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FUTURE OF THE EUROPEAN DATA CENTER INDUSTRY

Analysis of the industry and the market opportunities for future expansion

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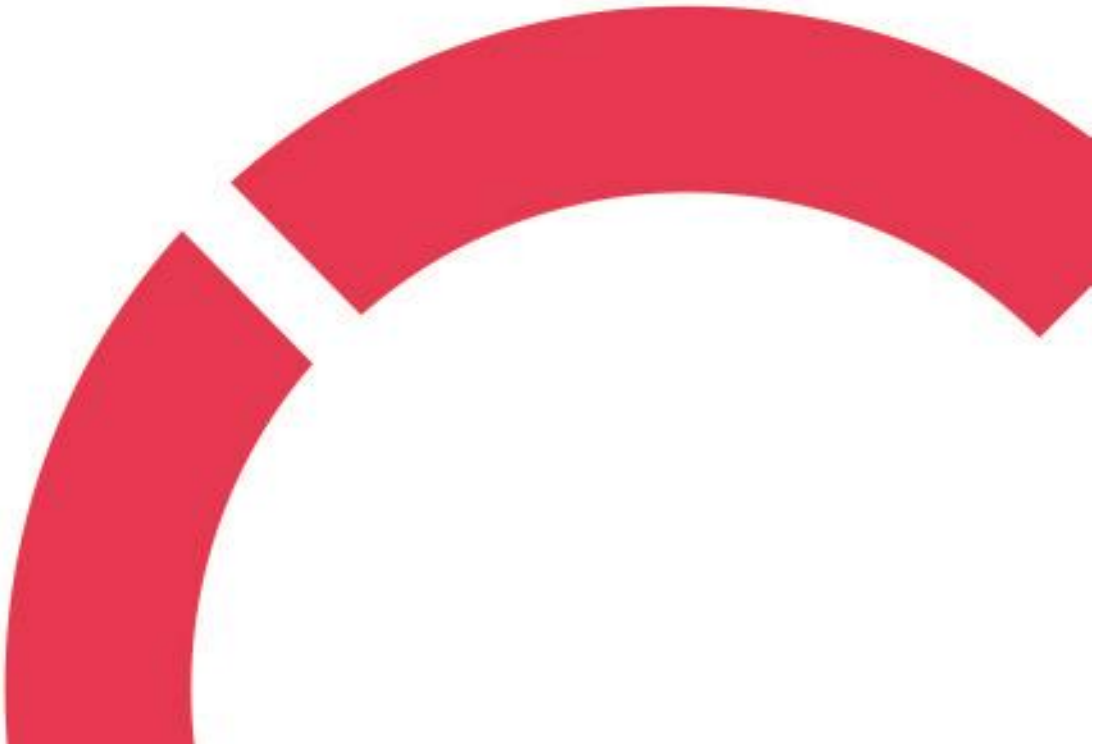

ABSTRACT

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In this thesis, a market opportunity analysis and market selection for future European data center industry expansion were conducted. The purpose was to understand the data center industry in Europe and to explore the opportunities to expand it. Based on the research findings, the main objectives were to determine which factors had the biggest impact in local market expansion by analysing the current state of the industry in Europe, as well as to research the factors that most influence the quality and functionality of a data center, conduct a systematic market selection process, determine which countries would be the most viable location candidates to develop the industry within and provide market entry recommendations for the selected countries.

The theoretical framework consisted of research on the topics of market opportunity analysis, market research, market selection and market entry strategies followed by an examination of the European data center industry based on qualitative and quantitative secondary data from sources commonly considered reliable, upon which an assessment and comparison were carried out to determine the factors contributing to the 2024 international environment.

Consequently, the data center industry was investigated to identify the factors prioritized in the decision-making process of industry development. Based on these findings, the PESTEL tool was utilized to conduct a preliminary screening of all European countries, with relevant statistical data collected from ethical sources. Ranked tables were then created for all analysed factors, with general conclusions drawn from political, economic, social, technological, ecological and legal perspectives.

In a final step, the resulting information was compiled into two tables summarizing each European country's performance across the six categories of factors, including those with the most favourable statistical data for local data center industry expansion and those with the least favourable data. A market opportunity analysis was conducted and the final best candidates for local expansion were determined by excluding countries where the industry was already well developed, aiming to achieve equitable, uniform international expansion. The thesis concluded with considerations on potential market entry strategies for the selected countries: Croatia, Czechia, Denmark, Finland, Ireland, Latvia, Lithuania, Portugal, and Slovenia.

Key words
Data center, Europe, market entry strategy, market research, market selection process, market opportunity analysis

CONCEPT DEFINITIONS

DC

Data Center

FDI

Foreign Direct Investment

GDP

Gross Domestic Product

GNP

Gross National Product

HVAC

Heating, Ventilation, Air Conditioning

MW

Megawatt

PBDC

Purpose-Built Data Centers

PESTEL

Political, Economic, Sociocultural, Technological, Environmental, Legal

PPP

Purchasing Power Parity

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1 INTRODUCTION

This thesis focuses on analysing the European data center (DC) industry and its expansion. Currently, most European DCs are being built in a few Western countries, mainly Germany (487 DCs), UK (456 DCs) and Netherlands (281 DCs), while other European countries have as few as one DC (Figure 1). In order to continue expanding the DC industry efficiently, a thorough analysis of the industry growth, market potential and opportunity should be conducted.

The main purpose of this thesis is to understand the DC industry in Europe and to explore the opportunities to expand it. In order to do so, an overview of the industry and how it came to function as it does today will be developed by investigating the reasons why the DC industry developed unevenly across Europe and uncovering what were the most important expansion deciding factors, which will help provide an industry guideline on the priorities that need to be considered in order for the best possible outcome to be reached. Learning the driving factors of the expansion of this industry by investigating factors that ensure suitability for local DC development will uncover the most significant strengths and weaknesses that need to be considered in the decision-making process.

The main objectives of this thesis will be to first determine which factors had the biggest impact in local market expansion by analysing the current state of the industry in Europe, as well as research the factors that influence the quality and functionality of a DC the most, conduct a systematic market selection process, determine which countries would be the most viable location candidates to develop the industry within and provide market entry recommendations for the selected countries.

This thesis will start by learning the current state of the DC industry in Europe and the factors that drove its development. Afterwards it will continue with learning which local factors make a certain country the best option on the international market and how to prioritize them. Lastly, it will rank the European countries for future development based on the learned factors.

Another aspect this thesis is going to consider is the construction of the DC building itself. Construction of DCs is a niched section of the construction field as this particular type of building has a multitude of specific design and technical requirements that must be considered to achieve quality operations. DC construction projects are complicated but precise and despite the fairly new entrance on the market, they are being built across the world at a fast rate in order to cover humanity’s increasing need

for cloud storage. Looking at construction specifics is an important aspect of selecting new potential DC locations as it impacts its functionality, cost, maintenance and operation.

Most DC construction projects are bid by international clients and built in a remote location, using teams and resources that are both local and imported, depending on specific needs. Based on the author's personal experience of working for 5 years in the DC construction industry representing both investing clients and construction crews, the research will begin starting from a personal hypothesis that the most important factors that need to be met by a good DC location are energy efficiency or access to renewable energy – as DCs consume a very high amount of power to function, it has a strong impact on its operating cost and its environmental effect; data security – as the building should be safe enough to store users' sensitive information; and high speed telecommunication network – as it is vital to be interconnected with the network.

The research methodology of this thesis begins with a theoretical exploration of market opportunity analysis, market research, and market entry strategies. Utilizing secondary data, including both raw and compiled sources, the author conducts a structured analysis of the European DC industry. This includes a literature review, secondary data analysis, and utilization of tools such as PESTEL analysis to assess political, economic, social, technological, ecological, and legal factors across European countries. Through quantitative and qualitative analysis, the methodology aims to identify potential expansion locations, focusing on equitable international expansion and considering regulatory environments, market demand, and local competitive advantages.

