

'The internal region of the EGTC can itself make strategic decisions'.

'The most dangerous thing is that this kind of status comes in, a couple of kick-offs are held for it and everyone nods that really nice thing, but then it is not implemented in practice, but it is not just an EGTC, it is a challenge for strategy work in general'.

Therefore, it is essential that cooperation continues after the establishment of the EGTC. The theoretical part also mentioned that the success of EGTC instruments strongly relates to cooperation and activity.

6.4.7 EGTC and mental models

Electric aviation will face challenges with credibility and mental barriers. The benefits of an EGTC do not always have to be concretely reflected in the creation of services or the construction of infrastructure. By promoting the benefits of electric aviation to its inhabitants and increasing its acceptability, EGTC can help implement electric aviation in the region.

'Then when there is a common good desire, we are ready to remove some formal obstacles like this'.

'There is a lot of enthusiasm, all the alternative which reduces emissions is a very high priority'

'A really big barrier with credibility'.

'If this is to become a safe, accepted high-quality mode of transport, then it is interesting to'.

SaarLorLux EGTC region in Central Europe pursued such a policy. They used the EGTC instrument to promote the region's cross-border strategy to the inhabitants (Evarard, 2016). A model like this could also be used in the Kvarken electric aviation project. This model will explain the benefits of electric aviation, its safety, and what kind of visions and commercial services are being planned around 'the first electric aviation project,

Kvarken would get on the world map'. This might involve inhabitants into the project, and potentially, inhabitants will get excited and start supporting the project. Another possibility is that inhabitants might slow down the process, start resisting and not get excited about the idea.

6.4.8 EGTC and electric aviation operators

Electric aviation is a new form of transport, and no services have yet been created around it. Electric aviation is set to increase local short-haul flights in the Kvarken region. There have been discussions on taxi services and aviation becoming part of the transport travel chain. This is a change from traditional aviation; therefore, services also need to be developed to support it.

'Therefore, I would spend quite some time wondering if there are any aircraft operators at all'.

'Yes, I would instead start from the private sector, whatever company or operator it may be, but a strong alliance with these players in the aviation industry'.

'Fly in one direction, then ship in the other'.

'If the cost of electric aviation is plenty reduced, then it would probably make sense to take this aviation in some way into the travel chain'.

In theory, it was mentioned that one of the key elements of cross-border public transport is that the area has a large population and is profitable from an economic viewpoint. The Kvarken region provides a good starting point for this.

'Within a radius of 150 kilometres from Vaasa Market Square, when the old county and Västerbotten have closer to a million people and diverse livelihoods, 50,000 university students at least'.

The Kvarken region has potential in electric aviation, but it remains open to what kind of services are being created around it. The future will show what kinds of services will develop in the Kvarken region.

7 Discussion

The results of this study support the results of previous studies. There are clear guidelines for CBC regarding challenges and possibilities. Challenges can be divided into political, administrative and legal. These barriers emerged in many studies, and the consensus is that they are the most significant barriers. Of course, the nature of the challenges relates to the area and the project itself. For example, regarding cross-border transport, it was described that barriers might be related to infrastructure and the challenges mentioned earlier. (Ulrich, 2020; Knippschild 2008; Engl, 2016; Medeiros et al., 20219). Table 1 shows the challenges and benefits of cross-border public transport. Adding to politics, administration and law, the table lists the financial, cultural, mental, and technical areas that may affect cross-border public transport (Basche & Spera, 2021). Medeiros et al. (2021) also presented similar challenges in Table 2.

Successful CBC requires much interest from stakeholders in the region. The region needs a shared vision and goals, and the region's stakeholders must strive to be as active as possible regarding cooperation. Often studies mentioned that shared history might produce better cooperation. The longer the history of CBC in the region, the better it becomes, as one learns about the culture of other stakeholders and how the politics, administration and laws of another state work (Engl, 2016; Ulrich, 2020).

As abovementioned, CBC has many challenges, and the EU has sought to reduce them. The EGTC is an instrument designed to promote and develop CBC. Although the EGTC has been in use for a decade, it still raises uncertainty. The main advantage of the EGTC for other cross-border instruments, such as the Euroregion, is that the EGTC has a legal entity that opens up new opportunities for cooperation between the region's stakeholders. In addition, it is believed to facilitate access to project funding, make cooperation more visible and stable, and facilitate cooperation in the region. Legal entity allows the

EGTC to set up its budget, which will allow it to hire staff or rent real estate, participate in projects and apply for funding (CoR, 2007).

