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**Connectivity Challenges in the Baltic Sea Region.
The Case of the Fehmarn Belt Fixed Link Project and Øresund Bridge.**

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Annotation

The Thesis investigates the connectivity challenges in the Baltic Sea Region by analyzing the Fehmarn Belt Fixed Link and the Øresund Bridge cases. The connectivity development depends on the transport links harmonization, modernization and prosperity. The study aims to designate the Fehmarn Belt Fixed Link impact on the connectivity elements by applying the comparison approach with the Øresund Bridge Project and qualitative SWOT analysis of the forthcoming project. The European Union instruments, such as the Trans European Transport Network and Interreg, connectivity elements of the Øresund, Skåne, Schleswig-Holstein and Zealand regions and transport projects' performance, timelines and forecasts are investigated. The study indicates connectivity challenges in the Baltic Sea Region and recommends the approaches to address the barriers within the Fehmarn Belt Fixed Link project scope. The transport infrastructure projects impact macro-regional connectivity development, cross-border integration and modernization of the transport networks in the Baltic Sea Region.

Keywords

Connectivity, Transport Infrastructure, Infrastructure Project, Transport Network, Regional Development, Cross-Border Integration

Anotācija

Darbā tiek pētītas savienojamības problēmas Baltijas jūras reģionā, analizējot Fehmarn Belt Fixed Link un Øresund Bridge gadījumus. Savienojamības attīstība ir atkarīga no transporta koridoru harmonizācijas, modernizācijas un perspektīvas. Pētījums mērķis ir vērsts uz Fehmarn Belt Fixed Link ietekmes noteikšanu savienojuma elementiem. Izmantojot salīdzinošo metodi, tiek analizēti Øresund Bridge projekts un gaidāmā projekta kvalitatīvā SWOT analīze. Tiek pētīti Eiropas Savienības instrumenti, piemēram, Trans European Transport Network un Interreg, tādu reģionu savienojamībai kā Øresund, Skåne, Schleswig-Holstein un Zealand, transporta projektu rezultāti, termiņi un prognozes. Pētījums norāda uz savienojamības problēmām Baltijas reģionā un sniedz ieteikumus šķēršļu novēršanai Fehmarn Belt Fixed Link ietvaros. Transporta infrastruktūras projekti ietekmē makroreģionālo savienojumu attīstību, pārrobežu integrāciju un transporta tīklu modernizāciju Baltijas jūras reģionā.

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List of abbreviations

DKK Danish krone

ESPON European Spatial Planning Observation Network

EUBSR European Union Strategy for the Baltic Sea Region

EU European Union

ICC International Chamber of Commerce

ICT Information and communications technology

OECD Organization for Economic Co-operation and Development

SWOT Strengths, Weaknesses, Opportunities, Threats

TEN-T The Trans-European Transport Network

UN United Nations

Introduction

Connectivity is one of the fundamental goals for regional development on both macro and micro-regional levels. The improvement of regional integration and cross-border cooperation is crucial for the Baltic Sea Region prosperity and position on the internal market of the European Union. The modernization and establishment of the transport infrastructure and networks is an indispensable aim pursued by the European Union and the Member States to enhance connectivity and eliminate the borders and barriers. The connectivity in the scope of the research is regarded as the set of interconnected nodes on the local, micro and macro-regional and international levels by an infrastructure. It consists of both hard and soft dimensions by representing the physical and information networks.

Perkmann (2003) claims that the significant process of connectivity development started in the 20th century when 70 regional and local authorities cooperated with other nodes across the border in the European Union by the end of it. The author states that the Scandinavian cross-border partnerships are highly intensive and profitable compared to the Central European regions. According to the author, cross-border cooperation is one of the fundamental drivers for connectivity improvement in terms of the new-regionalism concept. Another study provided by Friman (2019) claims that the high transport activity beneficially impacts regional integration and connectivity improvement. The study confirms that connectivity modernization is directly connected to developing transport connections and harmonization of them internationally and regionally. Lastly, according to the research conducted by Veggeled (1994), the concept of cross-border cooperation and cross-border regionalization are connected and performed by two or more states on the horizontal level. The author states that the connectivity, in this case, is seen as not only territorially oriented but also occurs on the functional level, concerning the common goals addressed. Moreover, the study provides that cross-border connectivity has challenges, but its outcomes result in prosperity and compelling functional advantages for the micro and macro-regions.

The Fehmarn Belt Fixed Link is an essential strategic transport project for the European Union and the Baltic Sea Region's states, due to the reason that it will inaugurate more possibilities and opportunities towards advancing the market economy, regional spatial development, strengthening of the political relations, regional cultural integration and transport connectivity, as well. The Fehmarn Belt Strait is located in the western part of the Baltic Sea between the Fehmarn Island in Germany and Lolland Island in Denmark. The strait is located in the basin of two countries and between two dynamic metropolitan cities of the Baltic Sea Region -

Copenhagen and Hamburg. The project will benefit the European Union objectives, the Baltic Sea Region and Germany, Sweden and Denmark. Denmark and Germany first agreed on the prerequisite of the modernization and development of the transport connections between the states in the strait area in 2007 (Isherwood, 2009). The transport connection project in the Fehmarn Belt strait area was designated as one of the perspectives in terms of the connectivity elements improvement. The project is currently at the stage of development, and construction started in 2019 (Femern A/S, 2019). However, the project already has complex pre-conditions and barriers history. By now, the underwater tunnel is expected in 2029 (Witz et al., 2021: 378). The criticism and uncertainties in terms of the project projections expressed by the stakeholders, public, authorities and experts are predicting the challenges and issues for the region and its areas. That is why the comparison with the already functioning transport connection of the Øresund Bridge, with the connecting part of the underwater immersed tube Drogden Tunnel can be done to examine the changing and strategic consequences of the Fehmarn Belt Fixed Link project. The Øresund bridge is a combined railway, and motorway bridge across the Øresund strait between Sweden and Denmark opened in 2000 (Lundhus and Matthiessen, 2017: 4). The bridge is indispensable for the Baltic Sea Region's core transport networks and corridor improvement, regional connectivity between Copenhagen and Malmö, market expansion, states' political cooperation, and regional integration. Analyzing the existing project's short-term and long-term impacts is crucial for identifying the new projects' prosperity and impact connectivity. Moreover, the designation of the challenges for better connectivity for the Baltic Sea Region can be derived from the comparison outcome. The projects' internal and external constituents and perspectives are expected to impact the cross-border area of Denmark and Germany and the macro-region of the Baltic Sea Region.

The research **aim** is to designate the Fehmarn Belt Fixed Link outcomes and their impact on the connectivity development in the Baltic Sea Region based on the comparison with the effects of the Øresund Bridge Project and qualitative analysis of the project's strengths, weaknesses, opportunities and threats. Another foremost **aim** of the comparison is to derive the recommendations which can be taken from the experience of the Øresund Bridge Project planning, constructing and functioning for the upcoming project.

The research **approaches** include the following measures. The recommendations would establish the solutions to the connectivity challenges and issues that might arise during the aforementioned phases. The forecast analysis would benefit further modernization and development of the transport networks and other connectivity matters within the Baltic Sea Region. To conduct the analysis, the research is focused on the examination of the pre-

conditions and geographical, political, legislative, socio-economic, transport infrastructure, environmental endowments, cultural and demographic trends segments in the cross-border areas, which designate the grounds for Fehmarn Belt Fixed Link and the Øresund Bridge impacts on the connectivity on the micro and macro-regional scales.

The main **objectives** of the thesis are:

- To analyse the transport connectivity development level in the Baltic Sea Region.
- To designate the perspective of the transport networks in the cross-border integration of the micro-regions.
- To study the compliance of the existing and future transport infrastructure projects with the European Union strategies and programmes.
- To analyse the Øresund Strait Area Bridge Project preconditions, characteristics, effects and outcomes.
- To analyse the Fehmarn Belt Strait area and Fixed Link Project preconditions, characteristics and projected outcomes.
- To conduct the SWOT analysis of the Fehmarn Belt Fixed Link Project impacts the connectivity in the Baltic Sea Region.
- To compare the functioning Øresund Bridge Project and future Fehmarn Belt Fixed Link Project and derived recommendations.
- To designate the connectivity challenges in the Baltic Sea Region based on qualitative research.
- To provide the forecast of the Fehmarn Belt Fixed Link Project effects on the connectivity in the Baltic Sea Region.

The primary **sources** for the data are the government publications, official reports, strategies proposals, records of organizations and agencies, research articles, cases and court records, academic journals and statistics datasets. The segments addressed within the connectivity scope consolidate geographical location, demographic trends, innovation, environmental endowments, economic and people-to-people connections, region participation in international trade, cross-border interactions, and opportunities and barriers. The experts' conclusions, founders and committees' statements, official reports by the ministries and departments, TEN-T and Interreg reports, public and stakeholders' attitudes are the sources for the determinants.

The **order of arguments and methodology** applied is the following:

- The analysis of the Øresund strait area, Øresund Bridge project timeline and its short-term and long-term impacts on regional prosperity and connectivity.

- The Fehmarn Belt strait area analysis, transport connectivity indicators, Fehmarn Belt Fixed Link project characteristics and timeline, and its projected outcomes and forecasts are provided.
- The analysis of strengths, weaknesses, opportunities and threats is a strategic approach applied to analyze the Fehmarn Belt Fixed Link project and its impact on regional connectivity and its indicators. The SWOT analysis approach is aimed to examine the project's performance and indicates the forecasted level of connectivity accomplished and the general aftermath on the regional development in multiple segments. The demanded outcome of the SWOT examination is deriving the solutions on the transformation of weakness into strengths and threats into opportunities.
- The qualitative research provides a comparative method applied to the Fehmarn Belt Fixed Link and the Øresund Fixed Link Project. It indicates the challenges for connectivity on the micro and macro-regional levels.
- Finally, the qualitative analysis of the Fehmarn Belt Fixed Link project impact on the Baltic Sea Region connectivity is accomplished through the descriptive method.

The following **research questions** are deliberated in order to provide an analysis of the objectives mentioned above:

1. Which connectivity challenges are encountered in terms of the Fehmarn Belt Fixed Link Project?
2. How to overcome these challenges according to the comparison and SWOT analysis results?
3. How will the Fehmarn Belt Fixed Link Project impact the connectivity of the Baltic Sea Region?

Additionally, the general consensus of the researched field is considered, the following **hypothesis** is practically formed:

- The connectivity of the Baltic Sea Region depends on the connectivity development of the demanding areas, especially the metropolitan and cross-border ones. Therefore, the cross-border integration of the regions, states and cities is a fundamental component of connectivity.
- Undeveloped transport links affect all the elements of connectivity and regional integration.
- The challenges and barriers are physical and geographical obstacles, unharmonized strategic plans, different objectives of the interacting nodes, administrative differences, domestic potential, nodes importance, power distribution, economic and market

potentialities, accessibility to the transport corridors, stakeholders' involvement, cultural and linguistic components, marginalized rural areas and criticism from the public and private actors, social concerns and environmental determinants.

- The Øresund Bridge and Fehmarn Belt Fixed Link project are primary drivers for the lift of the urban region on the Baltic Sea Region and international competition level. The transport infrastructure projects significantly impact regional connectivity development and provide more competitive region development opportunities, common challenges addressing, concentrating on the European Union and macro-regional and domestic goals.

The **order of the information** in the Thesis is divided into seven main chapters and subchapters. Chapter one discusses the transport connectivity in the Baltic Sea Region and European Union instruments governing its indicators and networks development. Chapters two and three discuss the Øresund Bridge and Fehmarn Belt Fixed Link project characteristics, timelines, outcomes and forecasts. Chapter four outlines the SWOT analysis of the Fehmarn Belt Fixed Link project impact on the Baltic Sea Region connectivity. Chapter five designates the qualitative comparison of the Øresund Bridge and Fehmarn Belt Fixed Link project. Chapter six discusses the indicated challenges for connectivity. Lastly, chapter seven outlines the Fehmarn Belt Fixed Link project impacts forecasts on the connectivity based on the qualitative analyses.

1. Overview of the Baltic Sea Region Connectivity

Connectivity is one of the fundamental targets and objectives in the international and macro and micro-regional plans, strategies and policy agendas of most states, organizations and institutions. These goals play a vital role in the contemporary economy, contributing to resources connecting communities, economies and states. A significant amount of the finances has already been invested into connectivity development and enhancement. However, it is still crucial to modernize multiple modes of transport and people-to-people connections within circumstantial areas and regions. The reason for that is that connectivity results in considerable opportunities and benefits in socio-economic and sustainable development. Nevertheless, the threats and challenges might be faced during the connectivity strategies and projects implementation, making the investments questionable due to the varying expectations and results.

The regional policies developed by the European Union estimate the investments into the economic development on the level of the particular regions. These policies were one of the principal factors impacting the modernization of the underdeveloped regions to conquer the single market and resemble the more advanced states or areas during the last three decades. As a result, the European Union remains the core of economic potential on the global level. Nevertheless, the disproportionality of regional development still has an impact on the socio-economic level. Thus, regional development is an inevitable process, which requires competent institutions in charge and comprehensive connectivity between the governments, organizations and social groups on the various levels. The European policies and strategies aim to transform the challenges into possibilities concerning connectivity. Moreover, some of the key accomplishments in regional development can be acknowledged by already modernized transport connections. Modern transport connections provide an opportunity for sustainable, effective and safe mobility and connectivity, shaping access to all areas within the specific regions and between them. The first models of the European regional investments considered the financing of the required and numerous infrastructure projects and, principally, the transport connections. The principle of solidarity also designated the financing approaches towards connecting the particular regions within the European Union and beyond it. In general, connectivity was constantly a significant objective to reach during the European Union founding and functioning. Nowadays, the European regional policy is aimed to improve the single market, develop regional competitiveness and prosperity and connect the states and regions. European Union strategies stimulate regional connectivity, cross-border connectivity, and connectivity for spatial development, network connectivity and economic integration. Connectivity and coordinated actions contributed to conceiving the structural agreements between the regions and states on the joint action plans, duties, and targets. It strengthened the relations between the states, city areas and micro and macro-regions within the Union. Furthermore, connecting the regions with the various states with common challenges and issues, such as Baltic Sea Region, stimulates practical and structured approaches towards common concepts and actions. Building effective transport connections is one of the most significant examples of the strategy's implementation, where the domestic action plans step beyond its borders (European Union, 2009).

The European Council ratified the macro-regional strategy for the Baltic Sea Region in 2009. The European Commission is one of the fundamental actors in designating the action plan and communication with the Council and the Member States in the region. The strategy is subdivided into three foremost goals or objectives: the region's principal indicated challenges,

essentially protecting the sea environment, developing prosperity, and connecting the region. Furthermore, coordination of the actions within the Baltic Sea Region, pan-Baltic organizations, financing institutions, and other non-governmental actors are guided by the Commission to impact the region's advancement. The Baltic Sea environment and ecological situation are inherent sub-objectives, focusing on the clear water and lessening the area's emissions by setting the circular economy or reliable energy markets. Clean and safe shipping is also a related goal. The convenient transport conditions are one of the most critical goals, enabling better regional connectivity and following up the initial idea of the other objective to connect the people in the region. Each of the aims, as mentioned earlier, is interconnected to deepen and fulfil the single market in the region, which is moderately complete for sustainable development, as well (European Commission, 2007).

The more immeasurable integration within the European Union is a challenge for most Member States in the region. Moreover, the countries fall under the scope of the European Union policy vertically. Thus, the majority of the issues and objectives implementation is embraced by it. The European Union embodies the status for facilitating the cooperation among the states on accomplishing the shared goals, following the counterbalanced legislation and supremacy of the rule of law principle and addressing the common regional challenges. There are cross-border, transnational and interregional programs running in the Baltic Sea Region, and many of them are carried and enforced by the European Union authorities. These programs contribute to balanced cooperation and connectivity opportunities within the region. The quintessential programs focused on connectivity, better cooperation, and regional integration are the Trans-European Transport Network, European Observation Network for Territorial Development and Cohesion, Interreg and STRING-Corridor. Each of these programs executes the steps towards strengthening and improving the connectivity in the Baltic Sea Region. The many challenges appear within the scope of implementing these programs and the European Union Strategy for the Baltic Sea Region. Mainly the reason for it is the considerably large area that is aimed to be developed and addressed. The basin of the Baltic Sea and its hinterlands stretch from Lapland to the North of Germany, which includes the areas of twelve states. The macro-strategy can be considered one of the most diverse because it includes eight European Union Member States and four neighbouring countries. Thus, the boundaries and challenges might emerge on both legislation levels, following the states' market and economic prosperities, domestic capabilities, and cultural and anthropological diversity factors. Nevertheless, the main intention of the programs and strategies implemented in the region is connectivity (European Commission, 2009). Thus, the Baltic Sea Region became one of the central figures in

conducting the integration processes, mainly in the regional connectivity policies and agendas. The rationale is that the Baltic Sea Region is a decidedly amalgamated area in economic, cultural and environmental means. However, the states in the region divide current resources and ascertain significant interdependence. Therefore, the arrangements applied in one area impact the other parts or even the whole region. That is why cooperation and connectivity in the region are recognized as an integral approach to Baltic Sea Region development. The already successfully and effectively applied transport projects can be used as the most dependable practice examples for contemporary and future ones. In the Baltic Sea Region case, the challenges do not always require action on the domestic level. The joint response tends to address the sustainable environment, regions' prosperity improvement, accessibility and security. Practically, the modernization of the transport links has an impact on each of the indicated above challenges. In general, transport connectivity establishes opportunities for these challenges proper response or maintenance. The Baltic Sea Region is regarded as transnational. The connectivity of the subjects, non-commercial organizations, governmental authorities and local self-government of the states in the region is somewhat effective and intense. However, the unsolved issues are still present in its formation and modernization, affecting further regional development. Moreover, transport connectivity is one of these issues. Thus, this factor is needed to use the full spectrum of the geographical location advantages, ensuring the increasing volume of foreign trade activities and strengthening the states' and region's role in the global arena. The formation and sustainable development of the transport corridors and connections are crucial elements for connectivity improvement. Moreover, the process of the transport connection sustainable development and planning is not possible without the government and European Union financing support. As for the economic challenges, conquering the impediments to the single market is essential. Another challenge to be overcome by the transport connectivity improvement is accessibility, where the network's elements play a critical role. In this case, the energy isolated regions remain one of the targets to approach. Another advantage of the proper connectivity establishment is connected to the safety means. The main priority of the transport connections is to lower the risks for the region's inhabitants, infrastructure and environments caused by hazards, the source of which is the air and marine pollution. Ecology is one of the crucial priorities of the transport connections development plans. Better connectivity is an opportunity for the region and separate states to use its potential, including the education and labour possibilities for the inhabitants, innovation for the particular industries, natural resources, and strengthening intra-regional and cross-border cooperation (European Commission, 2009). Denmark, Sweden and Germany are the

members of the Baltic Sea Region, which does obtain not only the high potential and efficiency but also a tremendous opportunity to build cross-border cooperation and modernize the connectivity in the Baltic Sea southwest area. The new road and rail tunnel connection project between the Fehmarn island in Germany and Lolland island in Denmark is predicted to contribute to regional development and integration to Central Europe by establishing a direct transport link between Hamburg Copenhagen and Malmö in Sweden. The Fehmarn Belt fixed link is essential for cross-border and regional connectivity prosperity (Walsh et al., 2015). One of the best examples of the cross-border connections and collaborations in Europe is the transport link established between the Danish capital region and region Zealand and region Skåne in Sweden. The Øresund fixed link tunnel and bridge provided an opportunity to establish a connection between the metropolitan area of Copenhagen and across the cities of Malmö, Lund and Helsingborg after its opening in 2000. This model can be regarded as the most publicised cross-border connectivity and integration model as an example for the other projects establishment and planning. It has positively impacted the regional integration and development process (Nauwelaers et al., 2013). Both projects are actual examples of the key elements for the intra-regional connectivity and integration processes and potential in the Baltic Sea Region. Moreover, both cross-border corporations are crucial for regional sustainability and growth. Still, the barriers and challenges in terms of connectivity can be foreseen for both future and existing projects (Ramboll, 2018).

1.1 Connectivity in the Baltic Sea Region

Connectivity in the Baltic Sea Region among the states and border regions grew out of the local and regional initiatives during the last several decades of the 20th century. During that period, numerous organizations have been established. The previously gained experience is an imperative source for the nowadays connectivity projects and plans initiatives. Cross-border cooperation within the European Union has been actively pursued since the 1990s. Nevertheless, many challenges and barriers are still present after establishing successful transport, economic, political, and people-to-people connections. In most cases, the barriers are the administrative differences and coordination regarding the financial and legal aspects of the projects and strategies. However, such challenges as the different cultures, language and socio-economic means can also be considered crucial to overcome for the better connectivity establishment. Furthermore, the physical and geographical obstacles, such as mountains, sea, or hinder cooperation, play a role as the connectivity barrier, as well (European Commission,

2002). As for the concept of connectivity, acknowledging the regional and cross-border connectivity, it is necessary to mention that it is a vital component of economic integration and cooperation, one of the foremost goals and priorities for the regions, countries and cities (United Nations, 2014: 3).

The connectivity concept is interpreted inconsistently by researchers, experts and infrastructure financing agencies. One of the prevailing characteristics is its equivalent with networks, which is a set of interconnected nodes. In this case, the node represents a singular entity such as a city or country, person, organization, or business enterprise. Connectivity can be perceived as the multi-layer concept of various networks, including both substantial and virtual ones. Connectivity contains hard and soft dimensions and concepts that regulate the influence cultivated by enterprises, households, and spatial entities. Moreover, connectivity as a concept can be analyzed on the local, regional and international levels and layers. Thus, connectivity is a crucial element for analyzing the network accessibility and efficiency between the nodes. The concept holds an indispensable position for the node functioning, including its hinterland importance for the network, financial aspects and costs of reaching the node and the accuracy of connecting to it. Particular links and networks can play a fundamental function in connectivity development because it enforces joint actions, tools, and approaches. Thus, the connected parties or nodes receive both opportunities and meet challenges at the same time.

As for the connectivity models, the prevailing one globally obtains a physical realm and information form. Physical connectivity related to the transport networks mainly focuses on lowering and reaching profitability for the engaging actors and areas. Nevertheless, another pattern of connectivity is performing the function of information sharing, which is at the same time a comprehensive source for the benefits acknowledgement. The less strong connections are a subject for potential investments due to the joint goal of the parties to reduce the barriers and weaknesses (Straub et al., 2008). However, one of the main drivers for regional economic growth and prosperity is infrastructure development, which considers transportation connections advancement. These links provide opportunities for entering international trade, foreign direct investment flows and strengthening the position on the internal market of the European Union for its Member States (United Nations Economic and Social Commission for Asia and the Pacific, 2012). There is no one concept for effective regional integration. It depends on the domestic potential, nodes importance, power distribution, strategies and plans, historical preconditions, geographical location, financial possibilities, and other physical and virtual barriers and opportunities. Many steps towards better connectivity have been already taken by the European Union actors through harmonizing the legislation and enforcing the

internal market freedoms by enabling access to goods, services, jobs and cultural richness. The Member States' benefits arise from the practical principles of free movement of goods and services determination. European institutions, such as the European Parliament, play the administrative and governing role for the principles and financial resources. Articles 4(2)(a), 26, 27, 114 and 115 of the Treaty on the Functioning of the European Union serve as the legal basis for the single market functioning (Ratcliff et al., 2021). The internal market is one of the drivers for regional connectivity development because it is aimed to increase economic prosperity and eliminate trade barriers. The regional connectivity concept depends on economic integration (Lin, 2012: 397-409).

Moreover, the infrastructure development level, another factor customarily considers the high costs and debatable benefits, depending on the challenges and preconditions. In this case, cross-border infrastructure projects are harder to establish. The national transport connectivity projects' benefits and costs are distributed more fairly because there is no need for the harmonization and negotiations. In contrast, regional projects require the coordination and commitment of all participants (United Nations, 2014: 66). Countries located in the Baltic Sea Region obtain different economic potentials from which the barriers for regional integration arise. For instance, the difference between the Eastern and Western parts of the region is essential due to the historical preconditions. Urbanization affects the regional development process in Europe and the Baltic Sea Region, respectively. The centre of the economic activities is concentrated mainly in the cities, where medium-sized cities, such as Tartu and Stockholm, and cities with over one million inhabitants, such as Hamburg and Saint-Petersburg, impact the regional development on a large scale. Thus, the urban settlements and infrastructure developments differ within the Baltic Sea Region. For example, Copenhagen and Riga are the cities where the economic activities are mainly concentrated, but the population density there is higher than beyond the city borders. The strategic plans designated for the macro-region determine the benefits and opportunities from the possibility of sharing a region, sea area and network between such cities as Helsinki, Stockholm, Copenhagen, Tallinn, Riga, Gdansk, Hamburg and Saint-Petersburg. The Baltic Sea is the most effective opportunity for regional connectivity, enabling it to establish Northern and Central Europe connections (Stiller and Wedemeier, 2011: 38-40). In Western Europe, the developed highway networks resulted in positive cross-border connectivity and population growth outcomes during the last 50 years. However, the Northern and Eastern part of Europe is still in the process of these links development. One of the examples is the Rail Baltic project, which is in the process of its establishment. Thus, the border regions are rather heterogeneous concerning the transport

infrastructure in the Baltic Sea Region (Christodoulou and Christidis, 2018: 5). The cohesion policy of the European Union is covering the NUTS2 regions in terms of reaching the fair layer of administration. Various approaches are still implemented because the governmentally appointed bodies and autonomous actors may vary in terms of the domestic spatial planning strategies and the cohesion policies implementation (ESPON, 2017: 7-8).

Maritime transport and shipping are some of the most developed transportation forms in the Baltic Sea Region, expanding gradually with trade increases. Even though maritime shipping benefits the integration process within the region, it still raises issues concerning environmental protection and technological innovations. The new shipping technologies are necessary for the waters and interior protection of the Baltic Sea. Indeed, the European Union actors designate sea water protection as one of the primary strategic goals for sustainable macro-regional development (European Union, 2010). Thus, one of the demanded and proposed improvements is the shift and distribution from maritime shipping to the on-land form. The transport shifts to land within the Baltic Sea Region gradually started in 2015. More precisely, the form changed to trucking transportation, and now one of the main focuses in spatial planning is developing the on-land transportation networks. One of the existing examples of the effective functioning network is the land links and routes from Western Europe to Russia and the Baltic States, which resulted in fair competition with the shipping transport forms, which eventually became more expensive to handle on this occasion. Thus, attention should be brought to the spatial and transport infrastructure development in the coastal areas (Stiller and Wedemeier, 2011: 19-28). The knowledge-based economy is stimulated by improved connectivity, and it is an essential element for sustainable development. The knowledge-based economy is designated by the innovation trends and opportunities undertaken through new marketing forms, production methods, and technologies, including infrastructure (Hill, 2020). Such an economy is related to the fundamental sources of growth and advancement of productivity across various sectors. The strengthening and improvement of the regional knowledge-sharing links are primary goals for many countries (United Nations, 2014: 16). As for the Baltic Sea Region, there are already successfully established research-intensive and knowledge-intensive projects and industries. The innovation, however, is not an active process yet in the Eastern part of the region. Thus, the cities are usually the leading centres for knowledge-based economies. The direct connections with such centres might positively impact such an economic improvement in the Eastern states of the Baltic Sea Region, as well. The improvement of the transport connections will reduce these issues, as well, due to the potential integration opportunities and better people-to-people connections crucial for the knowledge-based economy and innovation. These steps

will result in benefits for each state in the region in the future (Stiller and Wedemeier, 2011: 11).