This thesis is divided into two main themes: a theoretical framework included in Chapters 2 and 3, as well as a practical application included in Chapters 5 to 7. Chapter 2 and 3 contain the theoretical framework and research conducted on existing literature on the main research topics: market opportunity analysis, market research and market entry strategy. Chapter 4 describes the research methodology. Chapter 5 explores research of the DC industry, including its history, development, expansion requirements and location selection. Chapter 6 contains a practical application of the preliminary screening and PESTEL analysis. Chapter 7 is a practical application of the market entry considerations applied for the expansion of the European DC industry. Lastly, Chapter 8 includes overall conclusions on the research, the practical application results, reflections on the initial hypothesis and information on the thesis's ethics and reliability.

2 RESEARCH ON MARKET OPPORTUNITY ANALYSIS

In today's globalized market, identifying profitable market opportunities is essential for businesses looking for sustainable growth and competitive advantage. Market opportunity analysis aims to guide organizations through the complex process of evaluating potential markets and making informed decisions about market entry and expansion strategies. This chapter provides an overview on market opportunity analysis, drawing insights from Doole, Lowe, and Kenyon's "International Marketing Strategy" (2017), Stevens, Sherwood, Dunn and Loudon's "Market Opportunity Analysis" (2002), Rana and Shrivastava's "Doing Business in Emerging Markets" (2007) and Hollensen's "Global Marketing" (2014).

2.1 Market segmentation

Market segmentation is a process that helps divide a large group of target markets into subgroups by using various relevant characteristics that could separate them into different segments with shared properties (Doole, Lowe & Kenyon 2017, 122-146). These characteristics could be based on geographic, demographic, product usage and product benefit factors (Stevens, Sherwood, Dunn & Loudon 2002, 32-38).

Market segmentation based on geographic factors divides markets by using geographical borders such as cities, regions or countries. Demographic segmentation is based on dividing factors such as age, gender, income or education. Segmentation by product usage patterns divides consumers between users and nonusers in order to determine usage rates. Segmentation by perceived benefits classifies consumers based on the sought benefits for a certain product or service. (Stevens, Sherwood, Dunn & Loudon 2002, 32-38.)

Market segmentation helps businesses assess a wide international market area in a time and cost efficient manner by indicating how to prioritize the targeted markets, as well as indicating the unique preferences of different customer segments (Doole, Lowe & Kenyon 2017, 122-146). Traditional segmentation criteria (measurability, accessibility, profitability and actionability) can also be effective (Stevens, Sherwood, Dunn & Loudon 2002, 32-38), however, contemporary segmentation strategies are

proven to be more accurate thanks to using psychographic, behavioural and technographic criteria which refines the segmentation significantly (Doole, Lowe & Kenyon 2017, 122-146).

Psychographic segmentation is based on lifestyle dividing factors such as customer activities, interests and opinions (Doole, Lowe & Kenyon 2017, 122-146). Behavioural segmentation is based on patterns of consumption, brand loyalty, sought benefits and buying motivation (Hollensen 2014, 273-286). Technographic segmentation is based on patterns of consumers' technological adoption and usage, such as digital behaviours and preferences (Doole, Lowe & Kenyon 2017, 122-146).

The main type of market segmentation that businesses tend to use is based on geographical criteria. Once certain countries are selected, some businesses may choose to refine their market strategy by segmenting the market further based on additional national segmentation criteria such as demographic, economic and psychographic (Doole, Lowe & Kenyon 2017, 122-146). For a global market segmentation that considers country specific factors, Hassan and Stephen (2005) propose a hierarchical approach which recognizes both similarities and differences across markets, enabling business to develop cross-national market segments. This strategy focuses on consumer characteristics rather than countries, avoiding national stereotyping and acknowledging variations within nations (Doole, Lowe & Kenyon 2017, 122-146).

The implementation of a hierarchical segmentation strategy involves several stages starting with the assessment of the infrastructure availability and accessibility of the initial targeted global market. The viable countries are then compared based on favourable criteria related to market size and demand in order to determine mini-segments considering factors such as information search, behaviour and product preferences. Similarities across segments are then analysed from the perspective of various relevant factors and finally, cross-national segments are identified based on patterns of similar responses. (Doole, Lowe & Kenyon 2017, 122-146.)

Once market segments are determined and customer characteristics identified, market potential can be estimated in order to understand the expected sales volume on each segment. This process provides a quantitative measure that helps evaluate profitability and determine the viability of a specific market segment (Stevens, Sherwood, Dunn & Loudon 2002, 32-38).

Macro-oriented market screening tools, such as PESTEL analysis, help businesses assess external factors, including political, economic, social, technological, environmental and legal as it helps provide a list of issues that can influence the business strategy (Hollensen 2014, 273-286).

2.2 PESTEL analysis

One of the best tools that can be used for understanding the macro-environment and its trends is the PESTEL analysis, also known as STEEP, as it helps provide a list of issues that can influence the business strategy as well as identify factors that can potentially lead to changes based on the main macro-environmental factors, listed by Wheelen (2018, 129) as: political (indicators include the form of government, political ideology, stability of government, attitude towards foreign companies, terrorist activity), economic (indicators include development, income, GDP trends, monetary and fiscal policies, currency, wages), social (indicators include customs, language, demographics, lifestyle, religion, attitude towards foreigners), technological (indicators include regulations, energy availability and cost, natural resources, transportation network), ecological (indicators include non-governmental groups, environmental causes, recycling infrastructure) and legal (indicators include tax laws, regulations on foreign ownership of assets, trade regulations, foreign policies).

Political factors can influence a business's local and international operation through political pressures that impact the home country's international business expansion decisions due to political threats in the host markets, need of adaptation to new regulatory environments, taxation guidelines, political stability, trade regulations, labour laws and safety regulations. Governmental organizations' level of foreign business support also has a great impact on international expansion particularly through regulatory backing and financial assistance policies. Access to accurate information about the host markets' political environment is essential for an effective political preliminary screening. (Wheelen 2018, 127-156.)

Economic factors tend to impact a business's profitability due to the direct impact of economic issues in the host country with indicators such as gross domestic product (GDP), inflation, interest rates and credit availability. While developing countries tend to be overlooked in market opportunity assessments, according to the International Monetary Fund, even though they account for less than a third of the world's GDP, they also make up more than half of the global GDP growth. The economic development of Brazil, Russia, India and China (BRIC) has seen an important impact on the global economy,

with China becoming the world's second-largest economy in 2007, India the primary location for out-sourcing services, computer software and telecommunications, and Eastern Europe one of the main manufacturing suppliers for the European Union. (Wheelen 2018, 127-156.)

Socio-cultural factors help businesses understand how the needs of consumers are formed and what motivates them to purchase a service or product. Some of the main factors influencing customer preferences, purchasing decisions as well as package design and marketing are local culture, language, customs, values and norms (Doole, Lowe & Kenyon 2017, 78-104). Hollensen (2014, 244-263) defines culture as the learned ways in which a society understands, decides and communicates. Languages are an important component of culture and communication therefore understanding both spoken and silent languages is essential.

Communication techniques vary across different nations, with some languages being based strictly on words, while others taking into account surroundings, the social status of the message giver or other non-verbal elements. High-context cultures such as Japan and Arab countries rely more on indirect communication and prioritize relationship-building, while low-context cultures like those in Northern Europe prefer direct communication and individualism. (Hollensen 2014, 244-263.)