As mentioned, each member state adopts the EGTC regulation to its domestic law, which creates uncertainty because each state has its own laws. CBC faces challenges precisely in the legal and political sectors as they vary between countries. Admittedly, once the EGTC is set up, it has the potential to bypass national bureaucracy. The EGTC region's general experiences are more positive than negative and are helpful in CBC. Positive experiences have been linked to cross-border transport projects, and the EGTC can overcome the challenges of cross-border transport. Negative experiences are related to the challenges of setting up an EGTC, as seen on the German–Polish border. As often mentioned, the EGTC may not be the best instrument for initiating CBC. The EGTC does not create cooperation, but creates a new platform for cooperation, a joint management structure. The benefit of an EGTC instrument depends heavily on the activity of its members. The more active the members, the more effective cooperation it can create. As Figure 1 shows, spatial planning is very multi-level and the EGTC has the potential to reduce this, alongside speeding up decision-making, as it can be assumed that EGTC actors interact with each other (Ulrich, 2020; Knippschild, 2008; Engl, 2016; Durand, 2014).

The EGTC is a great tool for supporting the implementation of electric aviation in the Kvarken region. The region has a long history, successful cross-border projects and common objectives. This kind of starting point is favourable for the establishment of an EGTC (Ulrich, 2020). When it comes to electric aviation in the region, the EGTC certainly offers new perspectives and approaches. At present, electric aviation is part of the future, and the concrete benefits of the EGTC are impossible to say. There were many discussions in the theoretical section that the problem with cross-border transport is that states have different ticketing services, making it difficult for passengers and travel data to move between states. According to Medeiros et al. (2021), EGTC instrument can create a common platform to display passenger information, tickets and other relevant data, as needed. Currently, the EGTC can act as a coordinator that brings together different actors

to promote electric aviation. The Kvarken region is involved in an exciting project when it comes to electric aviation. The Kvarken region can be a pioneer in electric aviation, which will have a significant impact on the region's image if they succeed in their goals. EGTC is not an answer to every problem in CBC, but it can help fix them (Cor, 2007).

Table 4. Challenges and possibilities in the implementation of electric aviation in the Kvarken region.

Type of factor	Challenge	Potential Solution
Legal, politics and administrative	Different types of legislation, politics and administration	<p>Legal: Different legislative environments, yet aviation is also very tightly regulated at the international and national levels.</p> <p>Politics: The policy objectives at different levels support electric aviation development, and the green transport supports the new cohesion policy and the Paris Climate Agreement. The Finnish and Swedish governments also have ambitious climate goals. Sweden has set a goal of zero emissions by 2045.</p> <p>Administration: with the EGTC, the region will have a</p>

		unified governance structure, which will ease differences between administrations.
Infrastructure	Electric aviation needs new type of charging infrastructure.	The Kvarken region must ensure that it has the necessary infrastructure for electric aviation. The most critical infrastructure can be considered charging-related supplies. With the help of the EGTC, this can be made or planned for, and if necessary, funding or cooperation opportunities can be sought with various electricity infrastructure actors.
Institutional	Lack of joint management structures	The Kvarken region became the first Nordic EGTC region, and the region also has a solid and long history of cooperation. Consequently, the EGTC instrument can form a joint management structure and bring many regional stakeholders to the same table.

Cultural	Cultural and linguistic differences	In the Kvarken region, two different languages, Finnish and Swedish, are generally spoken. On the Finnish side, Swedish is the country's second official language, and there are many Swedish speakers in the Kvarken region, and the level of English is also good in both countries.
Mental	Electric aviation will face challenges with credibility and mental barriers.	EGTC can promote and communicate benefits of electric aviation in the Kvarken region.
Financial	How is electric aviation funded?	The EGTC can apply for funding from the states or directly from the EU as a legal entity. In addition, both private and public-private business models are created to support the implementation of electric aviation.

While EGTC offers promising opportunities to implement electric aviation, it is still challenging to say how it would be put into practice. For example, will it become part of the public transport travel chain, or will its operators work independently? What kind of services will become around electric aviation? Practical challenges emerge when designing

services around electric aviation. For example, who implements the services, how they are implemented, who pays, and how much they cost the customer. Of course, the EGTC facilitates dialogue between stakeholders, but the EGTC does not provide direct answers to these questions (Medeiros et al., 2021).