Socio-economic objectives are at the same time considered under itself the people-to-people connectivity matters. The advanced connectivity across the borders designate new possibilities for labour migration and new challenges connected to the cultural and linguistic boundaries. Meanwhile, the transport networks impact the more accessible mobility of these flows and integrate the engaging nodes. Moreover, the increased movement of people via the transport networks results in demographic changes and transitions, where the states with less potential might face the population ageing and decrease, while more developed will receive significant flows of the young and skilled population. Such imbalance might negatively impact the regions' prosperity and economic growth (United Nations, 2014: 15-45). Border areas in the Baltic Sea Region tend to be socio-economic undeveloped due to cities' high population and economic activities. Thus, cultural exchange in the form of the people-to-people networks might influence such unfavourable conditions by enforcing cultural penetration leading to the appearance of the similarities between cultures even though the differences are present (Verjans et al., 2015: 2).

In conclusion, according to the analysis of the connectivity concept and its elements, it is possible to designate barriers on the global and regional levels. In general, the barriers might appear on both physical and virtual scales influencing the potential negative impacts of the networks established. In most cases, the gaps in the planning process, lack of common strategies and objectives, absence of financing, undeveloped infrastructure, spatial distortions and economic disparities result in the social, environmental, economic and administrative negative effects. Common approaches and support from the other financial and political figures are needed to reach prosperity and better outcomes. The decision-makers must analyze the negative and positive externalities of the connectivity using the previous experiences of the functioning projects during planning the new connections or modernizing the existing ones. Estimating the short-term and long-term impacts of transport connections is a significant challenge for the spatial entities and other nodes, especially considering cross-border connectivity matters (Japan G20 Development Working Group, 2019: 8-9). A comprehensive example, in this case, is the cross-border connectivity barriers, where the standard strategies and projects and joint actions of the engaging local and regional participants are aimed to reduce the presence or elimination of "border" itself. The main objective of cooperation in such regions is to address the common challenges and designate action plans by constructing cooperative structures and instruments. According to the above-mentioned, the challenges

appear in cultural, environmental, economic, institutional and social domains. In other words, these challenges appearing in the particular cross-border areas create obstacles for the networks' and connectivity development in the whole region. Physical, institutional, and people-to-people connectivity depend on transport, ICT, energy, trade, investment, cross-border procedures and cultural and educational capacities. That is why addressing these challenges is one of the primary goals for the European Union and the Baltic Sea Region (Medeiros, 2014).

1.2 Transport Networks in Baltic Sea Regional Integration and Cross-Border Perspective

Transport activity level and the number of transport networks in the European Union stimulates economic improvement and growth for the last centuries. The wealthiest regions and states obtain relatively high levels of transportation activity due to their capabilities to afford it and the potentiality to engage in trade processes more profitably. The high transport activity is related to the motorways, airports, and other forms of transportation, which positively impact connectivity and regional integration. On the other hand, different forms of transportation, such as shipping or railways, play a debatable role in various transport corridors and states because their efficiency depends on fuel taxation, infrastructure possibilities, land use controls, environmental aspects, and other barriers. Nevertheless, connectivity improvement is directly connected to the development of transport connections and harmonization internationally and regionally (Friman et al., 2019).

As for the preeminent functions of the transport and logistic links, they are physical distribution and materials management, including the movement of goods and people resulting in a contribution to the trade and wholesale processes, people-to-people connections and spatial development (Hesse and Rodrigue, 2004). It is essential to acknowledge the part and value that transport networks take in the socio-political and economic activities of the states, cities and macro and micro-regions (Arvis et al., 2018). As for the leading transportation trends in the Baltic Sea Region, the technological changes and political shifts mainly impacted them. However, it can be noted that the network's connectivity and working still have not been stabilized because of the transforming trends and pre-conditions. State authorities and project leaders, along with the stakeholders, follow the tasks and actions towards better connectivity, maintaining and augmenting the profits according to the following trends, including technology-driven changes, environmental aspects and regulations, globalization, urbanization, supply chain flexibility, energy restraints and even ethical and cultural concerns.

Climate change and pollution are considered one of the main trends influencing the transportation aspects and initiatives. Urban pollution and emissions are a significant concern for the Baltic Sea Region. Alternative and eco-friendly ways of building and providing transport links are the new trends and challenges governments and businesses address (Friman et al., 2019).

As for transportation and logistics, the Member States hold 27 per cent of all 311 000 transport and logistic entities in the region, accounting for 34 per cent of the employed population (Liuhto, 2017: 131).

Maritime freight is one of the major activities performed on the Baltic Sea, so the cargo traffic is too high and dangerous for the environment. The alternatives are the shifts to land transporting and new infrastructure projects. It is essential to mention that the Hamburg port is one of the largest to handle a significant proportion of the maritime traffic. Thus, the new transport connections in the region are focused on the links with this entity and Hamburg metropolitan area in general. During the last few years, the trend concerning pollution matters also influenced the sustainability strategies, which impacted the shift from the transport value to rail (Friman et al., 2019).

The development of the infrastructure units is handled by the national states with support from the European Union and its projects. Comprehensive examples of such projects are TransBaltic, Baltic Sea Region Governance, Scandria Corridor, and Trans-European Networks projects. The last one obtains initiatives and control over most of the projects and strategies taking place in the region due to its collaborative actions and planning on the European Union level (Moraglio and Dienel, 2015). Nevertheless, each of the national states in the region has a connection to one of the most developed and leading ones in terms of trade and economic growth. In the Baltic Sea Region, Germany stands out and has physical connections to each of the other states. The Nordic states also obtain a sustainable infrastructure and cross-border connectivity improvement in all of its terms (Friman et al., 2019). According to the research handled on behalf of the European Parliament, the missing element for regional connectivity is the north-south railway link through the Baltic States, currently in the construction phase (Schade et al., 2016).

Regional development, in general, is divided into both containing and non-containing theories. According to the neo-classical theory, these concepts do not relate to the spatial areas significantly. Instead, regional integration depends on capital accretion, average income differences, labour-power indexes and technological development. According to the theory, the transport infrastructure performs only the beneficial role, but other aspects matter on a larger

scale in terms of connectivity. The aftermath effects of the networks performing result in a considerable impact on regional and cross-border integration. These effects also depend on the initial volume of goods and passenger movements within the areas. In other words, transportation activities are shaped by these factors. Generally speaking, the more urban the cities and national states are - the more economic profit and advantages appear. As for the concept itself, transport corridors are considered corridors if they include one or more than one route linked to the economic processes centre. The corridors can perform the physical connection role between regions or the multi-modal role, where the connection is provided for all of the transportation forms. Examples of such effective corridors are the Trans-European North-South Motorway Network or the Trans-European Rail Network (Keser, 2015).

The concept of cross-border cooperation can be connected to the cross-border regionalization performed by two or more national states on the horizontal level. The connectivity, in this case, is seen as not only territorially oriented but also occurs on the functional level (Veggeland 1994: 156). The common goals are related to the political, administrative, economic, cultural and environmental sectors. European Union regional policies and instruments, such as the Maastricht Treaty, serve as the driving force for better connectivity establishment (Maastricht Treaty, 1972). Cross-border connectivity also has particular obstacles throughout its installation process, but on the other hand, the outcomes serve prosperity, flexible and effective functional advantages for both participants (Veggeland 1994: 85). Therefore, sustainable regional development considers building new cross-border connections and modernization of existing ones through cooperation, focusing on common goals, and overcoming the existing connectivity challenges. The activities within such areas designate the potential for the whole region while not bringing costs for the sovereignty of the particular states through inheriting the geographical spaces, historical patterns, environmental issues, ethnic and cultural groups and economic potentials (Perkmann, 2003).

As for the Baltic Sea Region, cross-border networks and cooperation stand out as somewhat effective due to mainly already developed transport links and shared cultural and historical conditions, such as the cross-border area of Germany and Poland or the Baltic States (Christodoulou and Christidis, 2018: 37).

Another essential aspect to cover is the regulation enforcement on the European Union level concerning regional and cross-border integration. There are 38 internal land border regions, most of which are already instead modernized in terms of infrastructure. Nevertheless, there are still a considerable number of regions, which have not received both financial and political support. These regions are eventually the cross-border ones located far from the metropolitan

areas due to geographical and historical factors. This lack has resulted in acceleration and marginalization of the particular areas, which can eventually serve a beneficial purpose for the region. The internal and cross-border isolation creates obstacles for regional development in general. The European Commission took part in the processes of the legislation proposal, funding mechanisms, establishment and support provided to the Member States and areas to collect the data on the existing challenges and obstacles. The Commission evolved the usable preparations and action plans for the border regions and started experiencing the challenges by enforcing the information flows and exchanging experience sharing between such regions. These deals were aimed to intensify the integration processes mainly concerning the European Union enlargements based on the population share increasing in the border areas and cities. As for the geographical cohesion of the Member States, the border regions, in this case, are often underdeveloped concerning the transport infrastructure. The European Commission addresses this issue, as well, by additionally conducting public consultations. According to its findings, the lack of infrastructure development on the borders is related to the imbalanced transport investments carried by the different authorities, who often do not establish harmonized cooperation. Lack of practical cooperation is one of the significant challenges the European Commission addresses, which aims to analyze the accessibility and road infrastructure in the regions and designates the classification and identification of the inefficiencies. Coming from this, the Commission can enforce the action plans concerning the particular bordering areas integration (Christodoulou and Christidis, 2018: 5-6). The European Commission and the Council of Europe promote the policies of cohesion and integration, which impact these framework applications, as well (Perkmann, 2003: 153-171). The regional and cohesion policies enforcing the cooperation and integration in the cross-border regions receive a third of the European Union's budget (Medeiros, 2016). The first official cross-border border region was entrenched back in 1958 on the Dutch and German border. The areas of the Enschede and Gronau became integrated in terms of the Euregio establishment. Later, around 70 regional and local authorities cooperated with other nodes across the border in the European Union by the end of the 20th century (Perkmann, 2003: 154-155). As for the cross-border cooperation definition under the international legal framework, the Madrid Convention proposed by the Council of Europe defines it as the transfrontier cooperation aimed to foster the neighbourly relations between the territorial communities and authorities in the scope of the jurisdiction of the contracting parties (European Convention on Transfrontier Co-operation between Territorial Communities or Authorities, 1980).

The neo-regionalism concept can be related to the recent development of cross-border regions and tendencies. Cross-border cooperation, in this case, is the institutionalized partnership between sub-national authorities across national borders. Cross-border cooperation is mainly handled by the public authorities, which at the same time base their collaboration on the quasi-judicial arrangements by not concluding the international treaties and agreements. The main reason for it is that the public figures aim to mainly harmonize the actions and focus jointly on the common barriers, challenges and profits, and the resolution of the issue on the practical and administrative levels. Establishing the institutions and organizations governing the cooperation process and contacts is another crucial concern of the cross-border integration establishment regarding the neo-regionalism concept (Perkmann, 2003: 156). A comprehensive example of cross-border partnerships is the Scandinavian cooperations, which are highly intensive and profitable. Various authorities are engaging in these cases, starting from the state government figures to the local ones. These examples can be regarded as more successful than the Central European regions, where the neo-regionalism tendencies are still being developed (Perkmann, 2003: 159). As for the joint strategies, a crucial example is Copenhagen - all of Denmark's Capital. It is a strategy that developed a cooperation concept "Greater Copenhagen", including the Zealand Region and Region of Skåne in Sweden. The concept designated the green and innovative metropolis areas, such as sustainable mobility, internationalization and labour movement based on the public and private innovation networks. The strategy has been implemented since 2015. During that time, Copenhagen was developed partly to be a powerful growth centre competing with the other capital cities in Europe. This example serves as a successful cooperation result in terms of the regional development, integration, and cross-border networks establishment, where better transport connectivity elements were pursued (The Capital Region of Denmark, 2020).

Concluding, the regional and cross-border cooperation and integration in the transportation links perspective is developed variously in different regions of the European Union. There are different drivers for the challenges and opportunities in most cases, including the economic and social transformations affecting most cities and regions. An example of it can be the financial crisis taking place in 2008. On the other hand, the local and more sectoral factors can also impact every functioning and planned project or partnership, depending on the territorial or sustainability aspects, for example. That is why the importance of regional integration and cross-border cooperation should be supported on the supranational level by the authorities and European Union actors. In this case, the policies are the soft instrument affecting the promotion of the opportunities, such as knowledge economy or sustainable development and blurring the

challenges, such as migration and climate change, which cannot be dealt with on the domestic level. In order to gain new opportunities, cooperation between the European Union institutions, state authorities, international organizations and stakeholders is needed during the planning and decision-making. It undertakes spatial planning, integration, infrastructure and energy provision improvement, services establishment and societal governance instruments functioning (ESPON, 2017). The efficiency of many processes concerning connectivity depends on the effectiveness of the transport connections, especially in the bordering areas.

1.3 The Trans-European Transport Network

Trans-European Transport Network or the TEN-T aims to strengthen the transport infrastructure's role in terms of regional integration and economic development. According to the Consolidated Treaty on the functioning of the European Union, creating the transport policy to connect the Member States is fundamental, and thus the TEN-T strategy was developed (European Parliament, 1996).

Nevertheless, the policy was first shaped in the Maastricht treaty back in 1992, which formerly designated the guidelines on the actions and projects towards integrating each states' transport systems across the borders. Those projects later played a role in the TEN-T strategy development (Guasco, 2014: 6). Today, the project focuses on connecting the well-developed regions in the European Union with the regions suffering from economic issues, negative demographic processes and industrial downturn. It addresses the improvement and establishment of the transport modes and supports the transport shifts from road to the more environmentally friendly ones. The goals include infrastructure modernization, innovation and decarbonization, as well. In terms of reaching the aims, the project develops the links of the railway lines, roads, waterways, maritime routes, and nodes, such as airports, railway stations, terminals, and ports. Thus, it influences the closure of the gaps between the states, eliminates the barriers, and strengthens the social and economic cohesion in the Union. The policy application mainly addresses the joint planning of the infrastructure and standard measures regarding the financing aspects and investment. The regulation and application of the policy fall under the scope of the Member States responsibilities.

The main transport links are planned to be established by 2030, which will already bring considerable benefits for the region's prosperity. The core network at the same time is planned to be finished by 2050. This network is planned to include nine interconnected transport

corridors across several regions and states, guided by the separate European Coordinator (European Union, 2020).

The Baltic Sea Region is a part of the North Sea-Baltic Corridor, the Scandinavian-Mediterranean Corridor and the Baltic-Adriatic Corridor. The first one can be considered the most northern corridor, covering Finland, Estonia, Latvia, Lithuania, Poland, Germany in the Baltic Sea Region, and the Netherlands and Belgium. It provides the connectivity patterns between the East and West, bringing the opportunities for the better integration of the not that well-developed Eastern European Member States by gaining access to the developed West and its markets. This corridor also has established connections with the other ones through the multimodal points. For instance, Helsinki is connected to the Scandinavian-Mediterranean corridor and Lodz, and Poznan is connected to the Baltic-Atlantic corridor (Cox, 2020: 8).

Generally speaking, the Baltic Sea Region is a crossroads between Eastern and Western Europe for freight and passenger transportation. Nevertheless, the railway infrastructure is relatively underdeveloped in comparison with the motorways. There are no established direct railway links between the Baltic States yet. The Rail Baltica Global Project is planned to blur the gap between Central and Eastern Europe by providing a railway network. More specifically, the link is planned to be a double-track electrified railway, where the speed of the trains is programmed to be around 240 km/h. The link will be established from Tallinn to Parnu, Riga, Panevezys, Kaunas, Lithuanian, and Polish border through the Vilnius-Kaunas linkage. The proposed length of the link is planned to be 870 km for both passenger and goods supply. The Rail Baltica project will be connected to the TEN-T core network within the European Union and will serve as the integration opportunity for the Eastern European states and marginalized areas. Economic partnerships, market possibilities and elimination of the socio-economic and cultural barriers are the expected outcomes. The project will have a considerable influence on the Baltic States integration and regional development, mainly affecting the demographic trends. The reason for it is that the link will provide opportunities for advanced passenger and freight transportation to Central Europe and the Baltic Sea Region in general (Ernst & Young Baltic, 2017: 7-9).

Transport projects contribute to the long-term competitiveness and sustainability of the region. The transportation of people and freight improvement would benefit the whole internal market and develop the transport corridors within the European Union. The greening of the sector is another goal pursued by the project in terms of the shift to the railway networks. These patterns are essential objectives of the TEN-T policy. Moreover, the European Green Deal strategy addressed the notion of transforming the European Union into a competitive market region in

2019 by eliminating the emissions effects and turning them into resources for the economy by 2050. In this case, the TEN-T corridors influence the process of the decarbonisation of the transportation modes (Cox, 2020: 7).

As for the more detailed insight on the Scan-Med Corridor, it is crucial to mention that it connects the main urban centres in Germany and Italy to Scandinavia and the Mediterranean. The important centres located in the Baltic Sea Region part of the corridor include Oslo, Copenhagen, Helsinki, Stockholm, Malmo and Hamburg. Thus, the corridor might be regarded as the largest one because it covers around 9,600 km of the railways and 6,300 km of the motorways, including 25 core ports, 19 core airports, 28 terminals, and 19 urban nodes (Cox, 2020: 49). The Scan-Med Corridor scenarios are crucial in the analytical reports on potential accessibility opportunities and impacts. The Fehmarn Belt Fixed Link is one of the essential examples located in the cross-border region, which needs the designation of the possible consequences of its non-completion of feeder infrastructure. The non-compliance, in this case, can be regarded as a crucial issue for regional connectivity and new regionalization processes. The reason for it is that the tunnel will affect the corridor development as an extended infrastructure. The transport flows between Central Europe and Scandinavia are the areas that would experience challenges in this case due to the possible negative effect on the rail and intermodal transport allure and decreasing the opportunities concerning the TEN-T goal to connect the major economic centres across the corridor. Thus, the scenario analysis is an essential step in terms of the strategies and policies applied for the ongoing and planned projects (Cox, 2020: 32-33).

Concluding, the TEN-T policy and its objectives play a crucial role in developing regional integration and its connectivity by using the transport corridors and projects as comprehensive instruments. The Baltic Sea Region is a part of the three developing corridors, where the Rail Baltica is one of the currently developed projects, which would gain many benefits for the connectivity improvement within the region. The transport infrastructure and projects, including the planned ones, significantly impact the region and European Union. More precisely, 142 transport projects were already successfully finished, where the central part of the financing covers the railway links improvement. Currently, the fourth work plan designated 817 projects in total within the corridor, where 58 of the projects are placed on the cross-border areas (Cox, 2020: 49).

1.4 STRING-Corridor and Green STRING-Corridor Interreg Programmes

The Green STRING-Corridor is one of the crucial projects implemented within the scope of the TEN-T strategy. The strategy is already beneficially affecting the territories of the particular regions. An example of it is the regulations aimed to designate the models for the corridor improvement concerning the rail sector and substitute fuels, low CO₂ emissions and sustainable connectivity. The STRING network is a macro-regional initiative applied from Hamburg to Øresund and derives considerable potential for the Baltic Sea Region and particular areas such as the Fehmarnbelt region and the cross-border tunnel connection. The challenges it addresses consider the transport infrastructure integrity and many links affecting the ecology and consumption of fuels within the European Union. As for the legislation, the binding one is applied vertically over the national one to provide proper coordination of the policy (Guasco, 2014).

Implementing the TEN-T strategy and projects, such as STRING-Corridor, is regulated by the European Union law, including the regulations and decisions. An example of such regulation is regulation on the functioning of international rail freight corridors, aiming to influence the European rail network for competitive freight. The Fehmarnbelt region is located in the North-South corridor from Stockholm to Palermo, for instance, where according to the regulation objectives, the coordination between the Member States and infrastructure controllers must follow the goal of establishing the comprehensive freight corridor (European Parliament, 2010).

Green STRING-Corridor objectives are concentrating on the sustainability of both internal and cross-border rail traffic improvement, which can affect the whole Scan-Med corridor and Baltic Sea Region. The project is focused on conquering the national challenges and initiatives in coordination with the green transport corridor establishment. The primary goals are to provide clean fuel, zero-carbon and sustainable transport modes, regional connectivity and accessibility, integration of the regions and particular nodes to the whole network, and the establishment of the cross-border projects and efficient cooperation organization between the authorities and stakeholders. According to the previous experiences, the STRING-Corridor addresses these barriers rather effectively in supporting the regions along the TEN-T corridors (Guasco, 2014).

Concluding, the Green STRING-Corridor and STRING region will benefit the particular projects, such as Fehmarn Belt Fixed Link, comprehensive establishment by providing the funding, reports, and regulations for the three national states cooperating. Such initiatives result

in essential outcomes for the particular nodes and cross-border areas, as well. However, this project focuses mainly on the sustainable and green initiatives and goals to pursue during the planning and establishing of the projects and addressing the common challenges within the scope of the TEN-T strategy.

1.5 Interreg Öresund – Kattegat – Skagerrak Area Strategy

The European Observation Network for Territorial Development and Cohesion is not only one instrument of the European Cohesion Policy, where the Öresund – Kattegat – Skagerrak region is addressed under the scope of the Europe 2020 Strategy agenda. The Interreg Europe programme is a supporting instrument designated for policy performance, application, and drafting of the organizations and programmes. The practice and experience exchange by the local and regional actors for the public policies application is one of the primary purposes to designate the solutions finding for the strategies. The Interreg framework promotes cross-border cooperation as one of the main aims of cross-border regionalization in the European Union (Prokkola, 2011). The European projects have the potential and possibilities to gain convenient data. The reason for it is that, for example, the Interreg Europe programme obtained a budget of EUR 359 million for the period from 2014 to 2020. Its actions focused directly on policy topics, such as technological and research development, the competitiveness of small and medium-sized enterprises, low-carbon and green economy and resource efficiency. Thus, it is also a successor to the Interreg IVC programme, contributing to cross-border and transnational cooperation (Interreg, 2018). It is also applied in the Baltic Sea Region within the Europe 2020 objectives and the draft process for the European Cohesion Policy. The main objectives covered include smart, sustainable and inclusive growth, where territorial aspects are considered. The Öresund – Kattegat – Skagerrak area is one of the best in achieving these objectives already. Still, there are barriers and challenges to compete due to the rather intensive level of internal disparity. An example of it is the ratio of employment in the knowledge related fields to the total one in 2010 in the cross-border regions, which is much higher in Denmark than in Norway and Sweden. The following patterns of innovation were thus addressed and classified in the Öresund – Kattegat – Skagerrak area, where the applied science area was on the highest level on the Zealand Island in Denmark, which makes it attractive for the neighbouring region in terms of the knowledge economy development. Due to the well-developed product innovation levels, the bright technological application zone appeared somewhat modernized in the Swedish and Danish areas. The research conducted in terms of

assigning multiple degrees of progress in particular fields and comparing ratios provides a solid base for the programmes and projects to be undertaken or not in the areas. Special attention is brought to the cross-border cooperation possibilities, where the external knowledge, for example, can be embedded in technology and innovation capabilities or vice versa. One of the examples of the project's capabilities and potentials addressed according to the collected data is the Øresund Bridge located between the Danish and Swedish borders in the metropolitan areas of Copenhagen and Malmö.

Generally speaking, the territorial cooperation programmes and projects are essential for the further improvement of the cross-border areas in the region. The project zone is usually described as rural areas, the intermediate and urban ones, such as Oslo and Copenhagen. An interesting aspect is that this cross-border region is separated by the sea and the land area at the same time. Therefore, the multimodal accessibility can be designated as the specific goal in terms of regional integration and connectivity for this area, due to the yet not well-modernized transport accessibility compared to the average European level, excluding the parts of the region that have direct access to the international airports.

There is also a separate Interreg programme for the region or the Interreg Baltic Sea Region Programme 2014-2020, which is focused on aiming the sustainable and connected Baltic Sea Region. This programme also supports the application of the European Union Strategy for the Baltic Sea Region. It also provides funding for the institutional capabilities on different levels, including the public authorities, non-governmental organizations, research actors and enterprises. The priorities of the investments are the ability for innovation, better management of the natural resources, sustainable transport and macro-regional cooperation. In order to receive the funding, the projects must comprise at least three partners from three states from the area of the programme. Usually, the budget ranges from EUR 1.5 and 4.5 million (Interreg, 2020).

Concluding, the Interreg programmes provide fundamental grounds for the transition from theory into practice. The integrated and connected approaches towards the economic and regional development employ conducting the analysis on the programme area and its future priorities and opportunities. The reports published contain essential data on the territorial evidence for future cooperation initiatives. As for the consistent project examples, Transmec focuses on European cooperation, Terco related to territorial cooperation, Ulysses covering cross-border development and other crucial projects focusing on specific topics.

2. Øresund Bridge Fixed Link Project

2.1 Øresund Strait Area Characteristics and Connectivity Preconditions

The Øresund is one of the foremost successful examples of cross-border cooperation in the European Union, which influenced the development of the metropolitan area around Copenhagen, Malmö, Lund and Helsingborg. The process of the integration was stimulated by the establishment of the fixed link in 2000. The project's beneficial long-term and short-term effects performed the key changing role for the region's development and connectivity improvement in the Baltic Sea Region. Thus, the Øresund is considered one of the most influential and comprehensive models of cross-border integration, which can be used and researched as an example for further cross-border initiatives and transport projects. Nevertheless, the Sweden and Denmark region have a deep background of cross-border interplay and partnerships before the fixed link. Even 20 years after its establishment, the project beneficially altered the integration process by still partly eliminating the appearing barriers and challenges, such as the economic crisis in 2008. The analysis of the project by the European Union instruments and research groups within the strategies aiming for better connectivity and sustainability still brings innovation initiatives, which makes the connection even more far-reaching for both states engaged. Generally speaking, the Øresund area obtains many favourable pre-conditions for the functional region, including the physical accessibility and mobility possibilities both internally and externally (Nauwelaers et al., 2013: 6-7).

The Øresund region is placed on two strands of the Sound Strait or the Øresund Strait in Denmark and Sweden, establishing its maritime border by dividing the Zealand and Skåne areas. As for its characteristics, its length is 118 kilometres, and its width differs from 4 to 28 kilometres. The narrowest place is exactly 4 kilometres, and it is located between Helsingør in Denmark and Helsingborg in Sweden. The territory became more extensive in 1997 when the Swedish counties of Kristianstad and Malmöhus were connected to the Skåne one. Thus, the Øresund nowadays includes the region of Skåne in Sweden, the Copenhagen region and the Zealand region in Denmark. The whole region's territory is 21.203 km², of which 11.369 km² is in Sweden and 9.834 km² in Denmark (ESPON & TECNALIA Research & Innovation, 2012: 5).

Zealand, Lolland, Falster, Møn, Bornholm, and Skåne are parts of the Øresund region, which at the same time includes three administrative regions and 33 municipalities in Skåne region and 46 municipalities in the Capital Region and Zealand region. There are 3.8 million

inhabitants in total, where 2.5 million are on the Danish side and 1.3 million on the Swedish side, even though the last one is more extensive in terms of the area. However, one of the challenges in the region is the considerable gap in terms of the population density, where the metropolitan territories are relatively profoundly populated and the rural municipalities, like Lolland island, are bare (Statistics Denmark, 2021) (Statistics Sweden, 2021).