The sociocultural environment is also influenced by demographic changes, lifestyle trends and social dynamics, for instance, generational groups such as Millennials and Generation Z show different preferences when it comes to consumption patterns and brand perception (Doole, Lowe & Kenyon 2017, 78-104). Social changes, such as increasing urbanization and environmental awareness, shape the consumer’s attitude towards sustainability, ethical sourcing and corporate social responsibility (Hollensen 2014, 244-263). Other cultural indicators such as religion, education, family and socio-economic factors tend to influence individual behaviour and decision-making in business settings as well.

Societal environments also have impact how multinational corporations (MNCs) conduct their activities, such as marketing, manufacturing and finance. For example, MNCs operating in Europe have lower labour productivity due to a shorter workweek and restrictions on laying off unproductive workers compared to other continents. This situation influences European based MNCs to expand their operations to other foreign countries where labour is cheaper and labour productivity is higher. Firms need to be flexible in order to accommodate the many differences in societal environments among countries. (Wheelen 2018, 129-150.)

Ecological factors such as carbon footprint, climate change, extreme weather events or access to natural resources, have a great impact on potential markets as they can pose a wide variety of risks as well as opportunities. The ecological aspect of the environment has been changing, making it challenging for businesses to keep up with updating their policies to minimize their impact on the natural environment. Climate change has a significant impact on businesses as well, creating multiple types of risks which could be mainly categorized as: regulatory, supply chain, product and technology, litigation, reputational and physical risks. (Wheelen 2018, 129-150.)

Regulatory risks apply to compliance with regulations related to environmental issues. The Kyoto Protocol's first commitment period required 37 industrialized countries and the European Community to reduce greenhouse gas (GHG) emissions to about 5% against 1990 levels, while the second commitment period required the members to commit to reduce emissions by at least 18% below 1990 levels from 2013 to 2020. The European Union has an emissions trading program that allows companies that surpass a specific GHG emission level to buy additional allowances from companies whose emissions are lower than the allowed level. Businesses can also earn credits for their emissions. The risk of litigation rises for companies that produce large quantities of carbon emissions as they face the possibility of lawsuits. (Wheelen 2018, 129-150.)

Supply chain risk is another category of risk that companies face due to suppliers passing carbon related expenses enforced by governmental regulations onto their clients. Global supply chains are also at risk due to the increasing frequency of major storms and flooding, which continues to cause problems for ports due to rising sea levels. Additionally, transportation costs have also been increasing due to the scarcity of fossil-based fuel. (Wheelen 2018, 129-150.)

The risk associated with product and technology is that environmental sustainability is starting to enforce multiple regulatory conditions on businesses. A study conducted by Environics revealed that 60% of U.S. participants are more likely to purchase products and services from companies that are conscious of their impact on the environment. (Wheelen 2018, 129-150.)

The risk of litigation is mainly faced by companies that produce substantial carbon emissions. An example of this risk is the lawsuit filed against oil and gas companies in the federal district court of Mississippi, claiming that businesses such as tabaco, oil and gas companies were responsible for contributing to the severity of hurricane Katrina through their high GHG emissions. (Wheelen 2018, 129-150.)

Reputational risk is another concern for companies as their impact on the environment can have a significant effect on the overall image that customers perceive them through. Negative perceptions related to climate change can put the value of a company's brand at risk. On the other hand, companies with a good record of environmental sustainability may have a competitive advantage in attracting and retaining loyal consumers, employees and investors. (Wheelen 2018, 129-150.)

Climate change is a direct physical risk through droughts, floods, storms and rising sea levels, which have resulted in the melting of glaciers and an increase in sea levels by 2.5cm per decade due to a two to three degrees Celsius increase in average Arctic temperatures over the past 50 years. (Wheelen 2018, 129-150.)

Legal factors such as industry regulation policies, permits required to operate or employment laws tend to impact both industry competition levels and the effectiveness of business strategies. High taxation rates and labour laws in Western Europe influence companies to change their competitive strategies or relocate to other countries. For example, due to Germany's high labour and tax costs, German companies need to compete in the high quality products market or move their manufacturing operations to lower cost countries. Governmental bureaucracy can also create regulations with high impact on business operation profitability, making some countries more viable than others. (Wheelen 2018, 129-150.)

A company that operates in different geographic regions deals with a wide variety of unique societal environments that include a diverse range of sociocultural, technological, economic, ecological, political and legal variables. The societal environment can vary so much from one region to another that the business must be highly adaptable in its internal environment and strategic management process in order to thrive. Successful international expansion depends on adapting to local market conditions, building relationships with key stakeholders and maintaining adaptability in response to the evolving market dynamics.

2.3 Use of secondary data

Various sources including public libraries, electronic databases and internet resources provide valuable information for preliminary market screening. However, technological progress revolutionized international market research by offering easy access to online databases of secondary information. These da-

tabases have a significant advantage over printed data sources as they facilitate access to updated information which can easily be accessed from anywhere in the world. Some of the main advantages of online databases of secondary data include real time updates, cost effectiveness, 24/7 accessibility and targeted information retrieval. The consolidation of global market information into these databases allows researchers to conduct comprehensive studies and access critical information for international marketing strategies with more ease than ever before (Doole, Lowe & Kenyon 2017, 132-133).

Oftentimes businesses need to determine whether an opportunity is worth chasing without investing a large quantity of resources upfront. Employing a "quick and dirty assessment" (Stevens, Sherwood, Dunn & Loudon 2002, 38-40) approach can provide valuable insights early in the evaluation process by combining the census of business, the census of selected services, of wholesale trade, of manufacturing, of population and other censuses. These databases can be used to estimate the number of customers, the market size, sales potential and competitiveness, helping businesses reach a preliminary understanding of the market. Using available secondary data can help businesses estimate market potential and make sales projections, however, it is important to cross-validate estimates using alternative calculations and considering factors such as costs per capita to achieve a more accurate assessment (Stevens, Sherwood, Dunn & Loudon 2002, 38-40).

While online databases offer a wide range of advantages, ensuring the credibility and validity of the data remains the researcher's responsibility. Despite the multitude of benefits, researchers need to evaluate the reliability of the online sources that they are using in order to mitigate the risk of misinformation. While secondary data is valuable in international marketing research, several challenges must be considered due to variations in data quality and consistency across countries. One of the main issues may be the availability of quality secondary information, which can vary significantly between countries. Differences in units of measurement and data collection methodologies as well as political considerations can impact the accuracy of the data leading to discrepancies in the reported values. (Doole, Lowe & Kenyon 2017, 132-133.)

Another disadvantage of using secondary data is potentially working with outdated information which may mislead researchers and affect the relevance of their findings. Developing countries are known to be the most likely to face inconsistencies in data classification and shortage of reliable data. Despite these limitations, secondary data remains a valuable source, especially for smaller businesses that lack resources for primary research. Online databases offer access to real time information for international

market research, increasing the efficiency of the decision-making processes. By understanding and addressing the limitations of secondary data, businesses can use it to assess global markets effectively. (Doole, Lowe & Kenyon 2017, 132-133).

3 RESEARCH ON MARKET ENTRY STRATEGY

Expanding a business internationally can be a great opportunity for any organization, but it requires careful planning and analysis. Choosing the right market and understanding the opportunities it presents can make the difference between success and failure. This chapter will discuss the importance of market entry strategy, mainly based on Svend Hollernse's "Global Marketing" (2014), Thomas Wheelen's "Strategic Management and Business Policy" (2018), Doole, Lowe, and Kenyon's "International Marketing Strategy" (2017), Stevens, Sherwood, Dunn and Loudon's "Market Opportunity Analysis" (2002) and Rana and Shrivastava's "Doing Business in Emerging Markets" (2007).

3.1 Market entry strategy

Market entry strategies include a range of approaches for entering new markets, each with its own advantages, risks and considerations. Once a certain foreign country has been selected for expansion, the business has to decide which is the best way to enter its market by assessing each entry modes' advantages and disadvantages and deciding which are best suited for its type of activity, as well as which are best suited for the internal environment of said foreign country. The main types of entry modes are export modes, intermediate modes (contractual) and hierarchical modes (investment). (Hollensen 2014, 336.)