In the future, it will also be interesting to see how much EGTC regions increase and whether the EU is developing new and better instruments to take CBC even further. As is well known, regional development is a high priority for the EU, and with it, new instruments are possible if it is felt that the benefits of EGTC regulation are insufficiently visible.

Further research on this topic is limited, but it will be interesting to see how the Kvarken region develops and whether the EGTC instrument has had a significant impact on this over the next couple of years. Another exciting further study would be which areas could benefit from this EGTC instrument. For example, there seems to be cooperation between Helsinki and Tallinn, a railway tunnel planned between the cities. Would the EGTC instrument be helpful in this project?

8 Conclusions

The purpose of this study was to find answers to two research questions.

1. What is the EGTC instrument, and what kind of possibilities and challenges relate to its implementation in supporting cross-border cooperation?
2. How can the EGTC instrument be utilised to support the implementation of electric aviation in the Kvarken region?

A limitation of the study was that many of the respondents were not familiar with or did not know about the EGTC instrument itself. In addition, one clear expert in the EGTC instrument was missing from the interview data. Of course, the general atmosphere around the EGTC was positive and was seen as increasing regional cooperation and helping to implement electric aviation, but concrete examples were lacking. Due to the lack of concrete examples, it was necessary to build on previous cases from Central Europe on how the EGTC instrument has been used in cross-border transport. Nevertheless, the positive finding of the study was that the EGTC was perceived as useful in cross-border transport.

There were a few key findings in the study. CBC is challenging. The challenges are administrative, political and legal; regarding cross-border transport, actors can face infrastructure-related challenges. From previous research, the EGTC instrument is seen as a different opportunity to facilitate CBC. While the EGTC does not entirely address these challenges, it does provide new opportunities for CBC. In particular, the joint management structure was seen as critical in CBC. It brings the region's stakeholders to the same table where the discussion connection is better. The results of the study parallel those of previous studies on EGTC instrument. This study differs slightly from previous research on cross-border transport. Previous studies have been strongly related to rail and road networks. In this study, I aimed to investigate the benefits of the EGTC instrument in electric

aviation in the Kvarken region. Electric aviation differs from the rail and road modes of transport in that there is no need to build a single iron or road network, as the air acts as if it were a road network. However, there must be extensive aerodromes in the area with the necessary infrastructure for charging electric aircraft. Therefore, electric aviation has a good chance of success in the Kvarken region. The first reason I see is that it fits the region's image. The stakeholders are interested in bringing it to the Kvarken region, which increases the activity of cooperation. Second, the long history of cooperation and the addition of this region strengthen and facilitate the implementation of cross-border projects. Instead of the typical challenges of CBC, the challenges are related more to electric aviation than typical CBC challenges. However, it is also complex to say concrete challenges because there is much uncertainty around electric aviation. Experts still question what kinds of services can be built around electric aviation and who designs services in the Kvarken region, and how much it costs for the region's stakeholders, operator and customers. The joint management structure can overcome typical obstacles in CBC, but challenges have emerged in electric aviation to which the EGTC is not a direct answer.

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Annexes

Theme interview framework

1. The interviewee's / own organization's approach to the topic, from what perspective and background do you consider the topic
2. Electric aviation - Technological developments and climate policy (more supply perspective)
 - the importance of electric aviation in general
 - readiness, realistic timetables, etc.
 - time, effects of the corona on flying, the plight of major airlines, etc.
3. Demand: need for new solutions + readiness of different user groups for deployment
4. Regional development effects
 - regional aviation perspective (relevance of the topic from a regional perspective if not already addressed above)
 - the potential of e-flying for the development of remote areas, the role of small airports
 - long-term and short-term effects
5. Cross-border cooperation in technology commercialization and innovation - opportunities and challenges
 - opportunities and challenges for commercialization in the Kvarken region
 - smart specialization, regional competencies, and history from the perspective of this regional development path
 - Similarities and differences between Sweden and Finland, possible problems with the legislation, etc.
5. Opportunities for promoting cooperation in the context of the European Cooperation Area (EGTC)
 - How do you see the importance of the EGTC for the development of the region and the promotion of electric aviation?
6. In practice: measures to achieve the project objectives, key challenges
 - What would you highlight as key measures to promote the commercialization of electric aviation? What to do?
 - what about the bottlenecks and challenges in promoting the issue?
7. Finally: who are the key actors we should interview?