Nevertheless, the Øresund Bridge operates a role in the network addressing the population spread difficulty because it functions as the network between the North of Scandinavia and Central Europe by stimulating the migration processes. The connectivity between the cities positioned along the region is also advanced within the framework of the TEN-T strategy. Thus, the area is developing and experiencing the process of urban sprawl at the same time (ESPON & TECNALIA Research & Innovation, 2012: 5). It is crucial to mention that the term Øresund Region does not mean the administrative region because it is not a functional region in terms of the integrated labour market, and the political and administrative functions are controlled on the national structure levels (Ejermo et al., 2021: 3). Both Denmark and Sweden obtain comparable models of development in the form of knowledge-based economies. However, the economic centre is located in the Danish part, and the Copenhagen-Malmö-Lund area comprises a significant share of the Danish economy, settling around 49 per cent and 11 per cent of the Swedish economy. The region itself has a core-periphery structure because a significant part of the population, economic growth, and activities are arranged in the central area adjoining the Øresund Bridge. Another crucial factor affecting cross-border integration is performing joint economic activities by the small and medium enterprises, organizations and public authorities. Both the Øresund-Kattegat-Skagerrak border region and Baltic Sea macro-region benefit from the cross-border economic activities within the Øresund region, which also impact the development and competitiveness of the markets on both sides. For instance, Malmö experienced a significant economic boost since the establishment of the connection. There are many joint ventures operated jointly by both cities, which bring considerable benefits (Nauwelaers et al., 2013: 7). Another vital aspect describing the region's perspectives for cooperation and integration is its instead developed coastline. More directly, the residential territory for tourism and recreation, business centres and farms generating renewable energy are located along the coastline. These aspects designate opportunities for further economic benefits, but it still requires transport and spatial development on both sides (ESPON & TECNALIA Research & Innovation, 2012: 9). The regional development is supported by regional and national strategies and European Union instruments and projects, such as TEN-T and STRING-Corridor.

The Øresund Strait is a 16 kilometres width connection of the North and Baltic seas, which derives essential strategic importance (Ejermo et al., 2021: 3). There are opportunities for states on the opposite sides of the strait, such as cheaper accommodation in Denmark and more comprehensive employment options in Sweden. Thus, the initiative to connect both cities led to establishing the influential economic centre in the Øresund region. Nowadays, the project is one of the most prosperous in the 20th century because it is the first bridge and underwater tunnel link. That is why its founding became a technological step for the whole Baltic Sea Region. The project has connected not only the two major centres, city councils and commercial actors but the populations, as well. The exchange of everything by the bridge provides an efficient example of the properly working project influencing the Baltic Sea Region competitiveness and role in the global arena by contributing the connectivity between the city regions and cooperating.

2.2 Øresund Fixed Link Project Timeline: Planning, Construction, Maintenance

The sea waters almost entirely surround Denmark. The land border with Germany is only 67 kilometres, while the coastline arranges over 7000 kilometres overall. Thus, the shipping processes are omnipresent, and there is dense traffic of it in Øresund. The largest island in Denmark, Zealand, has been connected to the mainland by an imposing bridge over the Great Belt since 1958, a crucial passage for the state. Moreover, since 2000, there has also been a link to Sweden. The Øresund Fixed Link is a transport project consisting of a combined bridge and tunnel established across the Øresund strait. It contains the tunnel between Amager at Kastrup and the artificial island Peberholm and the bridge between Peberholm and Lernacken. The Øresundsbron link consists of a four-lane motorway and two-track railway (Omega Centre, 2014: 6). Even though the geographical gap between the states is comparatively small, the process from negotiations to building the transport connection took several decades. The more solemn discussions between the Swedish and Danish governments on installing the bridge and tunnel started in the 1990s. The agreement was approved despite the economic and environmental concerns, including the additional minor challenges and barriers, and the bridge was opened on the 1st of July in 2000. The connectivity and accessibility improvement of Copenhagen, Western Jutland, Germany, and Sweden was considered a potential driver for the economy (Ejermo et al., 2021: 5).

The Øresund Region was already an area of intergovernmental cooperation in the middle of the 20th century, as well. Politicians from both states in 1963 founded the cross-border Council.

It examined the concept to build the bridge rather sternly and even discussed creating the urban region Orestad. Nevertheless, the plan to establish such a connection was debated for several decades until the final agreement was made in 1991. Two years later, the special governing Committee was established to follow the anticipation of the project and obtain adequate investment plans. Therefore, the creation of the new functional region was the goal addressed within the region branding (Nauwelaers et al., 2013: 13). The Øresund Committee administers the project's governance along with the multiple public and private organizations, such as Øresund Direct and Øresund Institute. The first one focuses on the cross-border labour market development, and the second one provides the research on the area. The private actors, in this case, are the Øresund Chamber of Commerce, for example. The Øresund Business Council is the bi-national triple helix participant, which strengthened the conception of the formal project initiative along with the Øresund Committee. As for its aims, the Committee negotiates regional and local authorities of the region. Another project related to the governance and leading is the Ørestat initiative, funded by the Interreg and delivers statistical data on the cross-border factors for the proper strategies application. An example of such a strategy is the Øresund Regional Development Strategy, enforced by the Committee in 2010. Its objectives are aimed to ensure the knowledge and innovation goals.

The Committee is financed and supported by the Interreg A programme, which renders opportunities for establishing a more substantial basis for cross-border cooperation based on innovation. The Committee financing is based on the contributions and efforts from its members, based on the number of inhabitants in the particular municipality or region (Nauwelaers et al., 2013: 10).

The Øresund Bridge strengthened the economic bonds, encouraging commuting and cultural exchange since its opening. However, there were challenges addressed within the scope of the Øresund Fixed Link project planning and establishment. Firstly, the unemployment rates were an essential issue at the end of the last century in the region, caused by the common industries losing their importance and the closure of cars and textile factories. These factors affected employment on both sides of the strait. Therefore, the opportunity to decrease industrial unemployment in Malmö was considered crucial for the Fixed Link establishment by Sweden. The reason for it was the chance to access Copenhagen's labour market. As for the Copenhagen interests, link creation would mean expanding the production modes and services catchment zone. The Øresund Fixed Link aimed to develop the competitiveness of the whole region by stimulating the development of the infrastructure and educational opportunities to attract labour forces and businesses. As a result, Sweden received the desired demands and a massive part of

the exports from Sweden was directed to the central European states and two-thirds of imports also originated from there. Thus, the more accessible communication and accessibility enhance commercial exchange and tourism. Moreover, the bridge formed a new image for the region internationally and offered an opportunity to develop tourism businesses because Copenhagen is a crucial tourist destination.

The first significant initiatives and discussions on the link and project conception occurred at the end of the 1980s when regional development and cross-border integration became more required. The factors influencing the idea were economic and political potential and the need to shape the Øresund identity together. The reason for it was that there were and are similarities on the cultural and linguistic levels, but the population is varied by encouraging cultural interchanges. The other aspects considered within the project application and planning were the environmental concerns. The notions of providing green growth, reducing the CO2 effects and establishing sustainable public transportation were central.

Furthermore, the environmental concerns became fundamental in terms of the project planning and caused multiple protests from the population on both sides. To reduce the negative impacts of the building, the particular seafloor silt was dredged to control the water inflows. Otherwise, considerable damage would have been brought to the seafloor and its inhabitants. Moreover, 14 per cent of the bridge and tunnel cost was associated with environmental concerns and its optimization. The building process should have also been fast and accurate, and the builders managed to do that successfully (Global Infrastructure Hub, 2020).

The European Round Table of Industrialists organization consisting of the businesses was the primary initiator of the fixed link program in the late 1980s. This fixed link was named ScanLink. However, the contradictory opinions were met by the proposal because it did not even stipulate the particular area and place where it would be placed and regarded a highway project as a basis. Furthermore, this transportation mode would also acknowledge the vital transit traffic, which does not equate to environmental protection notions. Thus, this approach met suspicion from the other authorities. However, since then, the notion of establishing the fixed link in the cross-border area has been a central topic.

The first approved agreement to establish the fixed link was signed in 1973 between the two governments. Nevertheless, the economic and energy crisis affected the process related to globalization trends and the industrial quarter. The new regional balance was introduced when Denmark joined the European Council the same year. Denmark prioritized connectivity as one of the fundamental purposes and focused on establishing the link over the Great Belt and Fehmarn Belt in the future. The project could be built with financial assistance from the supra-

national budgets and not only the national ones. As for the environmental aspects, multiple investigations were conducted on both sides of the strait, causing conflicts within the ecological aspects. Mainly, the environmental legislation contradicted the possible aftermath of the project for the land, air and waters, but was harmonized in each of the states later. This process, however, took place one after another and thus, the construction of the connecting land control interfaces in Denmark started before the final decision was accepted in Sweden. The agreement was later rejected in 1978 because of Denmark's decision to transfer the airport to the Isle of Saltholm.

The Øresund Delegation was established in 1984. Political secretaries, represented by the communication and finance departments, national road and railway administrators of both states, took part. The Delegation reviewed the previous research conducted in the 1960s and 1970s to create new project proposals. Öresundsförbindelser was the preliminary report issued by the Delegation in 1985. The report designated the need for the project to be financed outside of the state budgets and that it must be produced in a beneficial way for the economy in the future. The railway tunnel was suggested in the report, which would be settled between Helsingborg and Elsinore. The road bridge was the second transportation mode suggested in the area between Malmö and Copenhagen. The Delegation provided numerous researches in the period from 1987 to 1989. The Öresundsförbindelser report published in 1987 was one of the most crucial. The report designated three alternative options of the links. The recommended options included the combined road and railway links due to its economic prosperity and the possibility of establishing the collective transport system between the two cities and the airport of Copenhagen. The project was a crucial topic discussed during the social democratic party congress in Sweden the same year. Many of the party members were against its objectives and unsure about its further prosperity. One of the main drivers for scepticism was the environmental concerns, where the water flows should not be affected. Thus, the establishment of only the railway connection was preferred initially, but it also required additional investigations.

The search for an answer on building the 16 kilometres connection became a complicated question for the Delegation, in general. A year later, on the 20th of April, the leadership in Sweden finally settled to vote for the combined road and railway option, which appeared to be the easiest and cheapest option. Thus, the government began negotiations with Danish authorities. In this case, negotiations with the Danish social democrats were necessary, even though they were not part of the government back then. The social democrats were confident about the project's necessity, but the government was not ready to approve and support it.

However, this proposal was not appealing for the Danish administration due to the increased domestic competition and possible adverse impacts on the link across the Great Belt. Another difficulty was the aversion of the motorway link across the Øresund strait among the Danish authorities and social democrats. Nevertheless, the dislike was reduced due to the Swedish approach to threaten to use the shipping ferries on the route from Trelleborg to Germany, which would negatively impact the competitiveness of the Great Belt link. The result of the negotiations was the settlement to build the combined road and motorway by Denmark and to ensure a particular volume of the railway goods transportation through Denmark by Sweden. The referendum carried by the Danish social democratic party in April 1990 resulted in a vote for the combined road and railway link.

The financing aspects were a central issue addressed by both administrations, and that is why the parliaments prepared premises for it in 1990 and 1991. The decision assumed that the residue must fund the latter from the fees on the former and that no budget grants can be used for the project. One of the primary concerns was the development of the pricing tool for road and rail traffic. Thus, the compromise arranged that there would be a model with the determined price paid by both states' national rail administrations.

The Danish minister of traffic Kaj Ikast and Swedish minister of communications Georg Andersson approved the agreement in Copenhagen to develop the fixed link across the Øresund on 23rd of March, 1991. The agreement entailed establishing the four-lane motorway and double-track railway link between Malmö and Copenhagen, including the bridge, tunnel and island. One of the fundamental elements of it was setting up state-owned stock companies by both states. The companies were in command of settling the consortium, which controlled the forecast, planning, financing, building, and operating processes of the set link. The consortium received the loans from the states, and thus the states played the function of creditors. The loans were intended to be covered by the taxes from the user charges within several years. According to the initial plans, the construction should have been started in 1993 and finished in 2000. The agreement to build the fixed link was ratified in August 1991.

The Øresundsbro consortium was founded in January 1992. It was a crucial actor for performing the obligations regarding the environmental impact estimation, as well. However, the ownership by the two states divided upon it. In the case of Denmark, the consortium covered Sound and Baelte areas, including such actors as A/S Storebaelt, Sound and Baelte Partner A/S and A/S Øresund. In the case of Sweden, the consortium included the Swedish Road and Rail Administrations and Svedab AB. The request to construct the fixed link was prepared by it in July 1992. It included 40 reports. Nevertheless, the application was declined by the Swedish

National Board for Environment Protection in January 1993 due to the arguments and uncertainties that the project would harm the Baltic Sea environment and its encompassing sea area. Moreover, it was considered the not successful approach for the environmentally sustainable transportation mode. However, the board's rejection was not considered binding, and thus it was applied to the Water Rights Court. It has approved the application because the final construction will not negatively impact the Baltic and the North Sea water circulate in November later that year. The decision was later regarded as "the zero impact solution", which made the consortium add modifications to the construction layouts and schemes and apply to the Water Rights Courte once again, which was successful. The leadership provided confirmation of the project based on the new conditions and plans on 16 June 1994. The technical aspects for the final approval were collected by the Water Rights Court and the Swedish National Board for Environment Protection (Omega Centre, 2014) (Global Infrastructure Hub, 2020).

The building phase began once the administration in Sweden formed a control mechanism and committee. This committee played a monitoring role on the impact limits of the construction on the environment since it was the prime issue. The first steps for it already started in 1993, on the 16th of September, where the land works in Denmark commenced the construction of the nine-kilometre motorway and 18 kilometres railway (Øresundsbro Konsortiet, 2005: 10). The consortium held a contest on the construction projects. One of the presented ideas suggested building the arched bridge, which would eventually be dangerous for the ships. Another option was the suspension bridge, which was later rejected because it would not handle the railways. Thus, the engineers chose the project of the cable-stayed bridge. One of the main reasons was that it is cheaper to build. The sufficient project was the combined four-lane motorway at the top and the double-track railway at the bottom. However, time went by, and the fixed link, including the tunnel, bridge and island, should have been built in five years. The negotiations handled by the consortium from July to November in 1995 indicated the Øresund Tunnel Contractors and signed an agreement with them on the 17th of July, 1995. Examples of the parties taking part are John Laing Ltd, E. Pihl & Søn and NCC AB, who were in the custody of constructing the immersed tunnel. The value of this contract was DKK 3.8 billion. It also agreed with the Øresund Marine Joint Venture, Per Aarsleff A/S and Great Lakes Dredge & Dock Co to construct the artificial island Peberholm. The artificial island had to be established, due to the reason that the real Saltholm Island could not be used. The nature reserve located there was another consideration in the ecology preservation terms. The artificial island is four kilometres long and is connected directly to the tunnel, which is 4050 metres long. The value

of this agreement was DKK 1.4 billion. The island was built with the use of stone delivered by shipping from Sweden. The last contract for building the high bridge and two-level entrance bridges was confirmed with Sundlink Contractors, consisting of the Højgaard & Schultz, Skanska AB and Hochtief AG. This agreement is valued at DKK 6.3 billion (Omega Centre, 2014).

The dredging of the Øresund seabed was one of the first steps started in August 1995. The 12 kilometres perimeter needed to be filled in. The material was taken from the sea grounds. Engineers also considered the deepening of the bottom for the bridge and tunnel. More than 50 ships were used during this process. The first two caissons for the entrances were towed to the bridge adjustment from Malmö and immersed in a 17 metres underwater tube in the sea bed in April of 1997. The establishing of the factory for the elements of the tunnel was another essential step. The tunnel itself was planned to be consisting of 20 sections connected under the water on the deepened seabed. The first elements were drawn at Copenhagen North Harbour to Drogden at the tunnel trench on August 8, 1997. Each of the elements was prepared in a month. The length of the sections is 175 metres, and the width is 38 metres. Height is 8.5 metres, including two tubes for cars, two for trains and one for emergencies (Henriksen et al., 2000). The weight of one element is 55 tonnes. One of the most challenging tasks was to transfer these elements. During this process, one of the most severe issues during the construction process took place. The placement of the first 12 elements was successful. However, the transferring of the 13 one or renamed element to 12A was almost tragic. Technical issues took place during submerging underwater when the element ripped off and fell on the sea bottom. Thus, using a different tactic for transferring elements was recommended and considered for future projects (Nilsson et al., 2007). The following significant part of the process took place on September 27 in 1997, when the Øresund motorway heading to the Copenhagen Airport was opened. Exactly one year later, the Øresund Line between Copenhagen Central Station and Copenhagen Airport was initiated. As for the bridge, the construction took place after the establishment of the tunnel elements. In this case, the chance of the planes colliding the bridge was also counted. Thus, it was projected to be as resistant as possible. The bridge consists of two abutments 44 metres high and a transverse element with 80 metres cables. The final metres of the tunnel was attached on March 16, 1999. That day the first transport drove through it. The latest bridge span was placed on August 14, 1999. That day Sweden and Denmark were connected. The last section of the route was established on December 1, 1999. The whole process lasted for nine years and included thousands of people taking part in it. The public received entrance to the fixed link on June 9, 2000. This day was

regarded as the "Open Day" when the thousands of people who walked through the bridge attended. The Outer Ring Road was formed on June 17, 2000, in Malmö. The land works ended on the Swedish side. The Øresund Bridge was opened on July 1, 2000, at 11 PM. The budget and deadlines were successfully met (Øresundsbro Konsortiet, 2005: 10).

Concluding, the bridge and fixed link can be regarded as the technological breakthrough, which broke many records and brought numerous benefits for the communities in terms of socio-economic notions. Nevertheless, many challenges were met on the stage of planning, negotiating and building the connection. The solutions applied towards eliminating the barriers can be considered a comprehensive example of the transport project application in the cross-border area. The connection developed the region by making it an essential part of the transport corridors and strengthening cross-border activities. The bridge has connected not only the two cities but the whole Baltic Sea Region.

2.3 Transport Connectivity Indicators of the Øresund Fixed Link

The Øresund Bridge is a unique transportation link operated by the consortium and financed by its users. The integration of the labour forces and markets across the region is not the only benefit. The link reduces the journey time, which makes it more attractive for leisure and freight transport. Transport connectivity indicators designate the time and distance of the route, several vehicles and trains, focusing on the operating costs and volumes. Increasing the numbers and volumes is a crucial aspect for the profitability of the project functioning and eliminating its costs in the long-term perspective. Thus, the positive development of the traffic across the bridge is necessary.

The essential public transport nodes, which are part of the fixed link, combine Kastrup airport, Copenhagen central train station, Malmö central station and multiple motorways, such as E6/E4 from Oslo to Stockholm, E22 from Lund to Kristiansand, E55 from Rostock to central Germany and E20 located in the Western part of Denmark.

A singular infrastructure is appended to the fixed link, which was modernized during the project establishing and operation. An example of such linking motorways is the Outer Ring Road located in the Malmö area coming from the Lockarp, which is not embraced by the agreement on the fixed link. Furthermore, improving the existing road from Malmö central station to this area was imperative for better connectivity in the region. Other transport nodes are indirectly connected to the bridge, including the railways connecting Malmö with Gothenburg and Stockholm. As for the Copenhagen area, the directly attached infrastructure is

the Metro, which originated in 1997 and has been modernized since then. As for the indirect connections, the improved railway between Odense and Hamburg leading to the Fehmarn Belt fixed link is an example (Omega Centre, 2014: 6). According to one of the newest reports in 2019, the Øresund Bridge has over 550.000 leisure customers using the BroPas - a year-long subscription for driving over the bridge. Nevertheless, the fixed link influenced the annual rising freight and leisure transportation volumes for the last 20 years. As for the average numbers, 29.423 vehicles per day passed the link in 2019. As a result, income from road traffic increased by 2.9 per cent, as well. The reason for that is that the average prices are higher for leisure and freight traffic than a commuter one. The profit in numbers during that period results in DKK 1.281 million. According to the statistics collected by the Trafikverket, the average price per passenger car that year was DKK 214. The vehicles drivers pay the charges for crossing at the toll station located in the Lernacken in Sweden. Moreover, the traffic volume, including the railway, resulted in 12.2 million passengers. Income from the railway increased during the five years, as did the passengers' cars. It rose to DKK 512 million. The obligations on the operation of the link decreased, as well to DKK 259 million. At the same time, the profit grew to DKK 1.460 million. Thus, the year profit results in DKK 855 million. Coming from this, the average profits were stable and slightly increased from 2014 to 2019. However, the numbers decreased due to the COVID-19 crisis in 2020 and 2021. Nevertheless, the direction from the Board of Directors at the Annual General Meeting on the bridge operating and prognostications was to shift the profits to the preserved earnings.

The BroPas user numbers serve the complete statistics in terms of investigating the number of bridge overpasses. Thus, the passengers' car volume was around 84.5 per cent of vehicles crossing the bridge, while the freight transport was 53.6 per cent in 2019. The reason for it is the growing interest in leisure and travelling on the other side of the connection. The transportation records were established in July 2019, when the number of cars crossing the link per one day was 32.100 and 857.500 per month (Øresundsbro Konsortiet, 2019: 5-12).

However, travel activity has decreased during 2020 and 2021 due to closed borders and epidemiological restrictions. For instance, the bridge was opened only for freight transport and travelling to Sweden in March 2020. Furthermore, strict entrance customs were applied for the passengers coming from Sweden to Denmark. The consortium operated actively on the initiatives to preserve the businesses and ensure accessibility during the COVID-19 crisis (Øresundsbro Konsortiet, 2020).

Nevertheless, the operating and maintenance of the Øresund Bridge by the consortium and other associated actors is relatively advanced and well-functioning. The suppliers of assistance

and technical apprentices work on a high-level basis. The new approaches are designated regularly for the better functioning of the connection and its profitability for both states. For example, the technical and data standards are addressed and improved. The increasing digitization aspects are one of the overall central goals. Maintenance cost reduction is another crucial goal. The long-term perspectives are essential for the decision-makers and consortium due to the reinvestment in the bridge segments, equipment and economic models. An example of such initiatives is the platform for painting the foundation on the bridge in 2020. The platform was manufactured to ensure the cost-effective painting manner while not changing the cars and rail traffic. It is the most significant investment since the bridge opening. In addition, the preservation of the bridge and guarantee that users have uninterrupted travel through the bridge was considered (Øresundsbro Konsortiet, 2019: 12-22).

Generally speaking, the Øresund Bridge has developed a significant increase in traffic volumes within the Øresund region and across the border. The average time for passing the fixed link by car takes ten minutes. The vehicle's speed limit is 90 km per hour in the tunnel and 110 km per hour on the bridge. As for the railway segment of the link, it is also a highly used mode of transportation. Two-thirds of the overall crossings operate by train. The travel time, in this case, takes around 35 minutes. The train goes from Copenhagen to Malmö and vice versa. The traffic is controlled by the special traffic centre located next to the toll station on the Swedish side of the connection. The cameras established by the centre on the bridge serve the critical function of monitoring traffic and emergencies.

Concluding, the transport connectivity indicators and applied data designate the well-functioning of the connection and its significance for cross-border integration. The travel time was reduced since the bridge construction, which also affected the volumes of passengers crossing the bridge. For instance, traffic increased by 74 per cent since the connection's founding, according to the data gathered for the fifth anniversary of the bridge on July 1, 2005. Therefore, it is necessary to transport infrastructure and connection that grant benefits in terms of figures for the economies and development of the whole region (Øresundsbro Konsortiet, 2016).

2.4 Short-Term and Long-Term Effects and Impacts of the Øresund Bridge

The most prominent cross-border link in Europe or the Øresund Bridge impacted the Øresund region, Denmark and Sweden, Baltic Sea Region and the entire European Union. The 16 kilometres connection has a border undeviatingly in the middle of the eight-kilometre bridge

and the immersed tunnel, which is four kilometres long. Nevertheless, the physical connection brings long-term effects in various spheres, including socio-economic features, demographic trends, spatial development, cultural and educational integration, institutional and people-to-people connections and tourism. These notions generate the non-physical but essential connectivity elements, which are crucial for the region's development. The transport infrastructure undoubtedly affected the joint regional political goal to create the “Øresund identity” within the similar culturally but distinct ethnically populations. Moreover, the identity is more notable in Sweden, which resembles the need to strengthen it on the Danish side. Øresund Bridge is functioning under the TEN-T project and Scanlink proposal. These initiatives are essential components of the link, influencing its aftermath and modernizing the connections between Central Europe and Scandinavia (Nauwelaers et al., 2013: 10-11).

The modernization of the transport link in the form of the bridge positively affected the regional development, including its functional, cultural and administrative notions. The aftermath of the bridge establishment and use by both sides resulted in benefits for the political and economic discourses. The shared initiatives of the authorities and activities of the societies helped the shaping of the Øresund region and its identity and the Baltic Sea Region, as well in a bigger perspective. Moreover, the transport connection resulted in changing the traffic flows in North Europe. As a result, the Øresund region became more competitive economically and more integrated into the internal market. These aspects impact the long-term effects for regional productivity sustainability. According to the authorities, there are still barriers and challenges in the administrative, institutional and cultural features. However, the process of the development of one shared urban system lessened its negative consequences. Furthermore, the connected urban systems expanded the volume of the South-Scandinavian con-urbanization. Generally speaking, there is a considerable difference in terms of regional prosperity in the pre-bridge and post-bridge times. The cross-border cooperation level also was rather low before its opening (Matthiessen et al., 2004: 31-39).

The fixed link is changing the transport modes attached to it through the transport networks and TEN-T corridors. The link, however, did not expand the transport links directly, but it expanded its potential and development capacity for the area, including the infrastructure modernization. Nevertheless, some of the transport modes were affected negatively by the new link establishment. For example, the ferry business experienced a decline in volumes and freight traffic due to the shift to railway connections. On the other hand, the road transport volumes between the two cities increased drastically, including the cargo and passenger flows.

As for the cross-border integration features, the bridge is regarded as one of the most successful models of these processes in the European Union. The region of Sweden and Denmark is viewed as bi-national. The reason for it is the historical preconditions in the forms of various interactions. The integration of the two states reached its top right before the economic crisis of 2008 (Matthiessen et al., 2004). Moreover, the interest and potential in projects across the state borders and the bordering areas are still growing. The increased activities are taking place in terms of economics, culture, migration and environmental concerns. The border and regional development are interconnected because similar factors impact their functioning and improvement (Blatter and Clement, 2000).

Copenhagen and Malmö-Lund areas connected by the fixed link are still in the process of connectivity development. Therefore, political strategies govern the means of integration. However, they are not applied relatively from the perspective of both states. For instance, the indifferences appear on the levels of political support. Such imbalances can be considered as the weaknesses of the somewhat complicated process of growing two balanced urban regions into one functional (Matthiessen et al., 2004: 31-39). Interestingly, the cross-border area became the first to be investigated by the OECD in 2003 within the Territorial Development Reviews. According to the study, the integration process during the first years of bridge functioning was still relatively unsettled. Nevertheless, the experts assumed that the metropolitan area's competitiveness could increase, which ultimately took place. Furthermore, the area was also observed as the crossing location for Scandinavia and a gateway to the Baltic Sea Region. Therefore, the recommendations assumed lowering tax considerations, asymmetric taxation arrangements establishment, and social customs equalization (OECD, 2003). As for the barriers, which were successfully defeated during the first year, the time-distance has been decreased, and the significant traffic of the ferries is not a problem anymore. Other barriers that still are present include cultural and linguistic factors. For instance, there are discrepancies in mentality and attitudes. Soft and hard integration barriers are another concern addressed by the authorities. In the case of the first type, the people-to-people and institutional partnership is regarded. Moreover, as for the complex barriers, the legal and administrative obstacles were present during the first years due to the taxation concerns (Matthiessen et al., 2004). Nevertheless, the tax and policy issues are still negatively affecting cross-border versatility. The not yet harmonized state legislations impact the positions of the foreigners, commuting employees and students. The differentiating and problematic aspects appear in terms of the insurance or grades recognition (Nauwelaers et al., 2013: 23).