Export modes are the most focused on externalizing the business which gives the least amount of control over the new investment. Business can be practiced indirectly by using a middle man, or directly by remotely controlling the sales, most often with the use of the internet. This mode's advantage is a high level of flexibility and low risk, while its disadvantage is a low level of control. The intermediate modes are mainly contractual such as setting up licenses, franchises, joint ventures or strategic alliances. This particular split ownership setup means that the control and risk are shared but the flexibility is low which is the main disadvantage. The hierarchical modes are used when the company is willing to make a substantial investment in the new market by making acquisitions or establishing new wholly owned subsidiaries. This mode's advantages come from the full internalization which means it has the highest level of control compared to the other entry modes. The disadvantages are high risk and low flexibility. (Hollensen 2014, 332-339.)

The simplest form of market entry is export, which involves selling products or services to customers in foreign markets (Doole, Lowe & Kenyon 2017, 167). Exporting offers low entry barriers and allows companies to test international waters with minimal investment. However, it may limit control over distribution and expose firms to currency fluctuations and trade barriers.

Licensing and franchising involve granting foreign entities the right to use intellectual property, trademarks, or business models in exchange for royalties or fees (Hollensen 2014, 332-339). This approach enables rapid market entry while minimizing investment and operational risks. Joint ventures and strategic alliances create partnerships with local firms to leverage their market knowledge, resources and local distribution networks (Stevens, Sherwood, Dunn & Loudon 2002, 3-7). Joint ventures allow companies to share risks and resources while gaining access to local expertise and infrastructure. However, they require careful negotiation and management of relationships to ensure the alignment of both parties' objectives and strategies.

Direct investment, such as greenfield investments or acquisitions, involves establishing a physical presence in foreign markets through the construction of new facilities or the acquisition of existing businesses (Rana & Shrivastava 2007, 97-115). Direct investment offers full control over operations and enables firms to gain a larger share of the value chain, however, it requires substantial investment, assumes higher risks and involves facing foreign regulation policies and cultural differences.

3.2 Market entry considerations

According to Root [2020, 332], there are three rules a business can use in order to determine the best suited entry mode: the naïve rule, pragmatic rule and strategy rule. The Naïve rule is a standard procedure a company can have for all market entries that uses the same business model every time and doesn't adapt to the local environment. This requires the lowest amount of research but also gives the lowest success rate. The Pragmatic rule is that the company adapts entry mode based on each foreign market entry with the caveat that not all possible alternatives are being investigated in order to lower the amount of research needed. The Strategy rule has the highest success rate as it evaluates all possible options which reduces possible risks significantly and gives the highest level of understanding on the local market. (Hollensen 2014, 332-339.)

Hollensen categorizes other factors influencing the choice of market entry mode between internal factors (firm size, international experience), desired mode characteristics (risk averse, control, flexibility), transaction specific factors (tacit nature of know-how, opportunistic behaviours) and external factors (sociocultural distance between home country and host country, market size and growth, intensity of competition etc). (Hollensen 2014, 332-339.)

Internal factors play a crucial role in determining the mode of entry for firms when expanding into international markets. One key factor is the size of the firm, as larger firms have greater resource availability and are better able to make high resource commitments to foreign markets. Contrarily, SMEs are more likely to use export modes as they do not have the resources to achieve a high degree of control over their international operations. As the firm grows, it will increasingly use the hierarchical model.

The physical characteristics of the product or service are also important in order to determine where production is located and what entry mode is most suitable. For example, products with high value or weight ratios are typically used for direct exporting, while soft drinks and beer companies typically establish licensing agreements or invest in local bottling or production facilities due to prohibitive shipment costs. The nature of the product affects entry mode selection because products widely vary in their use and characteristics. (Hollensen 2014, 332-339.)

When a firm is considering entering a foreign market, it must take into account various external factors that can influence its entry. One such factor is the sociocultural distance between the home country and the host country. Sociocultural similarities between the two countries can lead to similar business and industrial practices, a similar language, educational level and cultural characteristics. Sociocultural differences can create internal uncertainty for the firm and influence the mode of entry desired by that firm. The greater the perceived distance between the home and host country in terms of culture, economic systems and business practices, the more likely it is that the firm will shy away from direct investment in favour of low risk entry modes like agents or importers.

Another factor to consider is country risk or demand uncertainty. Foreign markets are generally riskier than the domestic market, and a firm's exposure to risk is a function of the market itself and its method of involvement. When country risk is high, a firm should limit its exposure by lowering its resource commitments in that particular market. This means that firms will favour entry modes that involve relatively low resource commitments, such as export modes.

The unpredictability of the political and economic environment of the host market can increase the perceived risk and demand uncertainty experienced by the firm, which in turn makes firms less inclined to enter the market with entry strategies that require high resource commitments. The size and growth rate of the country are also key factors to consider when determining the mode of entry. The larger the country and the size of its market and the higher the growth rate, the more likely management will be to commit resources to its development and to consider establishing a wholly owned sales subsidiary or participating in a majority-owned joint venture. (Hollensen 2014, 332-339.)

The business also needs to consider the flexibility associated with a given mode of entry. Hierarchical modes are typically the least flexible and most difficult to change in the short run. Contractual agreements and joint ventures limit the firm's ability to adapt or change strategy when market conditions are changing rapidly.

Another important factor to consider is the tacit nature of the firm-specific know-how. When the knowledge transferred is tacit, it is challenging to articulate, making the drafting of a contract problematic. The difficulties and costs involved in transferring know-how motivates firms to use hierarchical modes, which are better able to facilitate the intraorganizational transfer of knowledge. Therefore, the greater the tacit component of firm specific know-how, the more a firm will favour hierarchical modes. (Hollensen 2014, 332-339.)

3.3 Marketing mix

The concept of the marketing mix originates from the microeconomic theory of the single P (price) (Chong, 2003) that was later introduced as the “marketing mix” by McCarthy (1964, 60) commonly known today as the “4Ps”: product, price, place and promotion. While the “4Ps” are not a scientific theory, the marketing mix is a conceptual framework for the main decisions that managers need to make in order to align their product or service with customer needs.

These tool helps develop both long-term and short-term strategies (Palmer 2004) since its introduction in the 1940s, the marketing mix has been significantly influencing marketing and research (Grönroos, 1994, 4-20). Kent (1986, 145-154) refers to the “4Ps” as “the holy quadruple...of the marketing faith...written in tablets of stone”.

The product mix component focuses on developing a product or service offering that meets the needs of the targeted market through its physical attributes, features, quality, packaging and branding. Businesses can create competitive advantage by identifying the main selling point of the product or service that differentiates it from similar products and highlighting the features that bring innovation for the potential customer. (Kent 1986, 145-154.)

The pricing mix component refers to the monetary value of the product or service. Setting the right price is essential for achieving profitability and attracting customers. Factors such as production costs, competition, the target market's price sensitivity and perceived value must be considered in pricing strategies in order to include cost-based pricing, value-based pricing, skimming, penetration pricing, or promotional pricing. (Grönroos 1994, 4-20.)

The place mix component refers to the distribution channels and methods used to make the product available to the target market. This involves determining the right locations, outlets and intermediaries to reach customers effectively. Aspects such as logistics, inventory management and must be considered in the distribution strategies in order to include direct selling, wholesaling, retailing, or e-commerce. (Constantinides 2006, 57-76.)

The promotion mix component includes all the activities that are meant to promote the service or product to the target market. This can be done through advertising, public relations, sales promotion, personal selling and direct marketing efforts. An integrated promotional mix should be developed in order to create awareness, generate interest, stimulate desire and encourage action from potential customers. (Kent 1986, 145-154.)

While the marketing mix is a valuable concept for the marketing decision making-process, Constantinides (2006, 57-76) notes some limitations, pointing out that the traditional pillars of marketing management have faced substantial criticism including the lack of consideration for customer behaviour, customer interaction, theoretical content and personification of marketing activities.

However, by carefully analysing and managing each component of the “4Ps”, businesses can create a comprehensive marketing strategy that aligns with customer needs while helping their organizations make strategic decisions when introducing new products or services on the market.

4 RESEARCH METHODOLOGY

This chapter provides an overview on the research methodology that was chosen for accomplishing the thesis goals and it describes the research design, approach, data collection and analysis methods. The detailing aims to offer transparency on how the research was conducted. This thesis is built on the hypothesis that, since the DC industry appeared in Europe, it has been developing unevenly across its countries and in order to continue expanding in an efficient, equitable way, one must first understand which factors have influenced the decision making processes that led to its current state. To achieve this goal, the research questions that act as a structuring component are: 1. What factors explain the development and current state of the European data center industry today?; 2. What are the most influential deciding factors that make a market viable for a DC and how should they be ranked?; 3. Which European countries are viable for continuing the DC industry expansion according to the identified factors?; 4. What entry strategies should be employed for the countries identified as the most viable markets for industry expansion?

In order to find the answers to these questions, the thesis started with a theoretical research on market opportunity analysis, market research and entry strategies where the thesis author learned about market trends and how to understand their regulatory environment, how to recognize the cultural, social, geographic, political, technological and ecological aspects of markets, as well as how to identify gaps on the international market and how to evaluate the feasibility and viability of entering a chosen market.

The author’s research methodology is a comprehensive approach that uses secondary data to analyse market opportunities and select potential expansion locations for the European DC industry. It begins with a thorough literature review and analysis of secondary data aiming to understand the current state of the industry and identify relevant factors influencing expansion by creating illustrative comparisons of various statistical numbers versus the current numbers of built DCs in each European country and drawing dedicated conclusions. Utilizing the PESTEL tool, the researcher conducts a detailed assessment of political, economic, social, technological, ecological, and legal factors across the European countries. Drawing on statistical data from reputable sources (Eurostat, IEA, Global Economy, OECD, Statista, Statistics Finland, The World Bank, World Data, World Population Review), ranked tables are created summarizing each country's performance across these factors, facilitating comparison and identification of favourable conditions for industry growth. Through a market opportunity analysis,

countries with the highest potential for local expansion are selected, with a focus on achieving equitable international expansion by excluding the already well developed DC markets. Finally, the researcher provides considerations on potential market entry strategies for the selected countries, taking into account regulatory environments, market demand and local competitive advantages. Overall, this methodology combines quantitative and qualitative analysis to guide strategic decision-making in the future expansion of the European DC industry.

The main type of data that this thesis is based on is secondary data including both raw and compiled data (Saunders 2006). The benefits of conducting secondary research for foreign markets include being less costly and timely than conducting research abroad, as well as not requiring contacts outside of the home country, and providing objectivity since the author is not constrained by overseas customs. Additionally, secondary research was used as a preliminary stage in the market screening process to quickly generate background information and eliminate countries from consideration (Hollensen 2014). The use of secondary data allowed comparison of various sets of data and facilitated the opportunity to compare findings within existing datasets (Saunders 2006). By reanalysing and comparing secondary data, the author was led to unexpected discoveries of patterns thanks to which she was able to link sets of statistical data in order to reach conclusions on the reasons why the DC industry has developed more in some countries than others.

Ensuring the credibility of research findings requires focusing on two main elements: validity and reliability. According to Yin (2009), validity refers to the soundness of a concept, conclusion, or measurement, ensuring accurate alignment with the real world. On the other hand, reliability, as defined by Yin (2009), relates to the consistency or stability of a measurement or instrument. Therefore, a study achieves validity when it effectively measures its intended target and reliability when it consistently produces similar outcomes over time. The assurance of these qualities is essential for establishing the credibility and applicability of research outcomes as researchers are tasked with designing and executing their studies to guarantee both the accuracy and trustworthiness of their results.

Other field authorities agree with the significance of validity and reliability. According to Cohen, Manion, and Morrison (2018), “Validity and reliability are critical to the scientific foundation of educational research”. They explain that sustaining validity involves pinpointing the constructs to be measured and selecting suitable methods and measures, while maintaining reliability requires the use of uniform methods and procedures to achieve consistent results. Similarly, Saunders, Lewis & Thornhill (2016, 202) state that “Validity and reliability are essential to any research design”. They stress that

ensuring validity means formulating research questions that precisely reflect the study's objectives, while guaranteeing reliability involves maintaining consistency in data collection and analysis.

While the author ensured the validity and reliability of the data sources, the main disadvantages of using secondary data are the lack of guarantee of the dataset quality and the possibility of the information being outdated since it is often collected in previous years. The use of both qualitative and quantitative data supports the recognition that secondary data drawn from various documents and statistical data sets offers a comprehensive understanding of the complexity of the DC industry. The author acknowledges the significance of multiple-source secondary data, understanding that it involves the combination of distinct data sets prior to access. The thesis searches various documentary sources including compilations of statistical source adaptations of Eurostat, Statista and The World Bank.

To conclude, the author acknowledges that assurance of research validity and reliability is essential for credible and applicable results. Researchers must conscientiously execute their studies to ensure the dependability of their findings. Through this approach, they contribute to advancing knowledge in their respective fields and making meaningful societal contributions.

5 DATA CENTER INDUSTRY OVERVIEW

A data center (DC) is a physical room, building or facility that houses IT infrastructure used for building, operating and delivering applications as well as for storing and managing the data associated with those applications (IBM 2024). The DC industry is a rapidly growing sector (Tech News And Updates 2023) that encompasses the design, construction, operation and maintenance of DCs used by a wide range of organizations, including businesses, governments and institutions, in order to support a variety of applications and services, such as websites, online applications, cloud computing, big data analytics and the Internet of Things (IoT) (De Sousa 2018). DCs are essential for the growing demand for cloud storage services and the increasing reliance on digital technologies.

The DC industry is characterized by various trends including cloud computing, edge computing, sustainability and security (Stackscale 2024). The adoption of cloud computing has increased the demand for DC services, as more organizations are outsourcing their computing and storage needs to cloud service providers (Howard 2024). The growth of the IoT and the increasing need for real-time data processing has led to the emergence of edge computing, which involves placing DCs closer to the sources of data, such as factories, retail stores and other locations (Gillis 2023).

The DC industry is one of the main drivers of today's technological innovation and economic growth and it is expected to continue to expand in the upcoming years as the demand for services that rely on data storage continue to grow. The European industry has been steadily growing due to an increasing reliance on digital technologies, adoption of cloud computing, sustainability trends, data security, machine learning and artificial intelligence. According to estimates, the European DC market is expected to reach over $50 billion in value by 2025 (Gooding 2024).

However, there is a growing concern about sustainability within the DC industry as the buildings require a large amount of electricity in order to operate which leads to a high GHG emission level (Device42 2023). Sustainable practices focus on reducing energy consumption and carbon emissions by adopting renewable energy sources, such as wind and solar power, to cover their energy consumption (Directorate-General for Energy 2024).

Another concern is data security as it is a critical factor considering the potential sensibility of the information that a DC may be storing. The demand for measures such as encryption and firewall protection continue to grow in order to prevent potential cyber threats against the DC (Fortinet 2023). Demands for implementing regulations that ensure data protection such as The General Data Protection Regulation (GDPR) are also on the rise as they enforces strict rules for the protection of personal data in the EU (ManageEngine 2023).