Urban entrepreneurialism completed in the Øresund Region resulted in successful consequences after the bridge opening. Moreover, it was applied within the joint action plan of two states labelled “Øresund—A Region is Born” (Boekema et al., 2001). Furthermore, the Interreg IIA programme was profitable in financing during the first years of implementing and cross-border initiatives (Hospers, 2006: 276).

As for the economic benefits and costs obtained from the connection establishment, the interaction cost viewpoint can be acknowledged. Such interactions include logistics, politics, economics and culture in terms of cross-border integration. As for the logistics and technologies, the costs of product and freight shipping, movement of people, capital alterations, and information costs are relatively prompt for the change. The political factors include the regulations on the domestic level, customs obligations and tax zones. The economic patterns consider the economic growth level, need for goods and services, market structure, level of education of the population and adaptability of the infrastructure. The cultural factors are also crucial, including the language, religion, mentality and ethnicity and population density. They have a low potential for change. The most difficult to modify are the geographical factors, such as physical remoteness, natural obstacles and time zones (Westlund, 1998 and 1999). Thus, the bridge has reduced the complexity of the last factor by eliminating the geographical obstacles. However, that does not determine that its role in terms of the other interaction obstacles has declined. A fixed link still impacts the short-term aspects of tourism, particular goods and shopping prices. As for the long-term effects, the modernization of the travel opportunities impacts the labour market integration, including the housing one (Westlund et al., 2002: 5). Nevertheless, the interaction costs have been reduced since the bridge opening. The railway traffic volumes are one of its main drivers due to the travel time decreasing and frequency. Moreover, the whole region was combined into public transport and motorway links, which considerably affected its approachability. However, due to the high ratio of car and train use, the prices for the ferry tickets became higher. For instance, the round-trip from Helsingborg to Elsinore by a ferry operated by the Scandlines costs EUR 8 per person and EUR 28 if a person travels in a car (Scandlines, 2021). In comparison, the price was EUR 5 in 2001. Nevertheless, the price for the train tickets across the bridge is EUR 16 per single crossing (Skånetrafiken, 2021).

Generally speaking, the region is now displaying the two linked national economies, where the share is more significant on the side of Denmark. It is also regarded as the more critical and developed economic side of Øresund, creating imbalances in the cross-border area. However, the new image of Malmö, which is following the notions of the creative industries, brings

positive impacts for the whole area (Nauwelaers et al., 2013: 17-19). Such notions play a crucial role in the commuter's attraction. Thus the total daily number of such workers constituted 1.041 from Denmark to Sweden and 4.921 vice versa in 2001. However, the numbers have increased significantly from Sweden to Denmark, concluding with 16.892 people in 2015. Interestingly, the number of commuters from Denmark remains more or less the same, and 1.690 workers are travelling daily to Sweden. Here the imbalances in terms of the economic prosperity of the Danish market can be proved, according to the Øresundsbro data. The goods trade expansion between two states is another aspect of the bridge effects in the long-term perspective. The link provided compliance for the transportation and services and developed the capacities of the existing transport networks. The fixed link became an essential part of the urban areas of Malmö and Copenhagen, where the improvement of the business and market networks is an indispensable part of the national economic strategies. The processes and volumes of the goods trade are expected to increase in the future, as well. Overall, the economic boost results from the vital resources on the infrastructure project across the strait and its profitable returning plans. The bridge has impacted the bilateral goods trade between the states, resulting in 44 per cent higher volumes than if the bridge was not established. Moreover, the increase in trade is related to the synchronized business projects by the small and medium enterprises from both sides. The high migration level between the states and the region also resulted in commencing foreign direct investment levels (Persson et al., 2019: 16-17).

According to the experts, the commuter workers' volumes emerge from the Swedish goals to fill in the gaps in the service sector and various professional niches in Denmark. Moreover, the bridge from the economic geography perspective is acknowledged as a significant driver for commercial developments. For example, 60 companies based on the diverse industries have transferred their Nordic headquarters to Malmö during the first years of the bridge running. These decisions positively impacted the urban transformation aims set by the national strategies of Sweden in the 1990s. Furthermore, the probability of obtaining affordable housing for Danish citizens is another factor advantageous for economics. In general, buying the goods on the other side is favourable for the communities due to the currency differences (Savage, 2018). Following the notion of the communities, the human-oriented facilities were set as a fundamental goal of the Øresund Committee after the opening of the fixed link. In this case, the investment in their procurement was considered. The creation of the prosperity image of the region was another related goal, which was connected to the new opportunities provided by the bridge. The region's local, national and worldwide branding was marked as "Øresund: The Human Capital". The primary purpose was to create the promotion of the region for

working, living and travelling. Øresund Network AB is the managing body for the branding processes. It performs the role of the investigator and image handler at the same time. There are numerous businesses and organizations from both sides actively supporting the image creation and promotion of the area. This step can also be regarded as the long-term effect initiated by the new infrastructure project (Hospers, 2004: 278-279).

The Øresund strait challenged the movement of people for many centuries, which is why comparable attitudes towards the link establishment can be found in the Danish and Swedish mindsets. However, social integration is still a process to be fully accomplished. The reason for it is the different mentality and language barriers. The Swedish citizens tend to complete more activities on the Danish side than the Danes. As for the discrepancies between the communities, the following factors can be considered. Firstly, social and geographical groups are distinctive on both sides, besides the groups with a low level of education. Thus, the Swedes are engrossed in working and studying on the other side of the strait because of the more opportunities than in the Malmö-Lund region. As for the additional aims to cross the border for the communities, holidays and purchases endure significantly before and after the link establishment for the Swedes. As for the Danes, the principal motives to cross the border are the holiday and leisure trips, and they even travel on this basis in a more significant proportion than Swedes. The great proportion of the in-transit passengers crossing the strait going or coming from Germany, Norway or Copenhagen Airport can also be noted (Westlund, 2002: 13).

The creation of the Øresund identity was another crucial goal in the political agendas of both states after the establishment of the fixed link. The populations of both states are culturally similar, and the languages spoken are also comparable. However, the growth of the English language knowledge influenced the willingness to study the language of the bordering state. Nevertheless, the Øresund identity was developed through the cultural activities on both sides. According to the data collected in 2009, the sense of it was more notable on the Swedish side, where 80 per cent of people affirmed the attachment to the cross-border region feelings. At the same time, only 44 per cent of the Danes recognized themselves with it (Oxford Research, 2009). Besides, there is a substantial and growing share of the people willing to obtain the Øresund identity by presenting an interest in the cultural events along the borders and following the bilingual TV series “The Bridge”. These aspects determine the necessity for further initiatives to social and cultural integration, including the people-to-people connections, by using the opportunities provided by the link (Nauwelaers et al., 2013: 25). Coming from this, the economic and cultural-historical factors affect the interaction in the long-term perspective.

At the same time, tourism is another essential sentiment impacted beneficially by the bridge in the same perspective. The bridge performs a driver for stimulating the travelling across the strait from one state to another. In other words, it directly initiated tourism more accessible and conquered the competition between the transportation modes used for it. The spatial and infrastructure modernization was another consequence of the bridge impacting the tourism flows (Westlund, 2002: 11).

Tourism and travelling for leisure activities can be regarded as the rounds of a once-only or exceptional appearance, where mainly the bridge itself is also a destination. Nevertheless, the hotel businesses, entertainment facilities, natural parks and historical destinations have been developing since the bridge opening. Therefore, tourism is another essential component for the economic profitability of both sides (Westlund, 2002: 9). That is why the Øresund Committee concentrated on the regional tourism industry by regenerating the projects related directly to leisure and improved the cultural and entertainment quarters. The airport is another essential driver for the tourists' flow. According to the data presented by the Swedish Agency for Economic and Regional Growth, there were 3.6 million overnight stays from international tourists in 2000 in Copenhagen, when the bridge was opened. The numbers grew significantly during the last two decades, and the number of such states achieved 7 million in 2017. As for Malmö, there were 820.000 overnight stays in 2017, which is also two times higher than at the beginning of the century. As for the examples of attracting visitors, the Wonderful Copenhagen activities branding uses the slogan "one trip - two countries" to better promote the area. The direct impact of the bridge can be noted in this case (Savage, 2018).

Last but not least, the bridge has impacted the environmental aspects and concerns. Modernizing the technologies and transferring the transport models from the ferry to the railway are the consequences examples. Therefore, the fixed link is also a prosperous model of the ecologically friendly and green-transport connection (Hospers, 2006: 279). Environmental management is a crucial part of operating the bridge, mainly focusing on protecting the Baltic Sea waters. However, there are no considerable negative impacts on the waters by the bridge. On the contrary, the 51 abutments of the bridge unexpectedly changed the environment. They became artificial reefs covered with seaweed and mollusks, becoming the food and home for the sea animals. Moreover, the environmental organizations and supporters have not criticized the project since its establishment. The experts even concluded the rise of animal activities in the strait waters. The Øresundsbro Consortium is the managing body for the environmental effects. Ecological concerns and environmental protection are one of the main priorities 20 years later (Gray, 2009).

Concluding, the fixed link between Sweden and Denmark resulted in short-term and long-term impacts on the region and the Baltic Sea Region. The developed economic prosperity of both states, improved market, innovation initiatives, flows of commuter workers and tourists. The joint political strategies are based on the consequences of the bridge functioning for the last two decades, focusing on the interaction costs and factors affecting it. Populations of both states were also beneficially affected by the opportunities presented by the fixed link. The development of the shared identity and socio-economic integration positively impacted the communities' attitudes towards the other sides of the strait. The project resulted in more beneficial outcomes in various sectors. Even though there are still barriers present, such as cultural or linguistic ones, the authorities and actors find ways to eliminate them by promoting the regional image and providing the basis for better cultural integration. However, the market possibilities are the main drivers for the people to cross the bridge, excluding the purchasing of goods and tourism activities. Nevertheless, the fixed link affected the overall prosperity and regional development of the whole macro-region by effectively performing the cross-border activities and getting the profits from it, making it a compatible region internationally.

3. Fehmarn Belt Fixed Link Project

Transport corridors in Europe are crucial for connectivity development across the regions. The Scandinavian-Mediterranean Corridor is one of the most significant transport networks of the nine TEN-T corridors. The corridor includes the Øresund Bridge, which played an essential role in its accessibility improvement and greater integration of the Northern Europe and Baltic Sea Region. However, the Fehmarn Belt Fixed Link is projected to perform an even more significant role in the future as the transport mode and connection linking Denmark and Germany. Thus, both projects would establish the vital link from Sweden to Denmark to Germany and Central Europe.

The authorities of Denmark and Germany concluded to establish the cross-border connection between the states in the area of the Fehmarn Belt and across the strategically important strait located in the western part of the Baltic Sea in 2007. However, the project has experienced numerous barriers and criticism, and the link is still in its construction phase. Nevertheless, the Fehmarn Belt Fixed Link is expected to bring opportunities and advantages for the Baltic Sea Region and the whole European Union in terms of internal market development and common aims. However, there are still dilemmas among the politicians and experts on the future weaknesses and barriers of the project, and the expected outcomes are still under question. That

is why the conduction of the SWOT analysis will indicate the impacts and effects on each component of the connectivity by the fixed link on the local, national and international levels. The areas addressed include economic, transportation, regional and spatial development, cross-border integration, political, sociological, cultural and demographic factors.

3.1 Fehmarn Belt Strait Area Characteristics and Connectivity Preconditions

The Fehmarn Belt strait is positioned in the western part of the Baltic Sea between the Fehmarn Island in Germany and Lolland Island in Denmark. The strait connects the Bay of Kiel and the Bay of Mecklenburg. The waters are part of the transition area between the central Baltic Sea and the North Sea. The stratification in the Fehmarn Belt is linked to the water exchange between these seas, as well. The flow of the Baltic Sea waters continues up to Kattegat through the Great Belt and Øresund (Terra et Aqua, 2019: 9).

There are ferry connections placed in the cross-border area linking the harbours Puttgarden and Rødby on the islands. Thus, the strait is set in the basin of Germany and Denmark. It covers an 18-kilometre wide area, and the overall depths of the strait is approximately 20-30 metres. The maximum depth point is 30 metres, and the length of the strait is 25 kilometres. The wind and weather conditions determine the currents in the Fehmarn Belt, but usually, they are relatively weak. The strait performs the crucial functions of transporting goods and passengers by ferries between Scandinavia and Central Europe in the Baltic Sea Region. Thus, the strait is a strategically important shipping link between the Baltic Sea through the Great Belt and into the Atlantic Ocean (Femern A/S, 2020).

As for the area's geological features, the landscape was formed by the ice masses during the last Ice Age, about 10.000 Before Present, when the water layers were differing and unstable. Therefore, the Fehmarn Belt is a highly changeable sedimentary environment due to the deteriorating water flows preconditions. The uppermost subsoils embrace the frozen meltwater sand capped with clay and topped by the marine sand and peat. Such circumstances are necessary to consider in terms of the construction of the infrastructure in the area. Moreover, there are glacial shelves under these layers, chalk and Paleogene clay deeper (Terra et Aqua, 2019: 9).

In geographical indications, the Fehmarn Belt region is positioned from Hamburg over Schleswig-Holstein and the Mecklenburg-Vorpommern, Lolland, Falster islands and Zealand to Skåne in southern Sweden. Thus, Hamburg and Copenhagen are the nearest metropolitan regions and cities from the Fehmarn Belt area. Moreover, the strait adjusts the division between

the connections set between these two significant cities. The Fehmarn Belt Region comprises 9.3 million people, where 2.5 million are located in Denmark and 5.6 on the side of Germany. Nevertheless, the situation on islands is different. Lolland and Fehmarn are not sparsely populated and advanced areas. There are 12.875 people living on the Fehmarn and 11 798 on the Lolland, according to the national statistics conducted on the 1st of January, 2021 (Statistikamt Nord, 2021) (Statistics Denmark, 2021). The Zealand region archipelago of islands was connected to the mainland in 1997 when the Great Belt connection was established as a bridge and tunnel between Zealand and the Scandinavian Peninsula. The Øresund Bridge opened in 2000 was the following essential fixed link constructed in the Baltic Sea Region. The prosperity of the consequences of the functioning of both of these transportation networks leads to the decision to establish a new one in the cross-border area of Denmark and Germany. The reason for it is that the projects mentioned above significantly affected regional development and connectivity, mainly affecting traffic accessibility and volumes. Furthermore, the modernization of the existing transport corridors and the new ones according to the trends is another notion affected by the already existing connections. The new one would also impact these processes. The traffic volumes became more substantial after the opening of these links, and it inaugurated the new regional growth regimes, which were required to be sustained. On the contrary, the traffic flows after the Øresund Bridge opening took more time to increase because there were no yet developed transport links established upon it. Mainly, the benefits and modernizations following the project opening can be regarded as the learning process and examples of the new opportunities for the economies and metropolitan areas. Thus, the transport map is projected to change after the Fehmarn Belt Fixed Link construction potentially. Moreover, the consequences and effects are planned to differ from the existing projects because there are no significant urban centres in its proximity. The Fehmarn Belt strait is a physical barrier to traffic. That is why it is moderately weaker than the domestic regional traffics in Northern Germany and Southern Denmark. Moreover, the cross-border infrastructure in the region still consists of ferry services. Nevertheless, there are also ferry connections through the Øresund, but the bridge performs the main functions of the cross-border link (Lundhus and Matthiessen, 2017: 4).

There is a long history of cooperation initiatives across the Fehmarn Belt strait. The foremost motive for that is Hamburg metropolitan region and developing Øresund region focus on the common goals and initiatives. For instance, the government of Denmark assumed the strategy for creating the transport connection between Hamburg and Copenhagen already in 1863. The

plans were introduced by the German engineer Gustav Kröhnke. Therefore, the interest in establishing connection has been present for several centuries (Björn, 2019).

As the cross-border cooperation in the region, it already exists on both local and national levels. The Fehmarn Belt Committee is one of the leading players formed by the regional municipalities and authorities of the Fehmarn Belt area of Zealand and the County of East Holstein. The Committee was founded in January 2009 and consisted of 24 members. There are twelve members from Germany and twelve members from Denmark equally (Scandria Corridor, 2021). The Committee is concentrated on the integration process across the border and defends the concerns of the region. Political cooperation indicates common goals and seeks sustainable regional development with a focus on the green economy. The aims include expanding the labour market, economic prosperity and changing the living circumstances for the communities. Another essential concern is the modernization of the axis from Hamburg to the Øresund Region. Moreover, the Committee plays a crucial role in planning and organizing the Fehmarn Belt Fixed Link. The cross-border region is also a component of the STRING-corridor development from Hamburg to Øresund Region. Thus, political cooperation is focused on managing the development of the green model transport corridor (Nostra, 2020).

As for the human activities and demographic features, several aspects can be discussed. According to archaeological examination, the area was the human migration corridor over the last 6.000 years. The analyses concluded that the ethical dimension consisted of people coming from central Europe and Scandinavia. Thus, it might be assumed that the Fehmarn Belt strait was used as a transport corridor for thousands of years already. Furthermore, it is actively used nowadays, due to the reason that it is one of the most extensive trafficked waters globally. Mainly due to it being the gateway to the Baltic Sea (Terra Et Aqua, 2019: 10).

As for the more detailed commuter's data, the region's labour market measures can be regarded as mobile. The reason for it is the metropolitan cities located in the encompassing region, which interests the commuters. For instance, around 105.000 people commute to Hamburg from the areas located in the state's north. Moreover, around 40 per cent of them are coming from the Schleswig-Holstein area. As for the Danish side, Copenhagen is a destination for around 66.000 commuters coming from bordering and rural areas. It is essential to mention that 74 per cent of them are originating from the Zealand Region. Generally speaking, the two states' markets are different. The commuting in the states deviates by its flow directions. Moreover, similarly to the cross-border integration of Sweden and Denmark, the second one obtains more potential for employment growth and business establishment. Nevertheless, a relatively small number of commuters are coming from one side of the Fehmarn strait to another. The reasons for it are

the physical barriers, working conditions, qualifications' variations and even mentality (Lundhus and Matthiessen, 2017: 10-11).

The unemployment rate in the region is regarded as one of the lowest one in the territory of two states. Still, it varies geographically and changes based on the various economic conditions, such as the 2008 financial crisis. However, the rates became slightly better on the Danish side during the last years, while the unemployment is increasing in Hamburg and Schleswig-Holstein (Femern A/S, 2013: 30). This rate in the area was 6.3 per cent, according to the data for March 2021 (Federal Employment Agency, 2021). As for the Danish region of Zealand, the same rate was 4.3 per cent in 2020 (Statista Research Department, 2021).

As for the demographic trends, a prominent example regarding mortality rates can be introduced. The Lolland-Falster island area currently achieves the highest mortality rates and the lowest life expectancy on the territory of Denmark. There is a tendency for the rural areas to undergo depopulation trends when the younger segments of the population migrate to the urban areas. In most cases, the motive is to find a job, education or getting more suitable housing. Urbanization is an ongoing process for Denmark, and it results in a significant proportion of the population settling in the cities. Thus, the elderly segments of the population tend to stay in rural areas, such as Lolland-Falster. Migration has a positive impact not only on economics but on socio-demographic determinants, as well. That is why the regional development of the rural areas and its connectivity improvement with the urban ones is essential to eliminate such negative demographic rates. More precisely, the population in the Lolland-Falster has lowered from 130.000 in 1968 to 100.000 in 2018. Moreover, the life expectancy in Denmark, in general, is 80.9 years, while in this rural area, it is 79.1 years (Holmager et al., 2020).

In conclusion, creating the new fixed link in the Fehmarn Belt region would affect the connectivity on the local, national and macro-regional levels. Therefore, the new infrastructure project is needed to strengthen cooperation between Denmark and Germany and obtain opportunities for gaining benefits and barriers reduction. An example of the crucial issues in the region is depopulation in Lolland-Falster. The Fehmarn Belt region is an important sector to focus on due to its proximity to the significant metropolitan areas in the Baltic Sea Region. The regional development and cross-border integration, in this case, would result in multiple long-term effects for the area and its populations. The cross-border transport link across the strait has existed for many centuries already by the ferry's transportation mode. That is why its modernization in the transport infrastructure construction would be effective and play a vital role for the STRING-Corridor and Scandinavian-Mediterranean corridor.

3.2 Fehmarn Belt Fixed Link Project Timeline: Planning and Construction

The European Round Table of Industrials designated 14 lacking transport connections in the continent in the 1980s. Three of the missing links were allocated in the Zealand region in Denmark, where two of them were the cross-border ones. The Great Belt Link and the Øresund Link were set and are successfully operating, while the third one in the Fehmarn Belt region is still in its construction phase. The motive to establish the link was associated with regional development, and the notion that the ferries connect the systems while the fixed links unite them was acknowledged. The missing link is a part of the fundamental European Union strategies and initiatives, such as the Trans European Transport Network and Interreg. Moreover, the fixed link is proposed to be a part of the new North-European corridor in the future.

The first steps in acknowledging establishing the fixed link between the Federal Republic of Germany and the Kingdom of Denmark proceeded from the interim agreement between the governments on the 29th of June, 2007 (Isherwood, 2009). A year later, Denmark and Germany signed the State Treaty on the Fehmarn Belt Fixed Link construction on the 3rd of September, 2008. The Treaty was initially signed by the ministers of transportation of both states Carina Christensen and Wolfgang Tiefensee, during the official meeting in Copenhagen. However, it took time for the Danish government to approve the ratification. As for the State Treaty, it is an indispensable basis for the project. It contains detailed obligations for building and decision-making processes. For example, Denmark is administering the project's construction phase according to Article 3 of the Treaty. These aspects include the planning, investigation, tendering, analysing the plans, assuming the approvals and agreements, and building, monitoring and repairing. Article 4 designates the obligation for the motorway of the connection on the German side to be regarded as a federal one. Thus, there are also mainly responsible actors for the application of these articles. For example, the State Agency for Road Construction and Transportation Schleswig-Holstein is the regulatory and performing body for constructing the motorway segment connecting to the fixed link on the German side. However, the construction and maintenance would be done by the Danish authorities. Another example is Article 6, which designates the obligations for the Danish company Femern A/S. The company must engage in planning, contracts, approvals, construction, investing, and operating the link (Femern A/S, 2013: 24-25). The Femern A/S is eventually a subsidiary of the Sund og Bælt Holding A/S, which maintained the essential connectivity projects in Denmark, such as Storebælt Bridge and Øresund Bridge (Witz et al., 2021: 382).

The project's legal basis was also framed in the National Transport Route Plan of 2003 and Law on the Expansion of Federal Rail Routes in terms of the modernization of the rail connections across the Hamburg - Øresund region. Therefore, the project is regarded as an international one according to the classification approved in November 2010. Moreover, the project is designated as a central point in the TEN-T subsection on the Helsinki - Valletta core network, a transport corridor in the European Union. Generally speaking, the cross-border project is a strategic part of the national and regional plans and intergovernmental agreements. The State Treaty, which is an agreement, was adopted on 14th January 2010 (Femern A/S, 2013: 26-28).

The project at first was planned to be a 19 kilometres long connection beginning in the Rødby in Denmark, leading to Puttgarden on the island of Fehmarn. The construction plans assumed that the building would start in 2009, but due to particular challenges and barriers, it did not occur as planned. During that time, the project was expected to be a combined road and rail bridge, which would be the longest one in Europe (Isherwood, 2009).

Thus, the parliaments of the states agreed on the bridge-building scheme at first in 2009. The first proposals concluded that the bridge would constitute cable-stayed spans and be subcontracted by the four pillars. Such construction would allow the ships to pass under the bridge (Connolly, 2009). After the workability investigations, the Danish decision-makers and promoters came to a settlement to build the immersed underwater tunnel instead of a bridge in December 2010. Thus, the following State Treaty provisions recognized in January 2010 were applied for the final plan approval procedure. Firstly, a fixed link was planned to be established between Puttgarden and Rødbyhavn in a connected motorway and railway. The link was proposed to be developed as a four-lane road and twin-tracked railway. The planners also suggested implementing the comparable to the Øresund fixed link technical tools and parameters to allow better accessibility. The provisions also designated the legislation aspects and the responsibilities of the agreement's parties, where Denmark is in charge of the preparation, financing, installation and maintenance, and Germany only establishes necessary infrastructure on its territory. Thus, it is also presumed that the link would be placed according to the Danish technical criteria and regulations. However, the plan was still pending approval under the national laws. Moreover, the project provisions had to comply with the essential international conventions and strategies, such as Environmental Impact Assessment, Natura 2000 and Water Framework Directive and the Marine Strategy Framework Directive. Thus, both states' ministries were obliged to provide approval under the national laws at the time (Femern A/S, 2013: 28).

In this case, the following requirements should have been considered, as well, because the project must be built in harmony with the natural areas. The improvement of the environmental consequences during the construction should be acknowledged. The making of the new landscapes is a potential opportunity to centre on as well. Moreover, the fixed link should not affect the navigation ventures for the crucial international navigation routes uniting the Baltic and the North Sea. However, mainly the link must not negatively affect the water environment through the strait area (Terra Et Aqua, 2019: 9).

Generally speaking, the primary reasons for the project changes were the possible construction process risks and the uncertainties in terms of financing and costs. Moreover, the immersed tunnel would be more comprehensive in environmental, safety and technical terms. At first, the project was planned to be a 17.6 kilometres tunnel up to 40 metres deep. According to the experts, the costs of it were expected to be around EUR 5.2 billion, while the Rambøll tunnel plan constituted EUR 5.5 billion. Thus, the tunnel version of the fixed link was chosen as the preferred form ratified by the Danish government by the voting process of the parties in January 2011. However, the approval of the plan took longer than was expected originally in both states. The project needed to be declared in the paragraph of a Construction Act in Denmark's legislation. At the same time, Germany announced the postponement of the railway link development on its side until after 2015 (Lundhus and Matthiessen, 2017: 5).

Such a decision was proclaimed due to the decision of the German Traffic Minister Peter Ramsauer, who claimed the need to lower the government budget spendings on infrastructure development by 25 per cent. Nevertheless, this decision is directly connected to the aftermath of the 2008 economic crisis when the state had to restore the economy. The postponement of the approval, in this case, affected the planning of the fixed link process (Isherwood, 2011). The work on the conceptual designs took place from 2011 to 2013, when the immersed tunnel was analysed and planned to focus on the environmental aspects and alternative technical solutions (Lundhus and Matthiessen, 2017: 4-5). The following steps concerning the project planning took place in October 2013. That month, the Femern A/S and the Danish authorities maintaining the project applied to the German government for the approval of the tunnel construction based on compliance with the environmental conventions of the European Union. Furthermore, the options considered during the planning processes also analysed the traffic features and the possible impacts on the existing infrastructure, local and regional strategies, nodes specifics and transportation modes (Femern A/S, 2013: 4).

The application involved the regulatory approval of the German connection segment referred to the Schleswig-Holstein Road Directorate in Kiel. Nevertheless, the application was rejected

two years later because of the ratification of the new legislation. Three thousand one hundred objections and criticism from the public authorities, communities and non-governmental organizations impacted the rejection. However, the new guidelines and investigations on the environmental concerns of the project and modernized requirements were done on its basis. The application was later developed to consider the other aspects for further negotiations (Femern A/S, 2020). Generally speaking, Denmark's authorization process went quicker than the German one, where multiple obstacles emerged. Two negotiation rounds took place in 2014-2015 and 2016-2017, and they covered the notion of complaints and criticism, which resulted in over fifteen thousand by that time (Witz et al., 2021: 382).

The following essential steps comprised the application for the European Union funding and grant of the EUR 1.7 billion done by the Danish Ministry of Transport in February 2015 to finance the construction phase. It is crucial to mention that the Swedish Minister of Infrastructure, Anna Johansson, participated in the applications for state aid, mainly due to the strategic connectivity interests for the transport networks in Sweden. Another important figure taking part in the application letters was the German Transport Minister Alexander Dobrindt, who actively supported the project. Furthermore, the additional support and comments in favour of the fixed link were given by the authorities of Schleswig-Holstein and multiple public actors from both states. Thus, the European Commission approved the grant comprising 15 per cent of the tunnel construction costs and connecting elements to the railway links in Denmark. Furthermore, the public financing model of the project under the state aid regulations was confirmed by the Commission in July 2015. However, one of the barriers to this decision was the appeal against it conducted by the ferry services providers Scandlines and Stena Line in 2018. As a result of this claim, the Court of Justice partially annulled the 2015 decision of the Commission. However, the court later accepted the Commission's judgment concerning the financing granted to Femern Landanlæg for the hinterland connections (Case T-630/15, 2018) (Case T-631/15, 2018). The European Commission carried the formal examination to determine the propositions recognized by Denmark to fixed link before the final decision approval after the Court of Justice decisions (European Commission, 2020).

In June 2016, the Femern A/S and LBV Lübeck repeatedly applied to the German government to get approval for the amended construction proposals and plans by applying new regulations. Moreover, the investigation was administered by both state experts and researchers earlier that year to indicate the environmental aspects, geotechnology, safety matters and contingency. Thus, in the result of the research programme, alternative options and technical measures were considered for the construction means (Femern A/S, 2016). The process of signing and

ratifying the approval on establishing the Fehmarn Belt Fixed Link by the German government was completed in 2018. The Ministry of Transport of Schleswig-Holstein received approval on the 28th of December, 2018 (Femern A/S, 2018). The accepted plan compounded the new specifications for the building process regarding the ecological concerns on the German side of the cross-border connection. Thus, the European Union determined the project as the priority one within the TEN-T strategy framework after both of the states came to an agreement. The only barriers to the project are mainly the activists and the local communities against the link. After these adjustments, the ferry services in the Fehmarn strait and its port facilities owned by the Danish authorities and Deutsche Bahn were placed on the market to get supplementary capital. Femern A/S received the final construction plan approval from the Federal Administrative Court on the 6th of February, 2019 (Femern A/S, 2019). The preparatory works started on the ground, which examined the construction of the factory for the production of the tunnel elements. The government of Denmark demanded the establishment of it in Rødbyhavn on the Lolland Island. The tunnel factory will deliver 89 tunnel elements according to the plan. The harbour induction in the area was arranged to transfer the materials for the factory construction by harbour and shipping. The facilities and infrastructures for the workers are established in the area close to the factory. For this part of the project, the subsidies granted by the state aid were applied. Moreover, the production of the elements and the start of the construction will also be covered by these sources. The construction works for the factory establishment started in autumn of 2019 (Femern A/S, 2019).

The European Commission adopted the new public financing model for the cross-border connection across the Fehmarn construction. Vice-President Margrethe Vestager, representing the competition policy amendments, stated that the link would derive the cross-border integration of the crucial region and two developing countries. Moreover, it is expected to impact the internal market of the European Union beneficially, and that is why the financing model was approved, as well. Vice-President also claims that the project would impact the distortion of the unfair competition on the regional level (European Commission, 2020).

The Femern A/S started the process of concluding the contracts with the Femern Link Contractors in April 2020. The appointment of the fundamental objectives and terms in it was one of the crucial tasks. The contracts came into force on the 1st of January, 2021. The building of the factory, portals and ramps commenced on the Danish part of the connection. The works on the land in Rødbyhavn and Puttgarden are in process, where the central element of the construction is the harbour on Lolland. The Dutch consortium and Fehmarn Belt Contractors are in custody of this part of the construction phase, which is expected to be finished by the

end of 2021 (Femern A/S, 2021). According to the Ministry of Transport in Denmark, the tunnel's construction is expected to end in mid-2029. Nevertheless, the process was affected by the COVID-19 pandemic, which caused the construction works to be postponed for six months in 2020 (Euronews, 2020). The six German stakeholders' associations, however, appealed against the final approval to the Federal Courts. However, the court rejected the appeals and supported the tunnel construction at the end of 2020. The constructions on the German side are planned to start in 2022, but the terms remain uncertain due to the epidemiological crisis worldwide (Witz et al., 2021: 378).

One of the latest essential events was the Fehmarn Belt Days progressive program for stakeholders in May 2021. The experts and stakeholders gathered online and partly on-site to discuss the concepts and central challenges for cross-border integration. The infrastructure and transport networks were the fundamental aspects addressed during the event (Fehmarnbelt Days, 2021).

The Fehmarn Belt Fixed Link will be 18 kilometres immersed tunnel and a section of the Nordic Triangle, including the Great Belt and Øresund Bridge. The connection would increase the accessibility between Scandinavia and Central Europe. However, agreeing on Denmark and Germany cooperation and completing the construction plans approval took almost ten years. Not only legislation and administrative terms became the barriers, but also the criticism and appeals against the project by the stakeholders, ferry companies, politicians and local communities. Nevertheless, the link is still a lacking segment of the Scan-Med TEN-T core corridor, which would affect around 7.7 million people in its catchment area after its establishment. The construction phase on the German side starts in 2021/2022 and will take 5.5 years, while it commenced in Denmark in 2019 (European Court of Auditors, 2020).

3.3 Fehmarn Belt Fixed Link Project and the Tunnel Characteristics

The construction objectives are designated in the contracts between the participants and the Femern A/S. The performance of the objectives is based on several years of preparation and investigating the systems and approaches for building. Thus, the three principal aims during the building phase are declared in the contracts. The first one is related to the management processes over the objectives and terms of the project. The second one covers the monitoring tasks of the building, complying with the provisions outlined by both states' approvals. Lastly, reporting is another task covering the data gathering and communication on the stages, changes and processes. The project handlers apply the Key Performance Indicators to follow such

objectives as schedule and deadlines, budget limits, financial claims treatment, labour conditions, environmental aspects and working circumstances. Thus, the reporting process covers the documentary evidence on compliance with the requirements and objectives every month.

As for the state-owned limited company Femern A/S, it is crucial to mention that it operates under civil law statutes. The company along the A/S Femern Landanlæg and Sund & Bælt Holding A/S are sustained by the Ministry of Transport. Femern A/S complies with the Planning and Construction Act commissioned by the Ministry. Moreover, the Femern A/S has signed an agreement with the Øresundsbro Consortium A/S regarding budgetary control. Nevertheless, the construction and research conduction is financed by European Union funding, due to the project being a priority one within the TEN-T strategy. The organization of the processes within the project maintenance is still improving. The civil contracts also designate the imperative recruitment and employment perspectives. Femern A/S focused on the attraction of skilled employees and candidates from various states. It is essential due to the comprehensive project implementation and development. The employees currently engaging in the construction and planning phases are nationals of Denmark, Germany, Sweden, Italy and Great Britain. Thus, one of the focuses is maintaining the working environment with attention to cultural and mentality diversity (Femern A/S, 2021: 14-16).

The connection is projected to be 18 kilometres long, and it is one of the most vital infrastructures and transport projects of this model in the world. The total budget for constructing the electrified double-track railway and a four-lane motorway is expected to be EUR 7.1 billion, considering EUR 2 billion for the additionally kept spendings. In general, the European Commission earmarked EUR 789 million for the design and building (Femern A/S, 2021).

According to the researchers' calculations, a loss of EUR 56 million before tax and EUR 44 million after it is foreseen. The fair value share, in this case, compounds EUR 56 million. Thus, portions of the budget also aim to cover the project's conception, compensations and court procedures covering the appeals in 2018. Another part of the resting capital apart from the construction is planned to be allocated on the salaries, operating, rent, and IT costs. The capital is principally invested by the Femern A/S and European Commission's TEN-T programme. Moreover, the Commission prolonged the state aid financing from 2021 to 2023 (Femern A/S, 2021). According to the 2016 analysis by the auditor of the project, the loans will be fully repaid in 36 years (Femern A/S, 2016: 12-13).

The fixed link is expected to allow passenger and freight traffic in vehicles and trains to cross the Fehmarn strait in approximately ten minutes. Currently, the operating ferry service takes around one hour to finish the crossing. The tunnel would eliminate the significant gap in the Scandinavian-Mediterranean corridor, and after its establishment, the distance between Hamburg and Scandinavia will be reduced by 160 kilometres (Terra Et Aqua, 2019: 7). On the contrary to the Øresund Bridge, the link would be placed in a sparsely populated area of the region between the islands and bays. One of the central aims of the link founding is developing the connectivity within the Baltic Sea Region and rural areas in proximity to the connection. The cargo and passenger traffic in the macro-region are mostly long-distance ones, and that is why the opportunity to reduce the time of crossing the strait for at least 35 minutes is crucial. As for the railway traffic, the train journey from Hamburg to Copenhagen currently takes around four and a half hours with a stop for a ferry crossing. After the opening of the link, the time is planned to be reduced to three hours. The covering of the costs and financing of the project after its opening will be the same as applied in the model of the Øresund project. Thus, the imposition of charges on the tunnel crossing and tolls for road use will be done (TENTacle, 2018: 2).

As for the tunnel characteristics, the 79 tunnel elements and ten unique tunnel elements with a deeper floor for the supplies and tools for the tunnel operation are planned to be built. Each of the individual elements will be 217 metres long, 42 metres wide, and ten metres high. The estimated weight of one element is 73.000 tonnes. The construction process commenced from building the tunnel factory for the elements producing, measuring around one million metres quadrats at the Rødbyhavn. The following steps consider the trench dug for the tunnel in the seabed, which will compound around 500.000 metres quadrats, and the depth will be around 10.3 metres, and the width will be 16 metres. Generally, around 15 million metres cubed would be dredged. Nevertheless, these materials would be implemented to produce around 300 hectares of the new landscape and recreational zones on the Lolland and partly on the Fehmarn Island. The areas will also broaden the 500 metres into the tunnel. The other materials transported for the construction phase would include 80.000 tons of cement, gravel, sand, and iron transportation per week (Femern A/S, 2021).

The landscapes formed would play a role in the connection of tunnel portals and coastline. According to the objectives, it will be established in a non-harmful way for the existing landscape, and this segment of the construction is regarded as a green transition zone. In addition, the hill will be constructed on the German side. It aims to protect the tunnel from the rising sea levels. The artificial recreation zone and beach lagoons will also be established in

the east of Rødbyhavn, where two small islands are also planned to be constructed. The two openings of the tunnel gateway will also be allocated in the area. The new landscape will positively affect the natural features and biodiversity. The tunnel's construction is planned to make it almost hidden on the landscape, excluding the entrances. Moreover, the immersed tunnel will be built as a straight line from one coast to another. The monitoring station will be placed on the Danish side close to the tunnel gateways (Terra Et Aqua, 2019: 11-13).

The construction phase considers the possible technical challenges, as well. More directly, the intensive shipping traffic on the strait might be affected by the process. Moreover, it might create danger for the ferries and ships. The process of the tunnel elements establishment, however, will be the same as it was done during the construction of the Øresund Fixed Link and tunnel segment of it under the Øresund strait. However, there are differences, and in the case of the connection between Denmark and Sweden, the depth was around 25 metres, while in the case of the Fehmarn, it is up to 40 metres (Lundhus and Matthiessen, 2017: 5). The tunnel elements will be composed so that they can float in the water until the installation. Then, the tugboats will draw the elements into the tunnel and then lower them down and connect. Thus, the tube consisting of these elements will compromise the tunnel. According to the construction plan, the next step is the setting of the technical equipment and tools, including lighting, ventilation, electric and communication and safety systems (Femern A/S, 2020).

Last but not least, the project characteristics and its construction specifics are taken into account with detailed attention to the safety measures, environmental protection and objectives designated in the project plans. Some of the project features are done similarly to the Øresund Fixed Link model, including financial concerns and tunnel elements' establishment.

3.4 Fehmarn Belt Fixed Link Project Estimated Outcomes and Forecasts

Project managers, authorities, and experts regularly renew and analyze the projections and estimated consequences of opening the Fehmarn Belt Fixed Link project. Traffic volumes and flows, regional and spatial development, cross-border cooperation, environmental terms, economic outcomes, labour market and sociological effects are considered for the investigation. Moreover, these elements correspond to the notion of connectivity and integration. Thus, the tunnel opening will affect not only the territories of Denmark and Germany but the whole Baltic Sea Region and Central Europe.

According to research conducted by the University Press of Southern Denmark, there are three outcomes on regional development after the project opening. Firstly, the improved cooperation

between the central urban centres will take place. In this case, Copenhagen and Malmö Lund on one side and Hamburg, Kiel and Rostock on another will achieve better connectivity through the transportation infrastructure advancement. Another outcome considers the modernization of the areas close to the fixed link. The last outcome is the competition perspectives for the other towns rendering the ferry services.

Generally speaking, the metropolitan areas and central cities will be spatially and economically developed. It will mostly apply to Hamburg and other German cities due to the already high growth levels on the Danish side. These cities will become the crossing locations, obtaining better accessibility to the other areas within the region. The fixed link is expected to impact the transport systems of the European Union by connecting the Baltic Sea Region's major centres. The bordering areas will be integrated and regarded as the critical border regions with developing commuting zones and crossing volumes (Lundhus and Matthiessen, 2017: 8-9).

Additionally, to the physical accessibility, the economic integration of the regional market is projected. In this case, Schleswig-Holstein and Hamburg have an opportunity to be better integrated with the Øresund regional market (Lundhus and Matthiessen, 2017: 10). Moreover, the new project will affect the comprehensible labour market because the businesses and companies will gain access to the new and larger labour base. These conditions bring the possibility of more accessible access to foreign markets, as well (Ramoll, 2018: 12). Thus, according to the Danish Ministry of Transport, the labour supply will benefit from around BDKK 1 over the first fifty years of the link function (Odgaard and Kolstrup, 2015). Such mobility of the labour forces across the border will result in significant social cohesion in terms of cross-border integration. Thus, the more diverse labour market is crucial for the new cross-border areas (Lundhus and Matthiessen, 2017: 11-12).

Generally speaking, the economic state varies on both sides of the strait. These aspects consider the development of the major cities and decreasing growth in Mecklenburg-Western Pomerania and regions Zealand and Skåne, The Fehmarn Belt Fixed Link and its impact on the cross-border integration will initially change this disbalance by providing the development opportunity for marginalized areas. The composition of the population is regarded as one of the potential challenges in the future. It tends to experience negative demographic trends, such as outmigration, an ageing population, and high mortality rates. According to the demographic projections, these negative features will only increase in both states. Such a considerable proportion of the citizens older than 65 will impact the labour market competitiveness. The modernization of the accessibility notions is beneficial for the higher migration flows, which

are crucial in such demographic conditions. The link will attract foreign and local communities by trade, jobs, tourism, and cultural means (Femern A/S, 2013: 28).

The Danish Ministry of Transport additionally analyzed the project impact on the environment and climate. A crucial aspect is that the ferry operation is assumed to decrease, which will reduce air and water pollution and CO₂ emissions. These outcomes derive from the change of the traffic flows and shortening of the rail freight routes by 160 kilometres. Furthermore, less energy will be used by cars and trains, when on the contrary ferries require more of it for shorter crossings. However, the increased connection crossings and passenger flows will result in more CO₂ emissions and climate impact, but not on that considerable scale (Odgaard and Kolstrup, 2015). Thus, the Fehmarn Belt Fixed Link is regarded as a sustainable project because travelling by trains, for instance, would be frequent, long-distance and environmentally non-harmful. Furthermore, another modal shift apart from the transition from the ferry to railway transportation is expected to be less travelling by air and more by passenger trains. According to the calculations, such a shift will take place after 2030. Thus, the fixed link will eventually support the European Union goals on reducing greenhouse gas emissions until 2050 (Intraplan Consult GmbH and BVU Beratergruppe, 2016). Another essential projective for the environment is that comparable to the fixed link elements between Sweden and Denmark - the immersed tunnel will create opportunities for flora and fauna under the water.

Last but not least, the tourism perspectives are also an essential topic for the analysis of prognostications. The link will impact the creation of new tourism opportunities. The reason is that the preeminent tourism destinations are located in the major cities and partly onward the coastline of the Schleswig Holstein. Therefore, the setting of the fixed link is assumed to enhance the tourist flows and modernization of the industry in each area. An example of it is the East Holstein area, which will experience the more significant tourist flows because the project would provide possibilities for better accessibility to it. An exciting assumption to mention is that according to the surveys conducted by the Femern A/S in 2013, the construction square of the immersed tunnel will be a popular tourist destination. Moreover, the same survey shows that the communities on both sides consider the opposite coast an appealing destination for tourism (Femern A/S, 2013: 36).

The Fehmarn Belt Fixed Link project is crucial for the analysis and research due to its considerable outcomes and impacts in the future on various aspects. According to the study's results, regional and spatial development, traffic flows, accessibility, labour markets, environmental segment, and tourism flows will be affected. The link is perceived as an indispensable step for the Baltic Sea Region connectivity enhancement and cross-border

integration of the states in the region. Apart from reducing time travel and shortening the railway routes, the connection is expected to bring both problems and opportunities in socio-economic and cultural terms. Still, the projects designate that the missing link for the Baltic Sea Region will no longer be missing once the link is completed.

4. Connectivity SWOT Analysis: Fehmarn Belt Fixed Link Project

The analysis of strengths, weaknesses, opportunities and threats is an approach that will be applied to analyze the Fehmarn Belt Fixed Link project and its impact on regional connectivity and its indicators. Generally speaking, the connectivity in the scope of the research is also regarded as the set of interconnected nodes on the local, micro and macro-regional and international levels by an infrastructure. It consists of both hard and soft dimensions by representing the physical and information networks. For instance, passenger and freight travel is one of the essential features. In addition, transport, institutional, cultural, educational, energy, people-to-people, trade and ICT networks are crucial elements to consider. The integration of regions, states and cities is another element of the connectivity notion. The factors addressed within this scope include geographical location, population density and trends, environmental endowments, knowledge-based economy, region participation in international trade, cross-border interactions and its opportunities and barriers. Undeveloped transport links might affect all the elements of connectivity and regional integration.

The analysis is based on the internal and external factors and perspectives of the project's future influence on the cross-border area of Denmark and Germany and the macro-region of the Baltic Sea Region. Moreover, the analysis of the connectivity objectives achieved evaluates the positive and opposing viewpoints. According to the experts' scenario, the transport infrastructure project in a cross-border area will have a crucial impact on regional connectivity development. Thus, the experts' conclusions and studies, founders and committees' statements, company presented data, case studies, official reports by the ministries and departments, European Observation Network for Territorial Development and Cohesion, TEN-T and Interreg reports, public and stakeholders' attitudes will be adopted as the sources for the analysis conduction. The approach is aimed to indicate the forecasted level of connectivity accomplished and the general aftermath of the project on the regional development in various segments. The reason for this is that the new transport links tend to increase competitiveness, cooperation and market possibilities. The demanded outcome of the SWOT technique is transforming weakness into strengths and threats into opportunities.

The SWOT analysis was formulated by business policy academics efforts and the Harvard Business School in the 1960s. The approach regards the critical and systematic reflection and review of factors based on the internal and external features for projects, organizations, businesses or individuals (Hill and Westbrook, 1997: 46-52) (Gao and Peng, 2011: 796-808).

4.1 Strengths

The project is one of the essential international ones due to its projected impact on the local, micro and macro-regional and global levels. Thus, the detailed internal analysis of the project is crucial to designate its competitive resources and benefits. The internal analysis considers the investigation of the strengths and weaknesses of the project and its potential impact. In addition, the internal capacities, sources and competencies are the measures acknowledged (Sammut-Bonnici and Galea, 2015).

Firstly, the managerial sources are considered. The sources designate the internal competencies of the infrastructure project concerning planning, construction and maintenance. These actions are crucial for the prosperity of the future project and getting the most of the benefits in a long-term perspective. One of the crucial actors providing these functions is the Femern A/S, formed by the Ministry of Transport of Denmark in April 2009. The state-appointed company is in charge of the preparatory actions, research and planning of the fixed link. The company's role is designated in the "Act on the Planning of the Fixed Link across the Fehmarnbelt with Associated Landworks" ratified by the parliament. The legal basis for the company performance is a crucial strength for the project's objectives proper implementation. Another legal ground is the Construction Act released in April 2015 (Femern A/S, 2020).

The subsequent important step taken by the Femern A/S was conducting the four major civil works contracts for the construction phase in May of 2016. The appropriate and favoured contractors were chosen, which designates the already comprehensive labour force engaging in the project. Another strength, in this case, is that each of the assumptions of the construction works and responsibilities of the contractors is approved. The construction works were supported by other fundamental actors for the managerial sources in March 2019, when the political parties agreed on the commencement of the construction phase. The approving parties are Social Democracy, the Danish People's party, Venstre, Radicale Venstre, the Conservative People's Party, the Socialist People's Party and Liberal Alliance. The political support is an essential gain of the project, which guarantees its position in the international and regional strategies. Moreover, the connectivity objectives consider the project positioned on the

governmental levels for its prosperity and sustainability. Femern A/S provides another practical function on the objectives maintenance, including time, economy, quality, security and organization controls. Furthermore, the company treats the Corporate Social Responsibility policy assigned in the civil works contracts. The terms and clauses on the guarantees for the work ethics, safety and conditions on employment are acknowledged. The model of these policies applied within the project is relatively comprehensive due to the acquiescence mechanisms and monitoring unit actions. The unit is another essential instrument that is applied in both states and complements the steps of the working environment, ecology, and maritime authorities (Femern A/S, 2021: 5-7).

There is a considerable number of actors involved in establishing the project, including stakeholders from various segments. In terms of political organization and governing, the following actors play a crucial role. The Ministry of Transport of Denmark, which was mentioned above, governs the planning, construction and operation of the project along with its owned company Femern A/S. Another Ministry of Housing, Urban and Rural Affairs focuses on the inter-ministerial committee to help stakeholders and address the challenges. The Region Zealand authorities governing the regional development notions and support the tunnel establishment. Lolland Municipality is also focusing on the particular development strategy along with the new fixed link. On the other side of the strait, the Federal Ministry of Transport, Building and Urban Affairs oversee the state treaty implementation. The infrastructure modernization, and land works are performed by the Deutsche Bahn and Landesbetrieb Straßenbau und Verkehr – Lübeck. The Ministry of Economic Affairs and the state of Schleswig-Holstein established alliances and groupings consisting of regional and private actors to gain opportunities. Ostolsten is eventually a figure focused on the opportunities receiving, but with an attention to the tourism aspects. The last actor engaging in the process is the City of Fehmarn, which supports establishing the link on the island. Generally speaking, the notion of diverse and multiple supporting and engaging actors is a profitable aspect of the project, which separates it from the competitors and stimulates connectivity on the institutional level (Femern A/S, 2013: 40).

As for the infrastructure project strengths, they can be regarded as flexible and innovative, as well. The project will secure a faster and shorter connection between Denmark and Germany and Scandinavia and Central Europe, which will be the first link between these geographical areas. The crossing of the tunnel by car will take approximately ten minutes and seven minutes by train. The tunnel itself will be constructed in a way that the weather conditions will not affect it. On the contrary, the weather is a crucial issue for the bridges and ferry services in the

region. Another feature of the tunnel is its space, which grants no heavy traffic (Femern A/S, 2020). The project is one of the most comprehensive considering safety, traffic and environmental aspects. It is aimed to be technologically advanced and thus safer. More precisely, the automatic ventilation will provide quality air and visibility, and emergency exits will be established every one hundred metres. There are also plans to place the emergency lane and monitoring tools. The traffic monitoring system will inform the users and operators of the accidents and other occasions. Fire control systems automatically connected to the fire departments of both sides are another critical element for safety insurance (Femern A/S, 2013: 8).

Another beneficial internal factor is the fixed link impact on the macro and micro-regional segments and transportation systems in the European Union and Baltic Sea Region. Generally speaking, three states and six sub-regions in Sweden, Denmark and Germany are expected to experience the effects of the new connection. Therefore, the scope of the influence of the fixed link is a strength of the project (Femern A/S, 2013: 26). Moreover, the tunnel will be a driver for the growth potential of the micro and macro-region at the level of the dynamic European Union. Thus, the more effective and strengthened trade relations between Denmark, Sweden, Norway, Finland, Germany, and Central and North Europe are projected. Furthermore, it is inherent to acknowledge that the marginalizing region of Schleswig Holstein is assumed to gain new trading opportunities and access to vital neighbouring markets. Another advantage is the greater access of Scandinavia to its south Danish border markets, including the metropolitan area of Copenhagen, which is also a crucial element of regional connectivity. In other words, connectivity considers the better integration of the trade activities and improved positions on the internal market of the European Union. The reason is that the internal market is itself a connecting concept based on the freedoms of movement of goods, people, services and capital. Furthermore, the link establishment will impact the innovative region emergence, according to the Femern A/S. The Fehmarn Belt Fixed Link, in this case, is regarded as the backbone of the transport in the forthcoming new European region by providing preconditions for the further regional and European Union spatial development. Mainly, the project is aimed to produce new probabilities for the multiple branches of economy, politics, trade relations, business networks and people-to-people connections and trends. Nevertheless, the majority of the partnerships is expected on the cross-border level for Helsingborg and Hamburg. The knowledge exchange and interaction between more than nine million people will also impact the Baltic Sea Region connectivity in scientific research (Femern A/S, 2020). According to the investigation of the University Press of Southern Denmark, the project will have two beneficial impacts on the

connectivity, including improvement of the areas around the fixed link and modernized cooperation between essential urban centres, such as Hamburg, Kiel, Rostock, Copenhagen and Malmö. Thus, the connectivity on a larger scale will be enhanced through the spatial and economic development of the region and its urban and rural areas (Lundhus and Matthiessen, 2017: 8-9). The economic development driven by the tunnel considers the market integration and trade growth in the Baltic Sea Region. Generally speaking, it directly will be impacted by the higher transport activity and volumes enacted by the fixed link. The TEN-T and European Union transport corridors have an objective to be interconnected, and that is why the new vital link will influence all of them, mainly the ones located in the Baltic Sea Region, where the flows will have long-term effects and potential for the new network's development. Continuing the notion of the strengths of the project's significant impact on the transport networks, the following advantage must be mentioned. The project is expected to be the connection, which closes the gap in the European transport network (TENTacle, 2018: 38). Another strength of the Fehmarn Belt Fixed Link project is its compliance with globalization and urbanization trends. Moreover, it also contributes to the major strategies of the states in the Baltic Sea Region, which are also aimed to achieve connectivity through the transport corridors modernization along with the medium-sized and metropolitan cities (McKinsey and Company, 2018).

The Danish Ministry of Transport conducted another report on the transport indicators changes and predictions. The researchers concluded the beneficial consequences for the tunnel's future users. It is crucial to mention that the customers of the tunnel are supposed to be Danish citizens mostly. According to the calculations, the profit from the road traffic will amount to BDKK 34 during the first years after the tunnel opening. Rail freight is another concern that is assumed to be beneficial in the form of private rail transportations. According to the investigations of the Unit Prices in Transport Economics, the saved operating costs and faster transfer of the goods are crucial for the profitable outcomes. Thus, the traffic flow during the first year after the opening is expected to increase by 47 per cent for passenger cars and 26 per cent for busses. The reason for it is also the transfers from other roads, which will result in the transitional transport stage. Therefore, the number of vehicles is also assumed to rise by 1.9 per cent per year until 2047. Generally speaking, the outcome of the Fehmarn Belt Fixed Link establishment is the higher annual traffic increase, even in the case of the existing ferry operations continuing. As for the passenger trains, the number of users is expected to increase to 1.1 million during the first year of functioning. The number of passenger trains is planned to be 32 per day, and the freight trains will account for 61 per day and 16.000 per year (Odgaard and Kolstrup, 2015).