5.1 History and development

The term ‘data center’ was first used in 1990 when IT operations began to expand fast enough that the structures and materials needed to build one became affordable enough for investors to agree that building a special computer room was a good business decision. In spite of that, the first DC-type building ever created was in the 1940s at the University of Pennsylvania, created for military purposes and later on in the 1960s to support large mainframe computers, which were used by governments, banks, and other organizations to process large amounts of data. These DCs were typically large, specialized facilities that were expensive to build and operate. Since then, they have evolved as technology has advanced and the demand for data storage and processing has grown (Team Evoque 2021).

As personal computers and other devices became more powerful and widely available, the need for DCs increased, and they began to be used to host servers and other equipment that supported business operations and provided access to information and services over the internet (Team Evoque 2021). Today, DCs come in a wide range of sizes and configurations, from large facilities that occupy entire buildings, to smaller, more specialized centers that are designed to support specific types of applications or services. With the rise of cloud computing, DCs have also become more distributed, with multiple centers located in different regions around the world to provide better performance and availability for users.

DCs are important because they provide the infrastructure needed to store, process, and manage large amounts of data. They are the backbone of the internet, as they host the servers and other hardware that power websites, online applications, and other services that are accessed over the internet (Faist Group 2023). In addition to hosting servers and other hardware, DCs also provide networking, storage, and security infrastructure, as well as power and cooling systems to ensure that the equipment can operate

reliably and efficiently. They are essential for supporting the growing demand for data services, such as cloud computing, big data analytics, and the IoT.

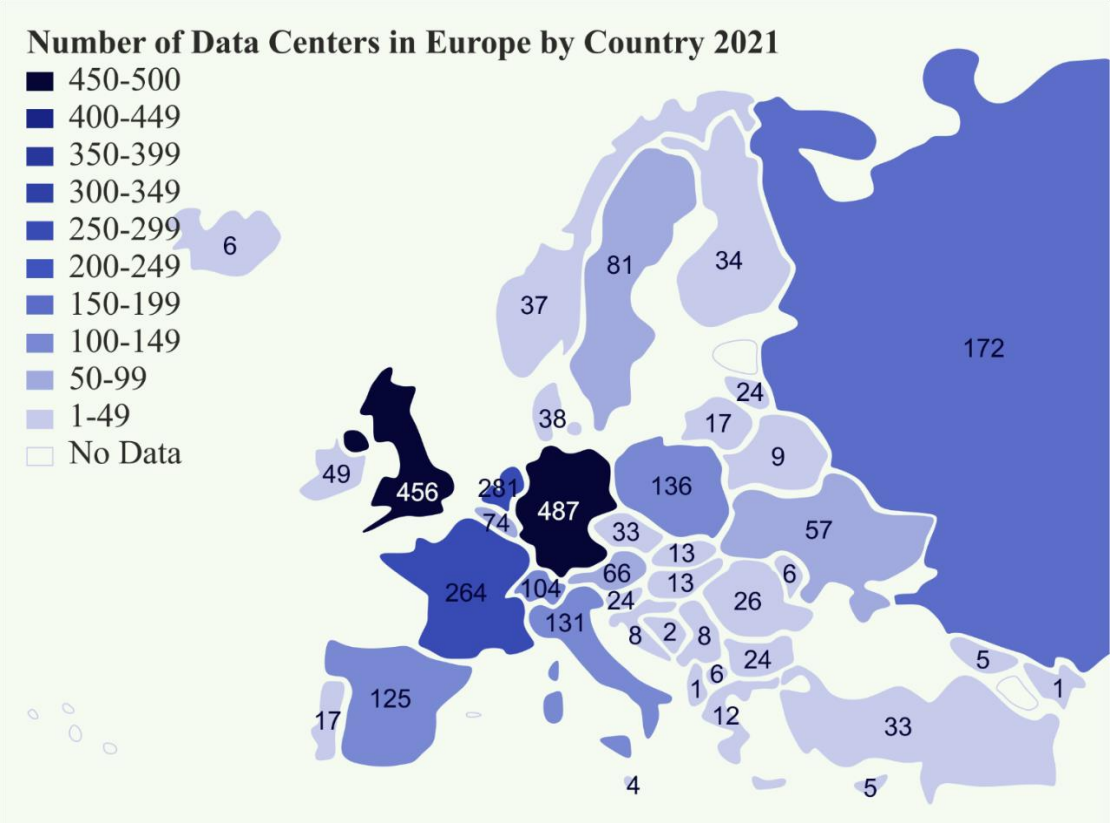


FIGURE 1. Number of data centers in Europe by country 2021 (adapted from Statista 2021)

Thanks to today's technology and international investment demand, a DC can be built just about anywhere and provide services that benefit not only local users but also international. This sort of flexibility is bound to facilitate industrial expansion but looking at the current situation in Europe, represented in Figure 1, it can be observed that there is a large difference in the development level from country to country, with the number of existing DCs varying between 487 and 1. The 3 leading countries as of 2021, Germany (487 DCs), UK (456) and Netherlands (281) house 42.4% of the entire European DC industry.

5.2 Expansion requirements assessment

It is relevant to understand why the current expansion of the industry is outspread unevenly across Europe. According to Figure 1, no striking pattern can be observed at first glance – no relation to country surface, geographical location or population density. For a more in depth analysis, secondary data will be researched using external regional and country sources for a set of relevant factors, as well as proxy indicators and compare them to the existing number of DCs for each European country by creating comparative illustrations. In order to proportionally categorise each value, a scale from 1 to 10 will be used, dividing the range of values into 10 equal intervals and assigning a scale value of 1 to the interval that includes the smallest assessed values, and a scale value of 10 for the interval that includes the largest assessed values.

5.2.1 Geographical surface

The first factor considered relevant to compare with the number of existing DCs today, is the geographical surface of each country. According to the research and as illustrated in Figure 2, no direct corelation can be observed between the number of existing DCs and the country surface, as the country holding the highest numbers of DCs Germany (487 DCs across 357, 386 km2) has a value of 10/10 on the DC scale and 6/10 on the surface scale; and the largest country, Russia, (172 DCs across 3,968,200 km2) has a value of 4/10 on the DC scale and 6x10/10 on the surface scale. Another relevant consideration is that Netherlands (281 DC across 21,198km2) has the lowest value point on the surface scale (1/10) while being the third most developed industry with a 6/10 on the DC scale and holding 9,74% of the entire European industry. The rest of the countries show no regular pattern but the fact that climate and economic factors may be relevant are observed therefore, they will be analysed as well.