Coming from this, the link will horizontally affect the modernization of the public transport and transport networks. For instance, the innovative opportunities for the rail transport branch are projected by the company. In other words, the tunnel will be a part of the rail network between Copenhagen and Hamburg, which is planned to take two and a half hours with no stops and under three hours with the stops of Zealand, Lolland-Falster and Holstein journeys. Therefore, the modernization of the existing rail links and new ones are beneficial outcomes for both connectivity and commuters. For example, the new train station on the Lolland-Falster will be placed in the middle of the European transport corridor from Finland to the Mediterranean area (Femern A/S, 2020). The modernization of transport corridors will reshape the connectivity between two innovative and significant regions in the Baltic Sea - Schleswig-Holstein and Hamburg, Zealand and Copenhagen. The first one, located in Germany, is a vital part of the cross-border area, while in Denmark, each region is a segment of the transport corridor, which takes around 60.000 square kilometres. The most advanced and populated part of it is Hamburg, where more than 1.8 million people inhabit. Generally speaking, the transport links between Germany and Denmark function more solidly than most of the other regions in the European Union in terms of employment and economic rates. For example, the average GDP per person is EUR 42.885 in the area. Still, the development of the existing corridors is demanded because other metropolitan areas in the northern part of the Baltic Sea Region, such as Helsinki and Stockholm, tend to perform better. Moreover, both of the cities have experienced lower economic growth rates than Malmö since 2000. In this case, the modernization of the neighbouring regions in the cross-border areas will provide an opportunity to change the situation. In other words, such steps would bring the metropolitan areas closer for further connectivity indicators performance. As a result, productivity and economic prosperity are higher in the more prominent regions, and these features would also decidedly affect the elimination of the challenges in the rural areas (Ramboll, 2016: 10-12).

Another crucial strength to consider is the impact on the globally demanded notion on the shift from maritime shipping to on-land forms of transportation, mainly the railways. The shift had already gradually begun in the Baltic Sea Region in 2015, and the project will contribute to its further spread (Stiller and Wedemeier, 2011: 19-28). It is essential to acknowledge that the greening of the transport sector and environmental endorsements are also elements of connectivity development. For instance, the immersed tunnel will decrease the ferry shipping volumes and shift to the railway networks. In this case, it also contributes to applying the European Green Deal strategy, which aims to reduce emissions by 2050. Thus, the tunnel will directly affect the decarbonization of the transportation modes (Cox, 2020: 7). The tunnel will

additionally save kilometres and time by the vehicles. Furthermore, the fixed link is expected to beneficially impact the STRING network macro-regional initiative covering the area from Hamburg to Øresund. According to its objectives, the Fehmarn Belt project is considered an efficient transportation link. Therefore, the competitiveness of the network is one of the perspectives enacted by the fixed link outcomes (Guasco, 2014).

The following strength of the future project is its function of connecting the major economic centres of the Baltic Sea Region, which affects the maintenance costs reduction and securing costs saving. The critical centres along the Scandinavian-Mediterranean Corridor are Oslo, Copenhagen, Helsinki, Stockholm, Hamburg and Malmö (Cox, 2020: 49). The increased connectivity between these centres is an element for economic growth. Thus, the regions and urban areas receive an opportunity to enter international trade and strengthen their position on the internal market. The new link stimulates the economic integration and labour forces movement (United Nations Economic and Social Commission for Asia and the Pacific, 2012). The better accessibility impacts the making of the educational and labour favourable circumstances for the communities in the Baltic Sea Region. The students will also receive faster access to educational facilities in other parts of the region. Moreover, it is crucial to mention that the project will form thousands of new jobs and hundreds of apprenticeships. Based on the civil works contracts' terms, approximately four thousand people per year will be employed in the construction process. For instance, three thousand people will be part of the building of the construction site on Lolland Island. Furthermore, the project will provide approximately three hundred job positions to operate the tunnel after its establishment. The current contracts of the project are planned to establish five hundred new apprenticeships after the construction ends, as well. According to the calculated data by the Femern A/S, eight million people and several hundred companies will receive potential for the new partnerships. In this case, the SMEs and businesses will receive new labour forces and market access (Femern A/S, 2020). As for the advantages for the populations affected, the local communities in the areas close to the link will be mainly impacted. In this case, the local labour market and export opportunities for the local businesses will also be increased. In addition, the tunnel will establish a shorter transportation time and lower costs for it (Femern A/S, 2016).

The project establishment will positively impact the business and SMEs networks, which estimates more solid information sharing flows. The connectivity improvement is directly correlated with the economic stimulation by the knowledge-based economy. This type of economy is driven by innovation trends and infrastructure improvement, and it depends on physical accessibility, as well. Generally speaking, the project will stimulate its growth by

connecting to the urban centres and areas, where the employment ratio in the knowledge related fields is vital (Hill, 2020).

The people-to-people network stimulation is another strength of the future tunnel's impact on the connectivity in the Baltic Sea Region. The people-to-people networks are expected to be more integrated from Hamburg to Copenhagen to Malmö and Saint-Petersburg outside the European Union borders (Stiller and Wedemeier, 2011: 19-28). These connections do not play the socio-economic role only, but it also beneficially affects the cultural exchange in the marginalized cross-border and rural areas. Moreover, such areas tend to be undeveloped in the macro-region due to the high concentration of population and activities in the cities, historically as well. The cultural exchange between the communities located in the bordering areas in Denmark and Germany will enforce the cultural penetration leading to the similarities between cultures. Therefore, the cross-border collaboration conveniences will improve the cultural exchange on the local and regional levels. At the same time, other communities in the area of influence will receive opportunities for cultural exchange along the modernized transport corridors since the gap in it will be closed by the new tunnel (Verjans et al. 2015: 2). Following the notion, increased tourism opportunities will be arisen by the new connection set. The industry already represents a crucial role in the Fehmarn Belt region economically. The main destinations are located in Copenhagen, Hamburg and along the coastline of the Schleswig Holstein will receive more tourist flows along with the cross-border areas (Femern A/S, 2020). One of the critical strengths of the Fehmarn Belt Fixed Link project is its affiliation with the United Nations Global Compact and United Nations Sustainable Development Goals. The first one considers compliance with human and labour rights criteria, which is a crucial component of the company's Corporate Social Responsibility policy. Furthermore, Femern A/S is focused on the sustainable goals indicated in the project's foremost objectives, establishing approvals and plans. The company also produces annual reports where the data on the accomplishment of the goals is presented. The integration of the goals into the company's Corporate Social Responsibility includes the following insights. Firstly, the goals on advancing sustainable and high-quality infrastructure are taken into account by the climate strategy disclosure by the Femern A/S, measurement of the environmental concerns in the installation agreements, and initiating the climate values for the construction of the tunnel. Moreover, it is vital to mention that the Femern A/S designated the outline for the remarkable climate and green transportation strategy in terms of the principal aims of the Fehmarn Belt Fixed Link project in November 2020. The aims hold the reduction of the CO₂ emissions, as well. Thus, according to the Annual report for the year 2020, the Fehmarn Belt Fixed Link is expected to influence the green shift

of the transport division and be established and administered in an environmentally friendly way. The green construction methods are already applied during the construction process. Moreover, the company plans to ensure innovative technological tools use and prepare the tunnel for the forecasted green vehicles.

As for the other sustainable goals, strengthening accountable growth and employment, including the educational points, were aimed. The project already successfully designated the CSR policy terms indicating lesser demands for the apprenticeship equivalents. The project also formed the "Target Zero – a State of mind" campaign concentrated on a stable working environment. The last goals were reached in 2020, where the Femern A/S pondered the nature and biodiversity protection applied for the monitoring programme on maritime control in the strait waters. It also granted open access to the environmental status of the project.

Nevertheless, the project is proposed to work on the sustainable development goals annually, and thus, the following aims are planned to be accomplished in 2021. As for the goals regarding sustainable infrastructure, consumption consideration and climate action, the climate strategy will be discussed at the special conferences, the tunnel preparation for the green vehicles will commence, and the market's green resolutions will be indicated. Furthermore, concentrating on the decent work and economic growth goal, monitoring the civil works contracts will be implemented, the construction of the camp area in the Lolland will be controlled, and lastly, the Target Zero campaign is planned to be performed. Lastly, as for the goals considering the maritime and ecological concerns, the inspection of the regional environmental impacts from the construction works is planned, the new data will be provided in terms of the environmental aspects on the portal, and the monitoring of the newly established nature areas on Lolland and Fehmarn will be performed. The focus on the United Nations Sustainable Development Goals is not critical for the connectivity notions in the macro-regional levels, but it ensures the project's prosperity in terms of its future application and sustainability (Femern A/S, 2020).

Concluding, the strengths specified above provide the grounds for the Fehmarn Belt Fixed Link project potential in beneficially affecting regional connectivity and cross-border integration on the various levels. The main strengths can be designated in terms of the projected outcomes designated by the experts' investigations and the Femern A/S. They embrace the positive outcomes in terms of spatial development, economic growth and better integration of the internal market, opportunities for the people-to-people connections, businesses and SMEs, transport corridors improvement and efficiency and benefits for the community's integration. In addition, the project itself is regarded as innovative and climate-friendly, corresponding with the UN Sustainable Development Goals and providing the fast and easy transportation of goods

and people. Essential aspects that designate the project's potential are its internal processes and actors engaging and functioning during the tunnel planning, construction, and maintenance.

4.2 Weaknesses

Weaknesses analysis is another crucial perspective for investigating the Fehmarn Belt Fixed Link impact on the connectivity levels. The barriers faced during the project planning, construction, and further maintenance designate the performance prosperity of the project. The weaknesses are the fields that need to be addressed or improved in order to endure competitiveness. The fixed link is expected to have costs and adverse outcomes in the form of the gaps in the planning processes, lack of everyday engagement of the actors, uncertainties in financing models, spatial distortions and economic disparities. These aspects have a direct impact not only on the project prosperity but on the regional integration and connectivity development, as well.

Firstly, the limited involvement on the administrative levels is noted during the planning phase. The reason for it is the lack of instruments and approaches for increasing interest. Furthermore, the Femern A/S initially ensured the undoubtedly advanced project, which did not need additional support and assistance. Thus, the non-metropolitan area actors are not enthusiastic about participating in the cooperation activities concerning the fixed link establishment due to the low potential for involvement (Ramboll, 2016: 33).

As for the financing and capital contingencies, the following weaknesses features can be indicated. Firstly, the project is based on the state guarantee basis of funding. More directly, the model guaranteed the project's financing by loans granted by the Danish Government, which are planned to be refunded by the income from the fixed link consumers after its opening. According to the presumed data and arguments in the State Treaty signed by Denmark and Germany in 2008, the project was already estimated as too significant to fail. Coming from this, economic involvement by civil works contractors is also expected. Nevertheless, these objectives are not enduring and stable. The Danish Government and the Femern A/S did not consider several aspects in terms of its financial feasibility. For instance, the transport volumes calculations techniques are debatable in terms of the further competition and funding recoup. One of the examples is the debatable projection of the traffic shift from the Great Belt to the Fehmarn tunnel, which concludes the gaps in the analysis and alternative scenarios consideration. Thus, the uncertainties in terms of the road traffic benefits are directly connected to the further prosperity of the project and its current weaknesses, which require more

consideration and deeper analysis. Moreover, the civil works contracts on the construction phase, which designate the particular terms and objectives, might result in additional negotiations requiring supplementary spending (Schjær-Jacobsen, 2017). Coming from this, the Femern A/S lacks compatible traffic forecasting methods. In other words, if half a million users will not refund more than one-third of what is projected in the estimated revenues calculated, then a significant amount of funds will be abstaining from revenues (Andersen, 2018).

The international consulting group COWI A/S provided additional analysis on traffic estimates, financing, and business risks regarding the Fehmarn Belt Fixed Link project. One of its investigation's vital resolutions was that the projected traffic volumes are realistic estimations, but it discharged the ferry services between Rødby and Puttgarden. Nevertheless, the experts describe the projections as rather conservative in terms of setting the new link. Furthermore, it states that the project stakeholders lack the methods for forecasting the potential practical consequences of the tunnel. Moreover, this aspect can be regarded as the weakness for the proper projections consideration, which makes the guarantees on the regional integration and connectivity aims at the planned level debatable (Schjær-Jacobsen, 2017). Furthermore, the operational and financing assistance after the tunnel opening cannot be predicted and calculated due to the changing globalization, urbanization, economic and political trends. A crucial example of such unpredictable circumstance is the COVID-19 pandemics, which affected the closing of the borders and lessened traffic volumes, especially the cross-border ones. Another concern that cannot be foreseen is the notion of accidents during the construction phase. In this case, the consideration of the Øresund Bridge building case can be recognized when one of the transporting elements, number 12A, fell on the seabed and caused considerable spendings.

Following the notion of manufacturing risks, the land transformation and infrastructure modernization on both sides of the strait are also present. As for the hinterland rail connection improvement on the German side, the spatial planning procedure by the Schleswig-Holstein municipalities was required. The result of it includes the following requirements to be accomplished, including the bypasses for the Baltic Sea resorts located in Timmendorf, Scharbeutz, Haffkrug and Sierksdorf without preserving the existing routes, bypasses for the Ratekau, Lensahn and Großenbrode areas and the building of the 73 per cent part of a new line between Bad Schwartau and Großenbrode. Considering the motorway modernization, the B207 motorway and four lanes between Heiligenhafen-Ost and Puttgarden are its subjects (Federal Ministry of Transport and Digital Infrastructure, 2021). Generally speaking, the insufficient infrastructure proved the initial low regional interconnectivity, which impacted the delay in

building the fixed link (Ramboll, 2016: 33). The infrastructure bringing the weaknesses for the project includes the German hinterland development, railroad constructions and modernization of the E47 South Motorway. These are the transportation nodes and subprojects of the fixed link (Schjær-Jacobsen, 2017).

Another essential barrier that emerged during the approval stage was the delay, domestic circumstances in terms of financing and legislation and uncertainties of the German government's authorities. Thus, the feebleness of the planning phase derives the preconditions for the different debatable attitudes towards the project and potential new difficulties in terms of the legislative revisions. The project itself met numerous obstacles and objections internally during the first steps of its planning and arranging. The alternative transport link options were discussed, as well. For instance, the Gedser-Rostock Bridge planned project was assumed to be placed fifty kilometres away from the Fehmarn Belt Fixed Link and was admitted one of them instead of the tunnel. Such features can be regarded as risks in the initial steps of the project proposal. If the project on the bridge were implemented in the future, it would serve a competitive state due to the reason that it would secure the link between south Scandinavia and Eastern Germany, including Berlin and up to the territories of Poland. However, the alternative project was declined during the discussions in 2008 (Vieregg-Rössler GmbH, 2008).

Another weakness and barrier for the project's impact on connectivity is the need to eliminate the rather specific environmental concerns the infrastructure can bring. For instance, the noise produced by the increased traffic volumes along the transport corridor is expected. Such circumstances might negatively affect the habitat and population of the Fehmarn Belt region. Moreover, according to the projected increased volumes of the vehicles taking the alternative routes to cross the link, a considerable part of the Baltic Sea Region population will be affected by the CO₂ emissions and noise. At the same time, the project's objectives are focused on eliminating these effects only in the particular area by still resulting in considerable impacts on the macro-region. Environmental matters are the crucial aspects for the connectivity development, as well, because it designates the prosperity and functioning of the existing transport corridors under the fundamental strategies, such as STRING Network (Detloff et al., 2009).

Nevertheless, the populations of the cross-border and regional areas will not only be affected by the environmental concerns and consequences. One of the examples of the negative repercussions of the new link establishment is the growing urbanization trends in the Baltic Sea Region. Thus, the less populated, marginalizing areas with high mortality rates are expected to face progressed out-migration trends. These consequences are damageable for the local

identity, labour market, businesses, SMEs and tourism industries. Another weakness affecting the loss of jobs by the ferry service workers is the expected lower regularity of the ferry operators travelling from Gedser to Rostock, Puttgarden to Rødby, Travemünde to Trelleborg and on the other Sweden-Germany ferry routes (Odgaard and Kolstrup, 2015: 24).

Another expected competitive outcome for the connectivity improvement is shifting the existing traffic from the Jutland route to the fixed link. Thus, the competition between the tunnel operating and existing ferry executives will be present. The seaports located on the routes, in this case, will be affected by the shift, as well. It is crucial to mention that even the ferry services from Szczecin to Sweden will be negatively influenced due to the appearance of the new, more attractive transport connection. Another decrease in the international traffic volumes will occur in the area located along the current railway corridor between Copenhagen, Kolding and Hamburg. Thus, the hinterlands of Guldborgsund, Rostock and Hamburg are also the subjects that will undergo the shift consequences. Thus, the modelling of the traffic forecasts by the Femern A/S and the Danish Ministry of Transport lacks the consideration of the enormous scope even though inter-regional connectivity in Denmark is another essential concern in its governmental strategies. Another concern is the necessity to modernize the rail terminal in Hamburg-Billwerder because it is not infrastructurally prepared for expanded traffic volumes from Denmark and Sweden. These demands might consider the other chain of spendings, which are not assigned in the project's budget. Generally speaking, some of the nodes located in the catchment area of the tunnel will endure gains and profits, and others will see the traffic volumes decrease. As for the connectivity matters, the loss of traffic will negatively affect the particular areas, their local economies growth, and potential regional integration. Moreover, the competing ferry services are one of the major weaknesses for the traffic demand on the new fixed link (TENTacle, 2018: 15-19).

In conclusion, the functional requirements are the weakness of the project implementation processes due to the need for additional investigation and analysis methods oriented to the objectives embraced. Thus, the Fehmarn Belt Fixed Link is an example of the traditional approach towards decision-making, mainly considering the alternatives. As a result, the project did not attract private actors and lost the opportunity to contribute to the civil interests and additional investment and alignment instruments. The outcome of this gap is less responsibility for the consequences and potential risks. The before-mentioned modifications might be accomplished by presenting the functional project requirements competently, including its prosperity for the communities and the traffic and economic sectors. However, there is no concrete formulation of the normative regulation system on the aims characterized by Denmark

and Germany, excluding the traffic and financing aspects. To regulate the possible costs and risks, it is necessary to re-calculate the economic analysis of the financial expediency conducted by the authorities at the beginning of the 2000s. However, the private players and experts have conducted new calculations, which affected the project implementation progress. However, still, there is a need for official reports conduction. There is a lack in investigating the limited effects of the potential financial recoups.

The currently prepared reports done by the Danish Ministry of Transport and supporting actors indicate the paraphrase of the previous investigations in most cases. Nevertheless, a comprehensive analysis of the socio-economic impacts, regional development potentials, private capital risks and environmental concerns was done. However, the Femern A/S and related authorities conducted the low inducement to assign the normative regulation system, society participation and functional requirements projections. Thus, addressing these gaps will eliminate the internal weaknesses of the project along with the possible economic disbalances, negative impacts on the local populations, ferry services competition, financing uncertainties and potential additional spendings on the challenges and accidents, including the modernization of the transport networks and hinterlands. Generally speaking, the uncertainties and gaps in the forecasts of the project might impact the overestimated connectivity impact by affecting the existing transport corridors and maritime routes, which will experience a decrease in volumes. Another critical challenge is the expected strengthening of the urbanization trend in the region, which is already enduring in the form of the high concentration of the population and activities in the urban centres and metropolitan areas. It is essential to notice that medium-sized cities and rural areas are a crucial part of connectivity matters. Thus, these weaknesses need to be addressed to designate the substantial influence on local, micro, and macro-regional connectivity (Flyvbjerg et al., 2003).

4.3 Opportunities

The Fehmarn Belt Fixed Link, project opportunities analysis, examines the external environment impacts and projected connectivity development. The preconditions, resources, and external actors' role in political, economic, social and technological features are essential for the research. The analysis of opportunities will also indicate the potential for further connectivity growth in the region and across the German-Danish border, considering the immersed tunnel connection.

The European Union Strategy for the Baltic Sea Region is an essential instrument that contributes to the macro-region's dynamic development. The strategy is regarded as a success story by many political actors because it provides opportunities for innovative ideas and tools for the demands of covering particular areas and increasing regional integration. Thus, the European Union harmonized legislation is itself the prosperity precondition for the project application. It also provides a solid basis for monitoring and coordinating cross-border and regional initiatives like the fixed link (Ozoliņa et al., 2010: 59,233). The EUSBSR is also regarded as the platform for long-term regional actions, which serves the structure of practical project-based cooperation in the region (Strang, 2016: 151-153). Moreover, for instance, Denmark has been a member of the European Union since 1973, and since then, it has proved its initial role in the integration process and connectivity. Generally speaking, Denmark was showing substantial economic interests in the European Union participation. Thus, the majority of the Danish population has positive attitudes towards being more interconnected with the Central Europe Member States. That is why Denmark has a reputation as one of the best compilers with the European Union initiatives and directives. The reason is that the state government strongly follows the implementation behaviour and practical application of the regulations (Mile and Wivel, 2014: 8, 26, 194). The existing European Union legislation, harmonized and focused on regional development, is a crucial opportunity for Germany and Denmark to establish cross-border cooperation in transport infrastructure.

The European Union grants financial support for the project, a significant opportunity for construction and maintenance phases. More directly, the European Commission provides the funding under the TEN-T programme. According to its motives, the fixed link is a preference project for the internal market improvement, distortion of the unfair competition in the region and modernization of the transport corridors. Moreover, the financing provided by the European Union state aid need not be returned. Therefore, the European Union adopted the public financing model for cross-border connection construction in 2020. The new resolution was approved based on the investigation carried by the Commission on the propositions granted by Denmark to Femern A/S in terms of the tunnel construction assistance. The measures are intended to comply with the General Court's December 2018 judgment, as well. According to the investigation results, the capital injections, the State guarantees on loans and the State loans invested by Denmark aggregate state aid under the European Union laws concerning the economic aspects of the cross-border and coastal infrastructure. Moreover, the European Commission applied the Important Project of Common European Interest measures in terms of the analysis, which designated the qualifications for the state aid. The Communication on

Important Project of Common European Interests for the criteria specification was applied too. Furthermore, following the negotiations with the European Commission, the Danish government ratified the particular developments in the project's financing structure based on the investigation results. The changes include the limitation of the public financing to the minimum required to fund regarding the use of state loans and guarantees up to a maximum debt amount of EUR 9.3 billion and up to the initial 16 years of the tunnel functioning. The changes are observed as unavoidable by the European Commission in terms of the beneficial impacts of the project in the future. Thus, the vital opportunity for the project provided externally is applying the state aid granted by the European Union. It is essential to mention that the financing model was prolonged from 2021 to 2023 by now (European Commission, 2020).

Another important external opportunity for the project prosperity and fixed link impact on the regional integration is the presence on the internal market and freedoms that it provides. The European Union legislation is a driver for the connectivity improvement in the Member States and micro and macro-regions. In this case, the harmonization of the legislation also contemplates implementing the internal market freedoms that allow access guarantees, and cultural components in terms of connectivity. The fundamental freedoms are the free movement of goods, people, services and capital, which beneficially impact the European Union functioning and Member States integration. The European Parliament is the governing body that assures the proper application of the freedoms. The legal basis for the internal market operating is Articles 4(2)(a), 26, 27, 114 and 115 of the Treaty on the Functioning of the European Union (Ratcliff et al., 2021). Generally speaking, the comprehensive legal basis serves profitable opportunities for the project's future prosperity because the internal market is crucial for improving regional connectivity on various levels. Thus, the transport links' prosperity depends on the economic integration possibilities and trade networks (Lin, 2012: 397-409). The project receives opportunities for the fair distribution of the costs and fundamental freedoms enforcement, which brings the assurance for its establishment (United Nations, 2014: 66). Moreover, the foreign direct investment flows and entrance to international trade are the opportunities for further project functioning (United Nations Economic and Social Commission for Asia and the Pacific, 2012).

The cooperation and strategic projects tend to benefit from the knowledge-based economy, innovation and education aspects. Advanced accessibility is possible with the application of knowledge-based products, such as innovative technologies and processes. The knowledge resources in the Baltic Sea Region is developing, and it is expected to increase after the better

connectivity establishment. More directly, Northern Germany is regarded as one of the vastest regions, where knowledge and science are used as an instrument. Moreover, the human resources in Denmark are also way above the European Union average, along with Germany (Ozoliņa et al., 2010: 121-123). Generally speaking, the connection to the most developed and leading urban centres is an opportunity for the further project's success, due to the reason that the cities are the source for the knowledge-based products and economy.

The external opportunity of the fixed link being placed on the Scandinavian-Mediterranean Corridor is another crucial notion to address. Moreover, the more significant interaction of the transport systems in the Baltic Sea Region and the European Union transport network is vital for connectivity matters. It might be achieved through the corridor's development and new connections, such as the Fehmarn Belt Fixed Link establishment. The German-Danish existing corridors of the Fehmarn Belt and Jutland already serve as the comprehensive basis for better project integration in the cross-border area. Furthermore, the corridors can be regarded as highly advanced regarding the attachment to Copenhagen, Hamburg and Aarhus. As a result, the cross-border areas present more outstanding performance than multiple European Union regions. However, there were comparatively low economic development measures in the 2010s. That is why addressing the issue is an initial opportunity for the fixed link functioning, strengthening the cross-border areas. Nevertheless, the two corridors in the region subserve the comprehensive preconditions for the project establishment. An interesting fact is that according to the European Union Regional Competitiveness Index, the German-Danish corridors would be put on 42nd position in the list of 262 European regions if they were a region. The elements of the regional development are modernized infrastructure connections on the German side and the skilled workforce and innovation potential in Greater Copenhagen. The corridors are only undeveloped in terms of transport infrastructure interconnectivity and market size integration. However, it provides opportunities in the form of technological readiness, solid education level among the communities, labour market prosperity, innovation trends and macroeconomic stability. These aspects are essential features to apply during the project construction and employing the skilled working force and further functioning. Coming from this, the strengthening of the corridors will only improve the segments mentioned above and thus, the project will receive more beneficial opportunities in the future. The critical aspect, in this case, is the potential of better connectivity with Sweden and Norway, as well. Such a large catchment area is a driver for the regional growth impacts, better access to the crucial metropolitan areas and more productive examination of corresponding opportunities.

The following sections for the potential opportunities for the tunnel project affect the connectivity and basis for its installation comprise the advancement of the cities and regions, accessibility, climate concerns and knowledge-based economy and innovation. Thus, the planning and construction of the infrastructure project in the area can be regarded as relatively prosperous due to the circumstantial preconditions. For instance, accessibility on the local levels is required for regional and international interconnectivity, and the Fehmarn Belt region is already equipped with international transport nodes. For example, it is one of the largest container ports in Hamburg and has two efficient international airports located in Hamburg and Copenhagen. Moreover, the area's motorways can be considered well-developed, as well, due to the large share of the internal goods shipments and vehicle traffic volumes. Thus, the accessibility is assumed to be even more facilitated after the tunnel opening and its repudiation of the remaining insufficiencies (Ramboll, 2016: 12).