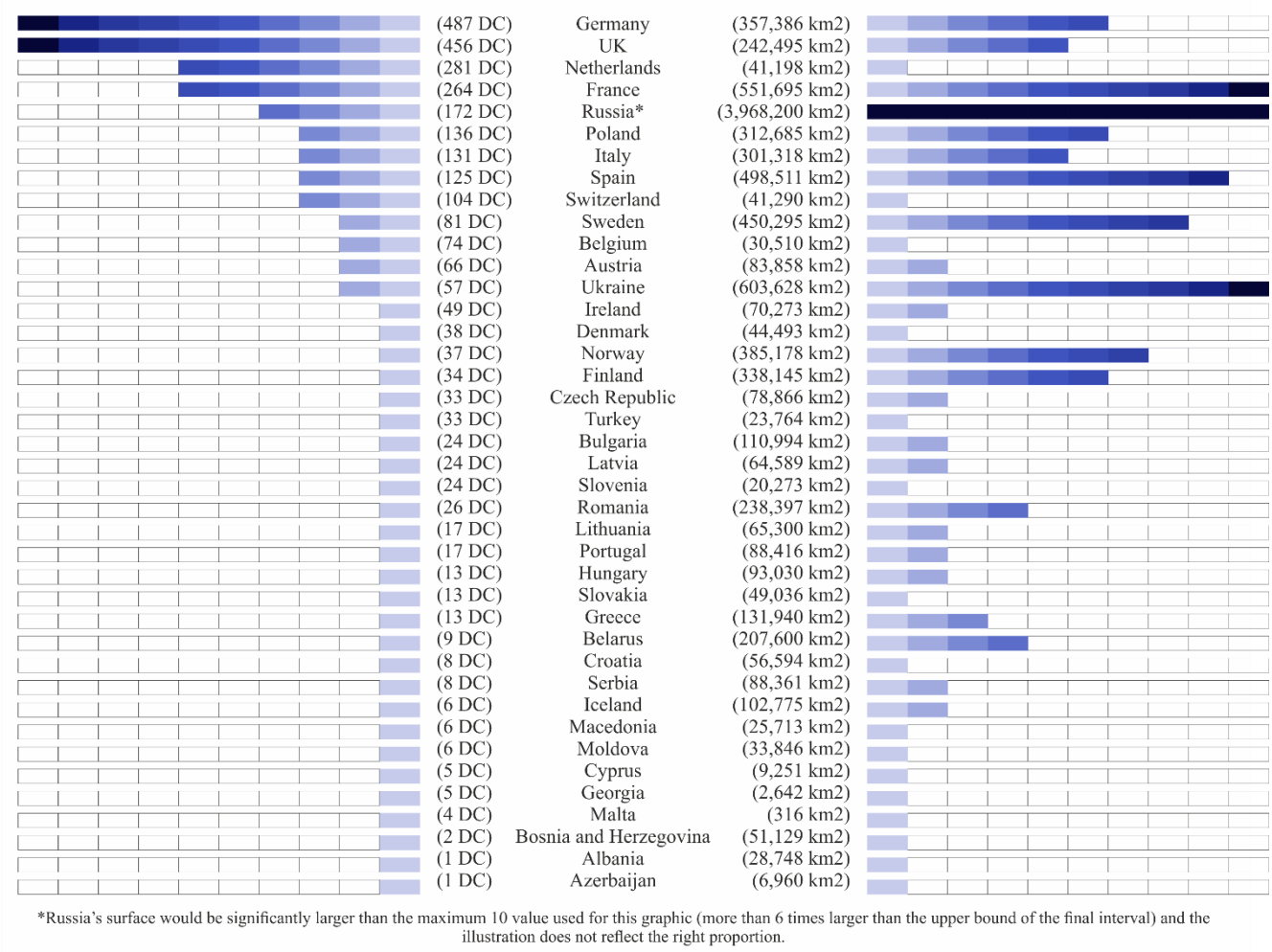


FIGURE 2. Number of data centers in Europe by country 2021 compared to country surface (adapted from Statista 2021 & The World Bank 2020)

5.2.2 Population

The next factor compared with the numbers of DCs per country is the total population per country. The illustration resulted from the proportional value comparison (APPENDIX 1) does not show a relevant pattern as the country holding the highest numbers of DCs (Germany, 487 DCs to 83,196 thousands of people) has a value of 10/10 on the DC scale and 6/10 on the population scale, while the country with the largest population (Russia, 172 DCs to 143,449 thousands of people) has a value of 4/10 on the DC scale and 10/10 on the population scale. Again Netherlands (281 DC across 17,533 thousands of people) has a low value point on the population comparison scale (2/10) while being the third most devel-

oped industry in European. The rest of the countries show no regular pattern either but population density may be relevant as it could impact real estate local pricing and operational security aspects so these factors are going to be compared as well.

The values of population density per country compared to the values of existing data centers per country (APPENDIX 2), do not show a relevant pattern either, as the country holding the highest numbers of DCs (Germany, 487 DCs and 238 people/km2) has a value of 10/10 on the DC scale and 2/10 on the density scale, while the country with the largest population density (Malta, 4 DCs and 1610 people/km2) has a value of 1/10 on the DC scale and 10/10 on the population scale. The rest of the countries show no regular pattern either but other population related factors may be relevant to compare such as access to electricity and internet use.

5.2.3 Access to electricity

The population percentage with access to electricity illustration (APPENDIX 3) shows no relevant pattern either, as all European countries with existing data centers have electrical access in a proportion of 100%. In this case we are going to follow up on the statistics of internet use as it could be a better indicator of local need for cloud storage, as well as on the quality and pricing of electricity as they play a major role in operation cost and functionality of DCs.

5.2.4 Internet usage

The illustration comparing the percentage of population using internet with DC numbers (APPENDIX 4), does not show a relevant pattern as the comparison reveals both very high and very low values on the internet use scale for countries with either many or few DCs. The country holding the highest number of DCs (Germany, 487 DCs and 91% of population using internet) has a value of 10/10 on the DC scale and 10/10 on the internet use scale; while the country with the largest use of internet (Iceland, 6 DCs and 100% of population using internet) has a value of 1/10 on the DC scale and 10/10 on the internet use scale. Italy (131 DC, 75% internet use), holding the lowest value on the internet use scale (1/10) is the 7th most developed European industry which further indicates that local internet use is not a strong influence on local DC development.

5.2.5 Local factors conclusions

So far we have learned that local factors such as surface, population, population density and population access to electricity and internet did not play a major role in deciding where the DC industry was going to expand, which leads us to believe that international market factors are more relevant than local factors within this industry. In order to test this assumption, a comparison of the yearly average temperature of each country will pe performed as literature suggests cool temperatures are one of the biggest impacting factors for long term savings on energy use (Lettiere 2021).

5.2.6 Average temperature

Assessing Figure 3, we may observe that the countries holding the highest numbers of DCs do have a low yearly average comparing to the ones with higher temperatures and the extreme temperatures (both high and low) are not preferred but rather the moderately low ones. The country holding the highest numbers of DCs (Germany, 487 DCs and 8.4C) has a value of 10/10 on the DC scale and 6/10 on the average temperature scale, while the country with the lowest temperature average (Russia, 172 DCs and -5.35C) has a value of 4/10 on the DC scale and 1/10 on the temperature scale and the country with the highest temperature average (Malta, 4 DCs and 19.2C) has a value of 1/10 on the DC scale and 10/10 on the temperature scale. To conclude, the countries with high numbers of existing DCs show a pattern of moderately low temperatures, below 13C yearly average and about 6/10 value on the comparison scale.