The fixed link project receives numerous opportunities based on its priority within the international and regional strategies. Firstly, the Trans-European Transport Network policies are focused on the connection of the well-developed and marginalizing regions by addressing the economic, demographic and industrial issues, which are eventually met in the cross-border areas of the Fehmarn Belt. The policies provide the support of the transport modes improvement and shifts towards environmentally friendly ones, as well (Pape, 2020). Regulation No 1315/2013, issued on 11 December 2013, provides the guidelines on developing the TEN-T. It includes the Fehmarn Belt Fixed Link and on-land connections on the territories of Germany and Denmark as a component of the core network. Thus, it is an additional ground for the project to be prioritized by the European Commission. Furthermore, Germany and Denmark's investigation and preparatory processes have been supported with the European Union funds from the TEN-T programme. For instance, the hinterland rail connections modernization accounted for the EUR 120 million funding until 2020. As for the hinterland rail and motorway connections improvement in Schleswig-Holstein, the infrastructure plans are designated by the Federal Ministry of Transport and Digital Infrastructure and Deutsche Bahn. The opportunity for the project is the public participation for it inducted by the authorities of Schleswig-Holstein in the form of dialogue conferences and meetings started in 2011. The results of it are the designation of the region key demands. However, the Deutsche Bahn Netz AG could not comply with all the new needs due to the scope of the legal basis in the planning. Thus, the German Bundestag approved the additional funding for EUR 232 million to apply and protect the new measures in July 2020 (Federal Ministry of Transport and Digital Infrastructure, 2020).

A Green STRING-Corridor is the macro-regional initiative implemented within the scope of the TEN-T applied from Hamburg to Øresund, including the Capital Region of Denmark, Schleswig-Holstein, Zealand region and Skåne region. It derives considerable potential for the Baltic Sea Region and the cross-border fixed link. The project addressed the challenges regarding transport infrastructure integrity and its impact on the environment and consumption of fuels. It provides the coordination policy for the national regulations in this matter, which is crucial for the project application under the scope of its objectives (Guasco, 2014). In other words, the opportunities for the support of sustainability and environmental protection are crucial for further project development. The Green STRING-Corridor and STRING region will positively impact the process by providing the funding, reports, and regulations for the three national states of Germany, Denmark and Sweden cooperating.

Following the notion of the environmental protection concerns, it is crucial to mention the already present circumstances and steps in the cross-border area of Denmark and Germany. Climate change is a fundamental challenge for the corridors in the area, as well. Thus, clean technology advancement has been a part of the regional and city strategies for decades. Such steps lead to creating the grounds for the new innovative tunnel construction, which will impact the area's transformation into a sustainable one. The drivers serving the opportunities for the project are the long-existing tendencies to reduce the CO₂ emissions and decarbonize the economy, considering the transport sector as well. For example, Aarhus is one of the primary cities in terms of the decarbonization processes and innovative concepts for energy production (Ramboll, 2016: 22). The stakeholders of the Fehmarn Belt Fixed link also designate the no considerable impact from the tunnel on the environment as an essential goal to comply with the already existing tendencies in the region. Generally speaking, the stakeholders mainly supporting the project establishment are Danish environmental non-governmental organizations and project developers placed on the Danish side of the strait (Witz et al., 2021: 383).

The presence of the common approaches and interests towards the fixed link project of the political and other regional actors serves the beneficial external basis. The Fehmarn Business Council promotes cross-border collaboration in the region and supports tunnel construction. Another supporting actor is the Femern Belt Development foundation, which provides reports on the business and tourism opportunities that the link will offer for the Zealand region communities. The Interreg project initiated the Destination Fehmarnbelt. It provides funding for cross-border development and thus serves as an opportunity for the project operation in the future (Femern A/S, 2013: 40).

Other external opportunities derive from the communities and cities development. In this case, the metropolitan cities of Hamburg and Copenhagen can be regarded as one of the most livable cities globally. That is why the cities are constantly advancing the urban areas and attracting the population. Thus, the transport and innovative projects are crucial for both sides' agendas, mainly because the leisure and marketing activities and shares increase. The areas already afford high-quality public transport connections and conditions for the fixed link more accessible establishment. No significant on-land modernizations are required. The cultural attractions and specifics on both sides of the strait also serve as the opportunities factors (Ramboll, 2016: 10).

Another favourable precondition for the project is the established relations between the communities of both states, which are relatively close in terms of partnership in various spheres. Moreover, the political dialogue has been effective for many decades. It is crucial to mention that Schleswig-Holstein has more ties with the Danish side of the strait. The interaction between the cultures has existed for centuries. Cultural exchange is already an essential element of existing relations (Federal Foreign Office, 2021).

Concluding, the external opportunities in the form of the harmonized European Union legislation, state aid from the European Commission, internal market freedoms and location in the area of the significant urban centres with the sources for the knowledge-based economy and already integrated areas and communities are essential for the project establishment. Moreover, these opportunities serve the prosperity grounds for further connectivity development through the new transport link setting.

4.4 Threats

The external analysis of the threats is the last element of the SWOT analysis of the Fehmarn Belt Fixed Link project and its impact on the connectivity of the Baltic Sea Region. Finally, the environmental investigation covers the analysis of the competitive conditions, economic, social and political circumstances, adverse trends and objections against the project.

The first essential threat for the project arose during the approval and planning processes on the German side of the connection. The preconditions for it were the unsuccessful experiences in terms of the completed infrastructure projects in the country. On the contrary, Denmark obtains a prosperous record of the existing projects, such as the bridges over the Great Belt and Øresund. That is why the controversies arose in terms of the considerable public and authorities' criticism towards the fixed link. Moreover, the delays in the infrastructure projects

are also noted in the German initiatives to establish connections to the neighbouring states. Thus, such negative experiences and preconditions of one of the states might serve as a threat to the proper project implementation (Witz et al., 2021: 386-387).

It is essential to mention that Germany lacks community attitudes and trust in the government, while on the contrary, Denmark has an entirely different situation. Moreover, the communities in Germany tend to provide more trust towards the Federal Constitutional Court decisions. That is why the different approaches were applied during the approval stage in both states. Denmark applies the legislative procedures regarding large-scale projects, and Germany implements the authority approval process. Generally speaking, the project plan is discussed and later, it receives support, concerns and objections. Objections negatively impacted the project approval processes and even became a threat to its establishment in general. The reason for it is the uncertainties for the authorities to make a final decision (STRING, 2014).

The municipality of the Fehmarn Island has positioned itself as the opposition of the project, as well. The authorities of the Ostholstein did not provide support towards its installation after the State Treaty signing. The Green Party was another actor who expressed criticism. The party even prevented public statements on the support of the project by the Mayor of Hamburg in 2011. These events contributed to the public and private actors' lack of awareness of the project, becoming a threat. Moreover, the German environmental non-governmental organizations and groups have expressed strong negative concerns towards the ecological aspects of the connection since 1994. The same objective positions of the environmental groups affected another large-scale infrastructure project, Stuttgart 21. The oppositional groups eventually emerged in the North German context but have not found supporters in Denmark and Sweden. The new regionalism tendencies played a role in this case, as well. As for connectivity development, the opposition in the political segment is a crucial issue to address due to its horizontal effect on the public and private actors and communities (Walsh et al., 2015).

In order to address the criticism, the authorities of Schleswig-Holstein provided the "Dialogforum" for the public discussion in 2011. The stakeholders' representing groups were invited to take part in it. However, the environmental organizations declared a negative attitude towards participating and did not join. Later that year, another stakeholder expressed disapproval towards the project. The privately-owned ferry operator started a chain of uncoordinated claimants arising, which displayed a substantial threat to the project on various levels. The litigations in the national and European Union courts, accusations, adversarial media campaigns, and protests emerged. The main grounds for the opposition were the new investigations on the project construction. The debate included the participation of the ferry

operators, which stated that an unfair business benefit is expected. The environmental non-governmental organizations of Germany addressed the considerable damage to the sea nature. The German municipalities in the catchment area of the fixed link expressed the awareness of the inadequate noise protection from the traffic volumes. Lastly, the local protests associations asserted that damage would be brought to the local identity, labour market and SMEs, tourism industry and environment. As a result, 15.000 complaints were submitted. Coming from this, Germany's approval process took longer and required two discussion rounds in 2014-2015 and 2016-2017. Multiple changes and amendments resulted from the delayed approval, which also affected the assigned initial deadline of the project. The project's future still depends on the behaviour and actions of the stakeholders and particular groups, non-governmental organizations and community, which is against the project (Witz et al., 2021: 382).

Another threat for future project prosperity is the relatively heavy maritime traffic in the waters of the Baltic Sea Region, which determines the issue of the permissible competitive shipping routes emerging. Crossing the strait is a comparable service provided by the two transport modes of tunnel and ferry. Thus, the ferry services might be modernized to assure high-quality performance and favourable prices. Concerning the market viability, the ferry operators are a solid competitor to the fixed link. Thus, there is a projection that the ferry services will reach profits in balance and become the tunnel competitor after its opening. In this case, there is a threat that the fixed link will result in an unprofitable project (Aigner and Weber, 2017).

The project faced threats in the form of court appeals against its objectives and construction. Six appeals were submitted to the national courts and the European Union Court of Justice by the two environmental groups, three companies including Scandlines, and municipalities of Fehmarn. Three other appeals from the different municipalities and a farmer were declined (Gibson Dunn, 2018). The Scandlines appeal formed the considerable threats for the project receiving the European Commission financing and state aid, basically questioning the project's future. The joint cases of Scandlines Danmark and Scandlines Deutschland v Commission and Stena Line Scandinavia v Commission appealed to the Court of Justice against the General Court's judgments in cases T- 630/15 and T- 631/15., which partly invalidated the Commission's decision to grant the state aid for the Fehmarn Belt Fixed Link project. Furthermore, the privately-owned companies Stena Line and Scandlines appealed to the Court Of Justice in 2015. The company declared the demand for the annulment of the Commission's approval of the project's financing model, mainly objecting to the 55 years accepted for the state aid, due to the terms that this period is lengthened to assure the total state aid. The Court of Justice admitted the appeal as the state aid case and reversed the approval of the financing

model for the fixed link in 2018. The Court of Justice ordered the Commission to commence the state aid case and legal processing. The authorities of the Schleswig-Holstein approved the tunnel construction in January 2019, and thus, Scandilines submitted the complaint against the legality of the approval at the German Federal Administrative Court. One of the principal determinants was that the planning phase did not recognize equal access roads to tunnels and ferries in Puttgarden and diminish it. The Commission adopted the amended financing model for the tunnel project in 2020. The investigation was carried out addressing the financing model granted by Denmark to the fixed link. As a result, the Commission declares that this compounds the state aid principles. However, the state aid was limited in terms of its period of application from 55 years to 16 years. Moreover, as for the complaint to the German Federal Administrative Court, the judgement was held in Leipzig in 2020, which asserted the approval for the tunnel as lawful. Nevertheless, the appeals against the provisions of the state aid initially adopted for the project in 2015 resulted in limiting the period of it, which is the negative external aspect for the project (Case T-630/15, 2018) (Case T-631/15, 2018) (European Commission, 2020) (Scandilines, 2021). Another concern compounding the potential threat for the project and its impact on the connectivity development are not yet well-stabilized work of the transport networks in the Baltic Sea Region and the less advanced border regions tendency. In other words, the network connectivity efficiency depends on the transport infrastructure quality and presence in the region. At the same time, it is a contradictory precondition for the transport link improvement due to the issues occurring in terms of the configuration with other links. Moreover, the Baltic Sea Region still demands the development of the transport networks and regional integration, and it might horizontally affect the cross-border link prosperity (United Nations, 2014: 8-10). Moreover, the decreasing economic and regional growth was recorded in Mecklenburg-Western Pomerania and regions Zealand and Skåne, where marginalization might encounter the connectivity determined by the tunnel. The last essential threat aggregates the unpredictable circumstances in the various areas and the external costs. Generally speaking, there is a necessity to follow and modify the project under the undergoing global and regional trends and shifts, including the technological advancements, increased environmental concerns and climate change, urbanization and processes of the out-migration from the rural and border areas. As for the last one, the Lolland-Falster Island, which falls in the catchment area of the tunnel, is encountering growing mortality rates and the lowest life expectancy in Denmark. It is a prominent example of the unconditional threat arising externally. There is a notion that the project will positively affect the depopulation trends decrease, but it is still debatable due to the growing urbanization processes (Holmager et al.,

2021). Moreover, the external costs also put the project efficiency and projected outcomes in danger. The costs incorporate environmental aspects, climate change, noise and accidents. In this case, the increased traffic volumes across the existing core corridors connected to the future fixed link will enhance the impact on the environment, putting the project's objectives under question. The estimated external costs will account for approximately EUR 2.7 million (Odgaard and Kolstrup, 2015).

In conclusion, the external threats have subsisted in each project phase since signing the State Treaty in 2008. The threats aggregate the criticism and opposition by the non-governmental actors, researchers, decision-makers, politicians, authorities, public and privately-owned companies. The Scandlines and Stena Line joint cases, which partially changed the Commission's original decision on the project's financing model, provided the external and unpredictable threat. The negative trends and external costs taking place along the transport networks and the bordering areas also accommodate the negative preconditions and grounds for the efficiency of the estimated influence of the project on the connectivity.

5. Comparison of the Fehmarn Belt Fixed Link Project and the Øresund Fixed Link Project and Recommendations

The Fehmarn Belt Tunnel is expected to close the transport gap between Northern and Central Europe in the Baltic Sea Region. It will establish the connection and a prosperous transport corridor between the Øresund region in Denmark and Sweden and Hamburg in Germany, which will impact the development of the competitive region and creation of the vital Fehmarn Belt region, as well (Lundhus and Matthiessen, 2011: 13). The functioning of the existing successful transport project across the Øresund strait or the Øresund Bridge is regarded as one of the prominent examples of the transport links, which experience in each phase can be applied for the establishment of the new projects. The transnational area from Hamburg to Copenhagen and Malmö has similarities and differences at various scales. Thus, the comparison delivers aspects that can be addressed during the implementation of the constructing project across the Fehmarn Belt strait and recommendations. The new project and existing project combination would impact the region's integration and change (Matthiessen and Vestergaard, 2010: 4). The Danish government considered the future construction of the Fehmarn Belt fixed link during the process of the agreement ratifying with Sweden on the Øresund fixed link in 1991.

The analysis of the planning, construction and operation process of the Øresund Bridge provides the notions that can be expected during the same process during the establishing of

the connection between Germany and Denmark. One of the main aspects is the considerable impact of the project on the micro and macro-region. The relevance of the experience application is essential due to the initial similarities between the two areas. For instance, the metropolitan areas of the urban centres obtain the relatively marginalized economically undeveloped area in Northern Schleswig-Holstein and Southern Denmark, which depends on the development of the neighbouring region. Thus, parallel development of the Fehmarn Belt region can be expected. There are also common challenges addressed in the cross-border areas, such as linguistic or cultural barriers. Finally, it is essential to mention that the challenges in terms of cross-border integration are still present in the Øresund region. The uncovering of the connectivity challenges in the Fehmarn Belt region and the macro-region can be done by analysing the models from the functioning project considering the transport infrastructure and volumes, trade and competition, labour market and commuting, environmental considerations and tourism flows and increased integration (Copenhagen Economics and Prognos, 2006: 36). Comparing the planning phases of both projects might derive the suggestions and recommendations on the negotiation, legislative, approval aspects. It is crucial to mention that coming to an agreement on the construction in both cases considered the multiple amendments in the plans and took more time than initially expected when both ideas were discussed at first. For instance, environmental concerns played a crucial role in the processes of both cases because they considered objectives from the authorities and communities. Moreover, the cross-border region of Sweden and Denmark was already effectively intergovernmental cooperation since the mid-20th century, which is relatively different from the Fehmarn Belt case (Nauwelaers et al., 2013: 13). The Fehmarn Belt Fixed Link was discussed in the process of approval of the Øresund Bridge. The first steps indirectly acknowledging establishing the fixed link proceeded from the interim agreement on the 29th of June, 2007 (Isherwood, 2009). A year later, Denmark and Germany signed the State Treaty on the Fehmarn Belt Fixed Link construction (Femern A/S, 2013: 24-25). However, it took almost a decade since to reach the agreement on the construction approval on the German side of the connection, due to the particular legal and administrative barriers, state's spatial and infrastructure strategies and objectives, environmental concerns and objections initiated by the authorities and public and private actors. In this case, the appeals to the Court of Justice and German Federal Courts by the ferry operators regarding the state aid and fair competition affected the process.

As for the central lesson obtained from the planning experience of Øresund Bridge, the actors engaging in the process are the fundamental component. The plan to establish such a connection was debated for several decades until the final agreement was made in 1991

(Nauwelaers et al., 2013: 13). The Øresundsbro Consortium, established in 1992 to decrease the number of operating governmental institutions in the planning, construction and maintenance phases, currently holds and operates the fixed link. It regulates the functioning of the 150 associated authorities and governmental actors from both interacting states. The consortium was formed to advise the private stakeholders, as well (TENTacle, 2018: 32-34). The agreement caused debates and criticism in Sweden because it did not precisely describe the construction process. The only aspects mentioned regarding it were ecological sustainability, technological frontiers and economic expediency. The environment of the strait is vulnerable, and construction inaccuracies were dangerous. In order to avoid ecological issues, the building process was a crucial stage (Global Infrastructure Hub, 2020). Thus, the stakeholders' concerns and attitudes were presented by the environmental protectionists. The population participation process took part during that stage to indicate the project environmental outlines amendments concerning the accessing roads and hinterland infrastructure.

Moreover, the experts consider public participation a strength because the project could not have been implemented without these concerns. As for the stakeholders, they followed the project process on both sides of the strait, principally concentrating on environmental concerns. The unique system EAGLE was implemented to reflect the impact on the ecology and allow the stakeholders to participate or object. From experience, it should be noted that the stakeholders have to be considered the companions to the projects and not the opponents. Furthermore, the cross-border projects, which consider the society from both states, should acknowledge the concerns of the communities and stakeholders at an early stage to eliminate the external threats and delays on the later stage of the project (TENTacle, 2018: 32-34).

As for the Fehmarn Belt case, the experience was considered during the preparations phase. However, it did not eliminate the protests and objections from the public, authorities and experts concerning the socio-economic and environmental aspects. Nevertheless, stakeholders from various segments engage in the planning and construction phases, which is already considered a valid notion for the project (Femern A/S, 2013: 40). Furthermore, the authorities of Schleswig-Holstein hold public discussions and conferences on the hinterland modernization and fixed link established annually since 2011, which increases the public interests and participation at the early stages. Based on it, the significant demands for the region were designated, as well. Moreover, the Fehmarn Belt Days is a crucial initiative and event for project development. The latest progressive program for stakeholders took place in May 2021. During the event, the experts and stakeholders discuss the concept amendments and central

challenges and threats for the transportation projects and cross-border integration (Fehmarnbelt Days, 2021). On the contrary, the environmental protests took place on the German side, while the Danish organizations and public stressed the negative ecological impacts. At the same time, stakeholders express the uncertainties on the project being not sustainable transportation mode on the European Union scale. Thus, the objective politics in Germany expresses the polarized politics regarding the environmental concerns of the transport projects, such as the previous unsuccessful initiatives. However, applying the public and stakeholders' participation instruments has a positive effect on the process (Walsh et al., 2015: 5-6).

Another concern to compare is the financing aspects and its planning. The Fehmarn Belt Fixed Link project planners applied a similar scheme of covering the costs and financing of the project after its opening as implemented in the model of the Øresund project. The scheme serves the imposition of charges on the tunnel crossing and tolls for road use (TENTacle, 2018: 2). The total costs used for the construction and operation of the Øresund Bridge are planned to be entirely repaid in 2050, while it was assumed that it would take place earlier in 2033 during the planning stage due to the adoption of the new dividend policy for the Øresundsbro Consortium in 2018 (Sund & Bælt, 2018). As for the Fehmarn Belt tunnel forecasts, the loans will be fully repaid in 36 years (Femern A/S, 2016: 12-13). However, the example of the functioning fixed links shows that it is hard to predict the precise timing due to the unexpected legislative changes, globalization and urbanization, economic and political trends. Moreover, the financial feasibility is debatable in both cases in terms of the traffic volumes, further competition, and funding recoup. Thus, the deeper analysis and consideration of the multiple scenarios is an essential element to consider during the planning stage (Schjær-Jacobsen, 2017). However, both of the projects met issues and barriers in terms of the state aid application and competition with the ferry services providers. The Scandlines and the HH Ferries filed a complaint against the Øresundsbro Konsortiet I/S regarding the illegal state aid in 2013 and the particular tax circumstances of the project in 2014. In both cases, the company ascertained non-compliance with the state aid regulations. However, the European Commission concluded no violations, but it is still under the investigation process. The state aid provided for the states is necessary for constructing the future one and operating the existing connection. Nevertheless, the governmental agreement ratified in 1991 provides the balancing regulations of the existing transport modes and protection from competition for the ferry operators. Thus, the ferry taxes designate the basis for the road fees. Such a strategy might also be considered on the Fehmarn Belt strait to eliminate the unfair competition between the transport means. The two connected states pay the Value-added tax, and the same financial scheme is planned to be applied on the

future connection, as well (Case T-68/15, 2018) (SA.36558, 2014) (SA.38371, 2014) (SA.36662, 2014). The potential financial risks are a vital element for the comparison because the experiences of the existing project might provide a basis for the preparedness for the threats. The interest rates are imperative for the financing costs gain depending on the traffic amounts. The projected volumes were not sufficient during the first years of the fixed link functioning. Especially counting the vehicle users and the ferry connection was still actively handled. The 2008 crisis resulted in inconsistencies in currency exchange rates, and it transformed customer behaviour, for instance. The refugee crisis in 2015 had an adverse consequence on train traffic revenues. The tax regulations and fiscal rules cross-border differences also had an impact on the connection. Thus, better integration of cross-border activities is required. Lastly, the other infrastructure projects in Europe are transforming the traffic flows across the Øresund Fixed Link. Fehmarn Belt Fixed Link is expected to affect it and be affected by the other transport networks and connections in the future due to the notion of connectivity development. Nevertheless, the expected impact, in this case, is projected as beneficial (Global Infrastructure Hub, 2020: 131-132). Additional features that can be considered as the lessons from the planning practice are the regional preconditions in socio-economic, globalization, and industrial trends. For instance, the objectives and challenges addressed by planning the cross-border connection between Sweden and Denmark were the energy crisis and high unemployment rates in the Øresund region. However, the Fehmarn Belt project stakeholders provided detailed reports and analysis for the projections, parties interests and common objectives appellation in the annual reports by Femern A/S, Ministries' of Transport investigations and the State Treaty on the Fehmarn Belt Fixed Link construction, as well (Global Infrastructure Hub, 2020).

The construction process of the Øresund Bridge and the participants engaged in it met difficulties and unexpected costs. In general, the constructors of the bridge followed the guidelines aimed to protect the environment from the negative impact of building, elements placement and seabed being dredged. Therefore, the construction process was fast and accurate, and the same is expected from the Fehmarn Belt tunnel constructors due to the authorities and public's similar environmental concerns. The factory for the tunnel elements was placed in the case of both projects. However, there are discrepancies in terms of the number of elements, where the Øresund tunnel consists of 20 sections, and the Fehmarn Belt one is planned to be an 89 section underwater link (Henriksen et al., 2000) (Femern A/S, 2019). The transferring and placement of element number 12A resulted in the accident, revealing high additional costs for the Øresund Bridge. Thus, the distinct elements transferring tactic will be applied in future

project building (Nilsson et al., 2007). The tunnel elements will be formed so that they can float in the water until the installation. Then, the tugboats will draw the elements into the tunnel and ground them down and attach (Femern A/S, 2020).

The process of the operation and maintenance of the Øresund Bridge is essential to consider, as well, to designate the possible challenges and lessons for the future project decision-makers. The link is operated and owned by the Danish-Swedish company Øresundsbro Konsortiet, a state-owned company similar to the Femern A/S. The Øresundsbro consortium reviews the environmental impact of the link in the form of the reports, which is also one of the already implemented objectives by the Femern A/S. The governance arrangement is considered a strength of the existing connection due to the sovereignty from the political regularities. The authorities, however, designated the strategy for the project initially, but currently, it is nearly self-reliant. Another strength of the project is the exact safety procedure, which is aimed to provide the operational risk analysis. Such procedures might also be considered in other infrastructure projects. Moreover, the Øresundsbro consortium collaborates with both states' authorities to designate a complete contingency plan. This notion is critical in terms of the project compliance with the requirements of the governments and the European Union. Therefore, it is another successful decision that the Fehmarn Belt project planners can consider (Global Infrastructure Hub, 2020: 131-135).

The Øresund project is administered by multiple public and private organizations, along with the Committee and including the Øresund Chamber of Commerce, Ørestat, Øresund Direct and Øresund Institute. Such division of the governing segments and objectives is a step towards the bridge's better impact on cross-border integration and connectivity. Furthermore, the Ørestat initiative is an essential statistical data instrument provided by the Interreg. The similar one can be expected in the Fehmarn Belt cross-border area, as well, due to the scope of the Interreg programme (Nauwelaers et al., 2013: 10). In general, both of the projects' aims are focused on developing the competitiveness of the whole region by stimulating the development of the infrastructure. Other similar objectives are the attraction of labour forces and businesses. In addition, more accessible communication and accessibility enhance commercial exchange and tourism in Sweden and Denmark. Thus, it is possible to project the same outcomes for the Fehmarn Belt region. The bridge formed a new image for the micro-region internationally, and the future project's impact expects the same consequences. Moreover, the creation of the Øresund identity is one of the goals, which resulted in better community integration through the cultural activities on both sides. Still, the future project's stakeholders need to acknowledge that the cultural factors, including linguistic and mentality features, have a low potential for

change and thus cannot be projected fully. Overall, the process of modernization of one shared urban system lessened the challenges and barriers for connectivity. There is a considerable difference in regional prosperity in pre-bridge and post-bridge times, especially in terms of cross-border cooperation, which was similarly low in the area, as it is in the Fehmarn Belt region (Matthiessen et al., 2004: 31-39). Nevertheless, the positive expectation on the Fehmarn Belt tunnel is still not shared by all interested parties, and the equivalence between local and regional costs and benefits make any economic assessment complicated (Matthiessen, 2010). The particular infrastructure, such as the Outer Ring Road located in the Malmö area, also had to be modernized during the project operation. That is why another consideration for the Fehmarn Belt project is the upgrading of the networks and motorways in advance with attention to all the scenarios (Omega Centre, 2014: 6). The precise attention should be brought to the traffic flows forecasts during the planning stage, as well. The transport connectivity indicators are an example of the applied data in this case. Moreover, the continuing new approaches designation after the opening is another crucial concern for the prosperous functioning and profitability. The reinvestment in the bridge segments, equipment and economic models, technical standards and digitalization advancements are examples for the Øresund Bridge (Øresundsbro Konsortiet, 2019: 12-22).

The physical connection between Denmark and Sweden resulted in the long-term effects in socio-economic, demographic, spatial and people-to-people aspects. However, the imbalances in terms of the economic prosperity of the Danish market is one of the issues affecting the commuter's numbers and destinations. The Fehmarn project drivers should acknowledge the same outcome in terms of the forecasts and authorities considering the national market strategies, where Copenhagen as the central city might once again appear as the more attractive market destination. The high migration level between the states and the region also expects the commencing foreign direct investment levels in the future (Persson et al., 2019: 16-17).

As for the particular barriers and lessons derived, the taxation and legislation obstacles during the first years of the bridge functioning should be considered. These issues still negatively impact cross-border integration. The not yet harmonized state legislations impact the positions of the foreigners, commuting employees and students (Nauwelaers et al., 2013: 23). Thus, the prior opening legislation harmonization is an essential step for the future non-profitability elimination. The regulations on the domestic levels and harmonization of the customs obligations and tax zones are the related steps.

There are already existing differences in political priorities in northern Germany regarding the project. For instance, the authorities of the northern Schleswig-Holstein assume that the

existing route on the Jutland axis will experience unfair competition and that the Schleswig-South Denmark area will transform to more peripheral (Buch et al., 2009: 38-54). The same issues are met in the existing connection experience, where the authorities of Skåne prioritize cooperation and spatial development more than on the Danish side. For instance, Danish actors are more focused on the Copenhagen-Zealand areas, which eventually benefits the future project (Nauwelaers et al., 2013: 10). Another challenge on the administrative level is the absence of the national authorities in the Øresund Committee, resulting in a weaker regulation involvement level. In order to overcome these challenges, the Øresund Committee developed the Action Plan during the last decade in the scope of which the prioritization of purposes, distinct targets and budgets including stakeholders beyond the Committee is considered along with the policies (Nauwelaers et al., 2013: 38). The Femern A/S can apply a similar strategy on the designation of the Action Plans due to the differences in competencies between the Danish and Swedish regions. The variations of the administrative structures between the two metropolitan cities had already negatively affected the cooperation development.

At the same time, the involvement of the Interreg programmes and STRING played a beneficial role for the Øresund Committee and project during its functioning. As for the Schleswig-Holstein and Zealand area, the Interreg A programmes derived the opportunity to enhance cross-border cooperation (Interreg, 2014). The Fehmarn Belt was an essential geographic focus of it. The Interreg programmes and funding is one of the projected possibilities for the forthcoming project, as well. Moreover, the Interreg strategy from 2021 to 2027 will modernize the criteria on cross-border cooperation and provide objectives on the interregional cooperation on innovation. These changes will horizontally impact the connectivity and both projects (Lierop, 2020).

As for the STRING, Hamburg, Schleswig-Holstein, West Zealand, Øresund Committee, and Fehmarn Belt Committee are its partners and observers. The functional geographies generated by the cooperation determine the tunnel's future operation prosperity (Interreg, 2018). The actors took part in the joint meetings of the corresponding ministers of Sweden, Denmark, Hamburg and Schleswig-Holstein, as well. The Fehmarn Belt region is a vital area for international competitiveness advancement through the scope of the STRING programme. It is because it will strengthen the role of the existing cooperation area in Øresund and stretch the efficient functional economic space from Hamburg to Copenhagen to Malmö and wider impacting the macro-region. In this case, the new regionalism theory is implicated due to the STRING region development to the North European green corridor level through the implication of the transport networks.

Concluding, the SWOT analysis of the Øresund Bridge project within the Regions and Innovation provided by the OECD in 2013 is another crucial notion for comparing the potentials of the projects. The investigation also concentrated on the Interreg IIIA programme in the region, its implementation and advantageous effects for the cross-border area. The indicated strengths are related to the internal mobility and accessibility that have increased since the establishment of the link. The notion also considered the elaborated internal integration within the Øresund Region, which affects the Baltic Sea region's connectivity levels. Another beneficial instrument is the Oresund Regional Development Strategy, which encourages cross-border interactions and discernment. Nevertheless, numerous regional and cross-border strategies and initiatives are applied in Øresund on the local, national and international levels. Moreover, as for the local actors, the Oresta and Øresund Institute conduct the promotion and branding policies and efforts for the bridge and area to be more recognized. As for the comparison with the future project, the infrastructure obtains similar strength in the form of a flexible and innovative link, which is expected to impact the micro and macro-regional segments of six sub-regions in Sweden, Denmark and Germany and transportation systems in the Baltic Sea Region.

The weaknesses concerning the project are the interest for the cross-border initiatives on the national level decreasing, even though it was relatively high during the first years after the bridge opening. Due to the effectively applied initiatives and projects during those years, the present and increasing regional imbalances are recorded between the core and periphery zones. Comparison of the weaknesses provides a similar situation in the second project, where the involvement on the administrative levels is limited due to the lack of approaches for increasing interest, especially among the non-metropolitan area actors.

As for the opportunities, the benefits of the bridge impacted the internal innovation tools aiming for cross-border cooperation. For instance, the accessibility and transport development opportunities are the additional connections and transport modes established in the region. Thus, the better integration to the TEN-T transport corridors provides an option to integrate internationally firmly. The Fehmarn Belt project opportunities constitute the knowledge-based economy and innovation sources application, as well. These sources in the Baltic Sea Region are developing, and it is expected to increase after the better connectivity establishment, especially in Northern Germany.

Thus, even though accessibility is granted, there are still threats to its uncompetitiveness regarding the labour market integration and share (Nauwelaers et al., 2013: 6). The similar

threats in the Fehmarn Belt area are the relatively marginalized territories in socio-economic terms, experiencing out-migration, which negatively impacts the labour market integration. Generally speaking, the Øresund region is an example of the crucial territories becoming more advanced and prosperous. The active transport infrastructure project serves as a solid basis for the research experience regarding the planning, construction and operating phases for the fixed link developed in the region. Both of the cross-border connections will significantly impact the regional connectivity of the Baltic Sea Region since the future tunnel will be opened. Naturally, there are differences and variations in terms of the projects' implication, pre-conditions and circumstances. However, the lessons derived from the first one serve as the basis for the recommendations for the second. The development of the new cross-border region in the Fehmarn Belt strait is also connected to the STRING cooperation area.

6. Indicated Challenges for the Connectivity of the Cross-Border Areas in the Baltic Sea Region

The new regionalism concept cannot be achieved without the harmonized cooperation, achieving and setting the common goals and conquering the challenges by the cross-border regions, states and macro-region as a whole. The territorial and geographical borders are becoming more notable. However, the non-physical and socio-economic, political and cultural factors remain the boundaries. The barriers and challenges are designed based on the analysis of the micro-regions of Øresund and Fehmarn and the transport infrastructure projects' impacts, comparisons and forecasts on the local, regional and European Union scales. The indicated challenges in cross-border integration and regional development serve as the basis for considering the connectivity challenges in the Baltic Sea Region.

Generally speaking, the challenges for regional connectivity are both physical and non-physical obstacles. The issues appear firstly within the scope of implementing the European Union Strategy for the Baltic Sea Region and its programmes, instruments and strategies. The main reason for it is the enormous geographical scope of the twelve states aimed to be developed and connected. Thus, in this case, the barriers consider the need to harmonize the legislation, market and economic prosperities, domestic capabilities of the states, and even the cultural and anthropological diversity factors (European Commission, 2009). In the Baltic Sea Region case, the challenges do not always require action on the domestic level. Instead, the joint addressing approach of sustainable development, environmental concerns, region's prosperity

improvement, accessibility and security are applied. Moreover, the improvement of the transport networks impacts each of the indicated above challenges and their maintenance.

The geographical cohesion of the Member States and their border regions tend to be undeveloped in terms of the transport connectivity in the Baltic Sea Region. According to the European Commission investigations, the lack of development of the sector is related to the imbalanced transport investments carried by the different authorities, who often do not establish harmonized cooperation. In this case, the challenge for the proper integration is the lack of practical cooperation (Christodoulou and Christidis, 2018: 5-6). The prominent examples of these barriers' presence can be designated based on the analysis of the planning and operating of the Oresund Bridge and Fehmarn Belt Fixed Link. The challenge for the projects' competitive impacts for the region considers the absence of the authority's involvement on the administrative level and their limited involvement due to the lack of approaches for increasing the interest. Cross-border cooperation is one of the main drivers for connectivity improvement, and the public authorities mainly handle it. That is why establishing the institutions and organizations governing the cooperation process and contacts is another crucial concern of the cross-border integration establishment in terms of the neo-regionalism concept (Perkmann, 2003: 156). The support by the supranational level actors provides the soft instrument in the form of the policies, which promote the opportunities and blur the challenges, such as migration and climate change, which cannot be dealt with on the domestic level. An example of the project implemented on the supranational level in the Baltic Sea Region is the TEN-T strategy, which focuses on connecting the well-developed regions with the marginalized ones. Thus, its objectives consider improving and establishing the transport modes and supporting the transport shifts from road to the more environmentally friendly ones. The project addresses the challenges concerning infrastructure modernization, innovation and decarbonization, which is hard to sustain on the domestic level in most cases. The regulation and application of the policy fall under the scope of the Member States responsibilities (European Union, 2020). The Interreg programmes, such as STRING and Green STRING-Corridor, address the challenges in terms of the transport infrastructure integrity and its impact on the environment and consumption of fuels. Environmental protection is one of the main concerns for the Member States and joint cross-border projects and network establishment. Not only legislation and administrative terms became the barriers, but also the criticism from the particular actors. In this case, the public, organizations, and authorities' objections towards the connectivity initiatives often derive from environmental protection concerns. Considering public attitudes is a crucial challenge for the connectivity establishment due to the possible

negative consequences for the local communities and non-profitability of the cross-border projects. The Fehmarn Belt Fixed Link is one of the essential examples located in the cross-border region, which designates the various projections' scenarios, including the possible consequences of its non-completion of feeder infrastructure impacting the regional connectivity. The transport links between Central Europe and Scandinavia are the areas that would experience challenges in this case due to the possible negative effect on the rail and intermodal transport allure and decreasing the opportunities concerning the TEN-T goal to connect the major economic centres across the corridor (Cox, 2020: 32-33).

Nevertheless, the cooperation of the cross-border region's objectives mainly focuses on eliminating the common challenges appearing in cultural, environmental, economic, institutional and social domains. More directly, these are the people-to-people, institutional and physical connections that depend on the transport, ICT, energy, trade and cultural and educational capacities, which need to be sustained and modernized according to the globalized trends (Medeiros, 2014). The challenges concerning the varying cultures, languages and socio-economic means are also crucial for better connectivity. The physical obstacles, such as mountains, sea, or hinder cooperation, play a role as the connectivity barrier (European Commission, 2002). The socio-economic challenges include conquering the impediments to the single market and the labour market concerns. For instance, the unemployment rates were an essential boundary for the cross-border integration for Malmö and Copenhagen at the end of the 20th century, which, however, were later eliminated by the fixed link establishment (Global Infrastructure Hub, 2020). Other patterns consider the economic growth level stabilization, movement of people, capital alterations, market structures and integration and adaptability of the infrastructure, which can be changed through accessibility improvement. The regulations development on the domestic level is another challenge to address due to the customs obligations and tax zones harmonization needs. These particular barriers can be seen in the experience of the first years of the Øresund Bridge functioning, which still partly affect the cross-border integration (Nauwelaers et al., 2013: 23). Generally speaking, the economic development and capacity variations in the connected areas are considerable boundaries. These imbalanced notions are present in the metropolitan areas of Copenhagen and Hamburg and areas experiencing decreasing growth in Mecklenburg-Western Pomerania and regions Zealand and Skåne. Moreover, the population composition and adverse demographic trends in the area are also impacting the disbalance challenges in the Baltic Sea Region. The trends consider the out-migration, ageing population, and high mortality rates, which are common for rural and border areas. According to the demographic projections, these negative features will

only increase in the Baltic Sea Region. These population proportions negatively impact the labour market competitiveness, which horizontally affects the connectivity prosperity (Femern A/S, 2013: 28).

Last but not least, the cultural barriers are also essential to address. The differences of the linguistic situations, regional aspects, historical preconditions, mentality and anthropological concerns have a relatively low potential for change but still impact the regional connectivity notions (Westlund, 1998).

Concluding, the challenges and barriers for the connectivity in the Baltic Sea Region include the geographical boundaries, unharmonized legislation and national strategies, different objectives of the interacting nodes and their importance on the regional level, administrative regulations' imbalances. Furthermore, domestic potential and economic capacity variations, market potentialities, cultural, mentality and linguistic components, negative demographic trends and marginalized rural areas, undeveloped infrastructure, spatial distortions, gaps in the planning process are considered barriers. Objections from the public and authorities and environmental determinants serve the basis for the obstacles, as well. Each of these challenges negatively affects the Baltic Sea Region's cross-border integration, regional development, and connectivity.

7. Foresight Perspectives of the Fehmarn Belt Fixed Link Project Impact on the Baltic Sea Region Connectivity

The foresight perspectives and forecasted impacts of the Fehmarn Belt Fixed Link project on the Baltic Sea Region connectivity can be designated based on the analysis of the micro-regions connectivity indicators, preconditions, characteristics, as well, as the comparison of the important transport projects in the connected areas and the SWOT analysis of the future project's competences. Therefore, the challenges mentioned above for connectivity are addressed by the infrastructure projects' objectives and their physical and non-physical outcomes on regional and cross-border integration.

The development of the transport corridors and networks are vital elements for connectivity improvement. The establishment of the transport links provides the opportunity for better nodes integration, which in general composes the connectivity. In the case of the Baltic Sea Region, it contains both hard and soft concepts. Particular links can play a fundamental function in connectivity development because it enforces joint actions, tools, and approaches. Furthermore, the transport projects tend to provide profitability for the engaging areas on the

local, regional, and even international scales (Straub et al., 2008). The strategic plans designated for the macro-region determine the benefits and opportunities from the possibility of sharing a region, sea area and network between such cities as Helsinki, Stockholm, Copenhagen, Tallinn, Riga, Gdansk, Hamburg and Saint-Petersburg (Stiller and Wedemeier, 2011: 38-40). The Fehmarn Belt Fixed Link proposes to connect the essential metropolitan areas of Hamburg and Copenhagen and thus stimulate the beneficial strategies implication. Moreover, the wealthy and developed regions tend to obtain complete transport activity levels, positively impacting connectivity and regional integration. Northern Germany is the leading economic growth area in the Baltic Sea Region, and that is why each of the national states aims to be connected to this developing centre. Sweden and Denmark are also crucial regional development drivers for the macro-region. The Nordic states also aim for sustainable infrastructure and cross-border connectivity improvement in all of its terms (Friman et al., 2019). The reason for it is the already effective cross-border networks is the shared cultural and historical conditions and similar national challenges and goals. Nevertheless, the more developed infrastructure brings the potential for domestic, interregional and international trade attention to social cohesion. The projects provide opportunities for strengthening the position on the internal market of the European Union for its Member States (United Nations Economic and Social Commission for Asia and the Pacific, 2012). The Fehmarn Belt project will directly connect the economic centres of the Baltic Sea Region along the Scandinavian-Mediterranean Corridor. These notions also designate the opportunities for connecting people in the region. Generally speaking, the more urban the cities and national states are - the more economic profit and advantages appear.

Furthermore, the fixed link will inaugurate more possibilities and opportunities towards advancing the market economy, regional spatial development, political relations, regional cultural assimilation and transport connectivity. The project will benefit the European Union objectives, the Baltic Sea Region and Germany, Sweden and Denmark. The connection is an indispensable gap for macro-regional connectivity. The reason for it is the project's role in addressing the crucial connectivity challenges. Moreover, the innovative operation of the project is expected to be provided under the essential priorities for the regional integration, including the lowering of the risks and issues for the inhabitants, infrastructure and environment caused by hazards, the source of which is the air and marine pollution. Thus, the environmental protection concerns are closely interconnected with the regional development plans, where better connectivity is regarded as possible through innovation and green approaches (European Commission, 2009).

Following the notions of challenges and cross-border barriers exclusion, it is vital to mention that the Fehmarn Belt Fixed Link project's central goal is to lessen the presence of "border" itself in varied aspects. Both states taking part in the project establishment focus on the common obstacles and designate action plans by assembling cooperative structures and instruments. Physical, institutional and people-to-people connectivity on the micro and macro-regional scales depend on defeating the issues concerning cultural, environmental, economic, institutional and social domains (Medeiros, 2014). Moreover, Denmark, Sweden and Germany obtain the high potential for influence on regional efficiency and an exceptional opportunity to build cross-border cooperation and modernize the connectivity in the Baltic Sea southwest area. It is also projected to contribute to the connection of Hambourg, Copenhagen and Malmö to Central Europe (Walsh et al., 2015). The project composes the second phase in the integration of Scandinavia with the rest of Europe, after the Øresund Bridge. Six subregions in the three integrated states are expected to be influenced by the new connection on an enormous scale (Femern A/S, 2013: 26). For instance, the marginalizing region of Schleswig-Holstein is supposed to gain new trading opportunities and access to vital neighbouring markets. Moreover, another advantageous outcome is the better access of Scandinavia to its south Danish border markets, including the metropolitan area of Copenhagen, which is also a crucial element of regional connectivity. Thus, the tunnel will directly impact the trade and political relations strengthening between Denmark, Sweden, Norway, Finland, Germany, and Central and North Europe. The new connection is perceived as the backbone of the transport in the forthcoming new European region by providing preconditions for further regional spatial development. The areas around the fixed link will be improved, and the cooperation between the urban nodes of Hamburg, Kiel, Rostock, Copenhagen and Malmö will be advanced. The Fehmarn Belt project will strengthen the multiple segments of the economy, business networks and people-to-people connections. The knowledge exchange and interaction between more than nine million people will also impact the Baltic Sea Region connectivity (Femern A/S, 2020).

Moreover, the link is planned to comply with the regional globalization and urbanization trends through the transport corridors modernization along with the medium-sized and metropolitan cities (McKinsey and Company, 2018). These cities will be the crossing areas, gaining better access to the other areas within the macro-region. Such consequences have a direct impact on the transport systems and corridors effectiveness and functioning. Moreover, the TEN-T transport corridors follow the interconnectivity purpose. The new link will impact the ones located in the Baltic Sea Region, where the traffic flows will have long-term effects and

potential for the new networks' development (TENTacle, 2018: 38). Many investigations are carried on the traffic volumes and developments, such as the research done by the Interreg, TEN-T experts and Institute of Shipping Economics and Logistics representatives. The traffic flows are essential for the goals of the macro-regional strategy on the Baltic Sea Region due to its long-term regional effects. Thus, modeling the expected traffic flows and volumes was conducted (TENTacle, 2018: 12-16). The Scandinavian-Mediterranean Corridor is the longest corridor, with such quintessential infrastructure connections as the Øresund Bridge, Fehmarn Belt Fixed Link in construction and the Brenner Base Tunnel Corridor. Furthermore, the future fixed link is expected to be the crucial element between the other two for the North-South axis (European Union, 2020).

Nevertheless, the connectivity impacted not only the physical matters but also the socio-economic ones. Such assumptions consider people-to-people connectivity means advancement through the application of the transport link. In this case, the possibilities for labour migration and educational opportunities are increasing. Meanwhile, the transport networks impact the more accessible mobility of these flows and integrate the engaging nodes (United Nations, 2014: 15-45). The Fehmarn Belt Fixed Link project is projected as the instrument advancing the socio-economically undeveloped areas by enhancing the cultural exchange. The increased people's mobility enforces cultural penetration, leading to the similarities between cultures (Verjans et al., 2015: 2). Therefore, the cross-border collaboration practicalities will improve the cultural exchange on both local and regional levels. Following the notion of mobility, the link is expected to beneficially affect the business and SMEs networks, which estimates more dependable information sharing flows (Hill, 2020). Generally speaking, the knowledge-based economy and people-to-people relations are stimulated by connectivity and positively affect its improvement vice versa. This kind of economy is obtained along with the innovation trends, including the transport infrastructure. It also provides significant sources for productivity improvement across the various sectors in the cross-border regions and the regional knowledge-sharing links of the Baltic Sea Region (United Nations, 2014: 16). The direct links with the innovation centres, such as Hamburg, will beneficially impact the Eastern states knowledge-based economy. The steps of advancing the people-to-people connections through physical accessibility will benefit each of the states in the region in the future (Stiller and Wedemeier, 2011: 11).

Last but not least, the greening of the Baltic Sea Region is another expected outcome of the Fehmarn Belt Fixed Link. Firstly, the shift from maritime shipping to the on-land and railway one is beneficial for sustainable macro-regional development. Furthermore, the spatial

modernization and innovative tunnel will benefit the strategic notions designated by the European Union, such as the European Green Deal strategy and the STRING network macro-regional initiative covering the area from Hamburg to Øresund (Stiller and Wedemeier, 2011: 19-28). Thus, the process of greening the transport sector is an element of connectivity improvement. Furthermore, the immersed tunnel will decrease the ferry shipping volumes and shift to the railway networks and impact the decarbonization of the transportation modes within the Baltic Sea Region. Therefore, the competitiveness of the network is one of the perspectives enacted by the fixed link outcomes (Guasco, 2014).

In conclusion, the impact of one transport project and connection is essential in terms of the connectivity development of the Baltic Sea Region, concerning its physical and information share, economy, political and people-to-people dimensions. The harmonized transport connectivity is a fundamental driver for the integrated areas and communities. The modernization of the existing links and the development of new ones creates the prosperity grounds for further regional development. The Fehmarn Belt Fixed Link project obtains the potential to affect cross-border integration on the micro and macro-regional levels beneficially. The forecasts of the project designate the spatial development opportunities, economic growth, internal market integration and possibilities for business networks and communities' integration. The innovative perspectives of the project settle the environmental protection goals, which collaborate with the UN Sustainable Development Goals, TEN-T policies and Interreg programmes. However, there are still negative aspects regarding the project's future maintenance and prosperity, which have to be sustained by the proper planning, construction and external compliance, such as globalization or urbanization trends, which affect the connectivity on the macro-regional level. The over-estimated connectivity is a concern of the private and public actors. However, it can be opposed from the previous projects' experiences, outcomes and efficiency of the transport corridors in the region.

Conclusion

The Baltic Sea Region connectivity is one of the main objectives of micro and macro-regional strategies, plans and policy agendas. Comprehensive connectivity, cross-border cooperation and regional integration development are vital for connecting economies, markets, communities and states. The Øresund Bridge and Fehmarn Belt Fixed Link project are examples of competitive transport connectivity instruments that beneficially impact the macro-region in multiple connectivity segments, including soft and hard dimensions. The infrastructure projects are crucial elements of the modernization of transport networks, creating a more competitive region, common challenges addressing and complying with the fundamental goals of the domestic and European Union.

The research aims to identify the Fehmarn Belt Fixed Link outcomes and their impact on the connectivity development in the Baltic Sea Region based on comparing the effects of the Øresund Bridge Project and qualitative analysis of the project's strengths, weaknesses, opportunities and threats. Another aim of the research was the comparison approach applied is to derive the recommendations which can be taken from the experience of the Øresund Bridge Project planning, constructing and functioning for the upcoming project. Based on the qualitative analysis of both projects' impacts on the connectivity segments, it can be concluded that both of the infrastructure transport projects play a crucial role for the connectivity development in the micro-regions and the Baltic Sea Region due to the considerable strengths and opportunities of the Fehmarn Belt Fixed Link project and recommendations derived from the comparison with the effective functioning Øresund Bridge Project, which can be applied for the weaknesses and threats addressed by the future project. Both methodologies' results indicate the usefulness of the previous experiences on the planning, construction and maintenance stages application and particular impacts on the connectivity improvement forecasts, which confirm the fundamental role of the project for the region.

The main objectives of the Thesis were followed and concluded the analysis of the transport connectivity in the Baltic Sea Region and the transport networks performance in the cross-border cooperation within it. The European Union instruments and programmes also play a crucial role in the theoretical analysis conduction. The study on the compliance of the existing transport Øresund Bridge project and future Fehmarn Belt Fixed Link project with the European Union and national strategies and programmes were acknowledged. The connectivity indicators and notions of the Øresund Strait and Fehmarn Belt areas were analyzed concerning the infrastructure transport connections' preconditions, characteristics, and outcomes. The

SWOT analysis of the Fehmarn Belt Fixed Link Project impacts the connectivity in the Baltic Sea Region was provided, with a continuing focus on the comparison with the functioning Øresund Bridge Project and deriving of the recommendations on the challenges addressing and practical application of strengths and opportunities segments. Finally, the forecast on the Fehmarn Belt Fixed Link Project effects on the connectivity in the Baltic Sea Region was provided with attention to the qualitative approach results and theoretical reviews on the connectivity development level and indicators.

By evaluating the transport infrastructure projects and the micro-regional territories from Hamburg across Schleswig-Holstein and the western part of Mecklenburg-Vorpommern, the Danish islands of Lolland, Falster and Zealand to Skåne in southern Sweden, this demonstrated the connectivity challenges in terms of the Fehmarn Belt Fixed Link project designation addressed by the Thesis objectives. In this case, the barriers are both physical and non-physical obstacles. In the first case, the geographical aspects serve as the basis for challenges during the transport project's construction, planning, and maintenance stages. As for the soft dimension of the challenges, they are diverse objectives of the cooperating nodes and their distribution, discrepancies in the municipal and state administrative arrangements, internal potentials and probabilities, power distribution within the micro and macro-regions, economic and market capacities, stakeholders' and authorities involvement, cultural and linguistic segments, marginalized rural areas, negative demographic trends, criticism from the public and private actors, social concerns and environmental determinants. Moreover, the differentiation of the integrating states plays a role in the obstacles for the regulations and policies due to planning segmentation between the distinct actors, markets, and administrations. In the construction project example, Germany and Denmark met issues during the agreement and planning stages. Furthermore, another connectivity challenge for the Fehmarn Belt Fixed Link is the undeveloped border regions in socio-economic and spatial terms. The project also addresses the challenges concerning infrastructure modernization, innovation and decarbonization, which is hard to sustain on the domestic level in most cases.

The SWOT and comparative analysis of the transport projects concludes the lessons and experiences from the currently functioning Øresund Fixed Link. The Øresund Bridge can be regarded as one of the most significant traffic drivers in the macro-region. Thus it is one of the prominent examples, which experience in each phase can be applied to establish the Fehmarn Belt Tunnel. Furthermore, the area from Hamburg to Copenhagen and Malmö has similarities. The comparison provides the challenges and concerns that can be addressed during the future project's planning, construction, and operation. The cross-border integration establishes

possibilities for eliminating the common challenges appearing in cultural, environmental, economic, institutional and social domains. Mainly, the people-to-people, institutional and physical connections that depend on transport, economic, social, cultural and educational capacities must be sustained and modernized according to international and regional trends. The transport connection serves as the physical basis for the challenge's elimination. The analyzed strengths of the Fehmarn Belt Fixed Link project designate the grounds for its potential in addressing these challenging dimensions and beneficially affecting regional connectivity and cross-border integration on the various levels. The expected project's outcomes claim the spatial modernization, economic growth potentials, integration on the internal market, opportunities for the people-to-people connections and transport corridors improvement. The opportunities which the project's stakeholders can apply are the harmonized legislation, state aid funding, internal market freedoms and regulations, proximity to the metropolitan urban centres and already integrated communities. These opportunities derive the probabilities for further connectivity development through the new transport link setting and connectivity challenges elimination.

Generally speaking, the Fehmarn Belt Fixed Link Project will beneficially impact the connectivity development of the Baltic Sea Region. The project is forecasted to harmonize the transport connectivity, which is significant for the regional and cross-border integration on the micro and macro levels. The project will benefit the European Union objectives, the Baltic Sea Region, and Germany, Sweden, and Denmark. The connection is an indispensable gap for macro-regional connectivity.

The hypothesis formed can be claimed as proven due to the reason that the qualitative approach and analysis concluded that the connectivity development of the Baltic Sea Region depends on the connectivity development of the cross-border areas and their integration. The transport infrastructure projects significantly impact regional connectivity development and provide more competitive region development opportunities, common challenges addressing, concentrating on the European Union and macro-regional and domestic goals. The Øresund Bridge and Fehmarn Belt Fixed Link project are crucial rivers for the lift of the connectivity of the Baltic Sea Region. Referring to Perkmann (2003), the Fehmarn Belt Fixed Link is a component of the fundamental drivers for connectivity improvement in the new-regionalism concept. According to Friman (2019), connectivity development is connected to the harmonization and modernization of transport networks, which depicts the prosperity of the future link between Germany and Denmark. The connectivity in the Baltic Sea Region has its

particular challenges, but their elimination and addressing by establishing the transport infrastructure results in prosperity and compelling functional advantages and outcomes.

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