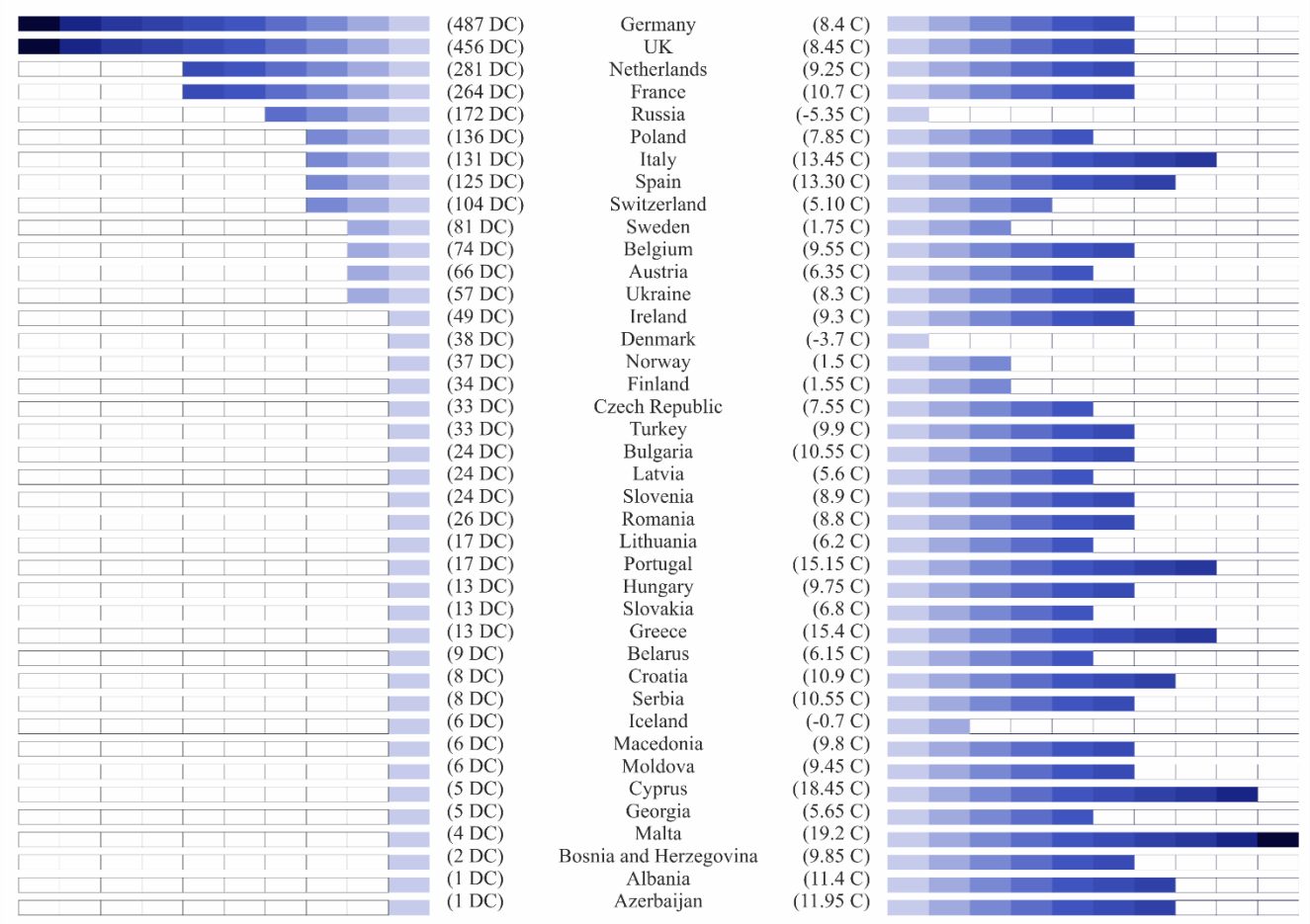


FIGURE 3. Number of data centers in Europe by country 2021 compared to average yearly temperature (1961-1990) (adapted from Statista 2021 & Mitchell, Carter, Jones, Hulme & New 2003)

5.2.7 Electric power stability

Another highly relevant aspect that may reveal a pattern of importance of international factor comparison with high impact on DC functionality is the likelihood of electric power transmission and distribution losses as energy loss is considered to be one of the biggest threats to DC operation. As illustrated in Figure 4, there is indeed a tendency of low risk of energy loss (under 10% in the leading DC number countries) and high risk (up to 24%) in the countries with the lowest industry presence. The country holding the highest numbers of DCs (Germany, 487 DCs shows a 4% risk) has a value of 10/10 on the DC scale and 1/10 on the energy loss scale and the country with the highest risk (Albania, 1 DC shows 24% risk) has a value of 1/10 on the DC scale and 10/10 on the energy loss scale.

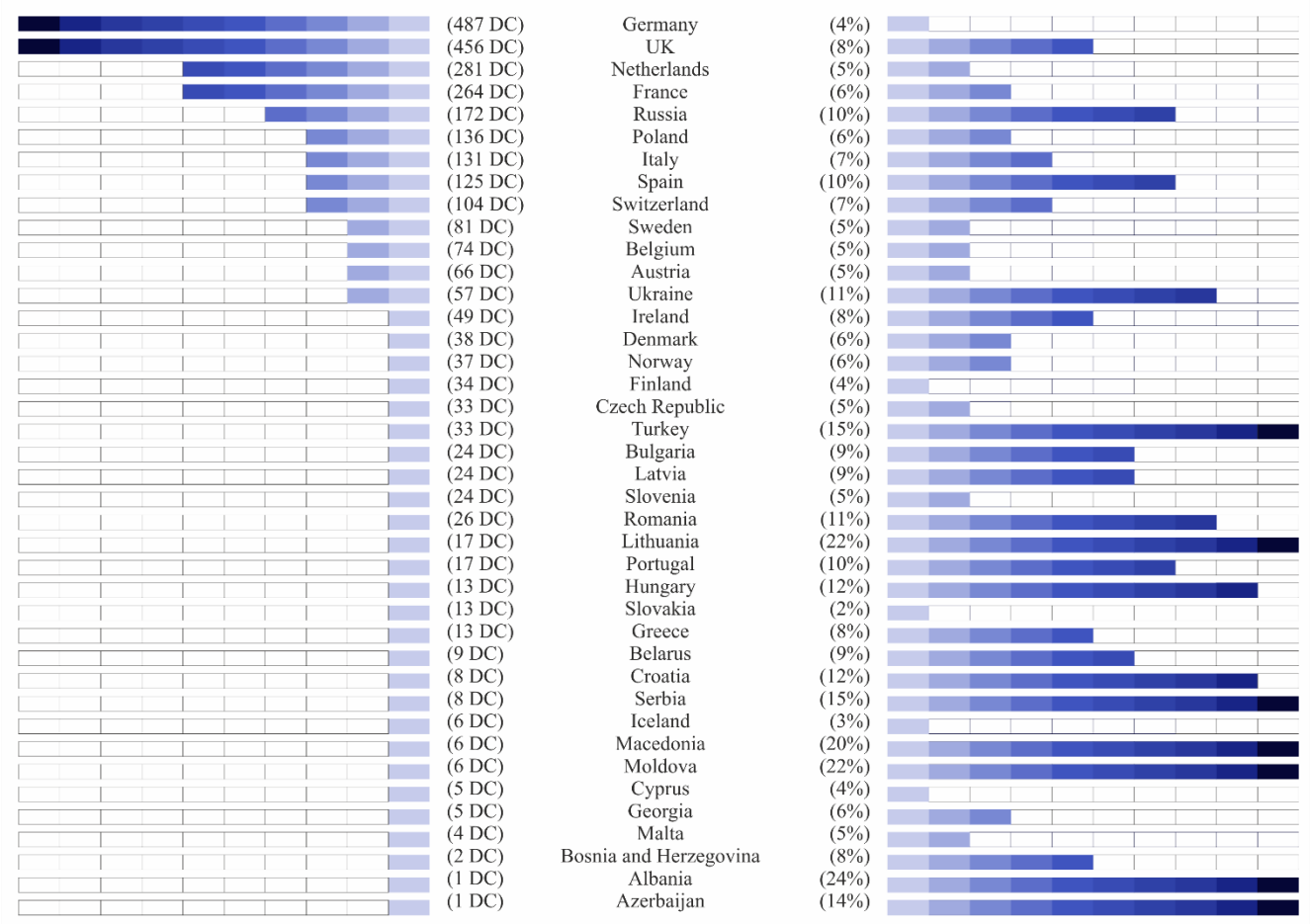


FIGURE 4. Number of data centers in Europe by country 2021 compared to electric power transmission and distribution losses (percentage of output in 2014) (adapted from Statista 2021 & The World Bank 2018)

5.2.8 Risk of catastrophic events

Another highly relevant comparison value is the risk of catastrophic events which is going to be analysed using the percentage of population who suffered from disaster events during 1990-2009. In Figure 5, we can observe a pattern of higher risk in countries where the industry was least developed, with Albania (1 DC and 5.3% risk) showing a value of 1/10 on DC scale and 10/10 on risk scale, as opposed to leading DC industry in Germany (487 DC and 0.0% risk) showing a value of 10/10 on DC scale and 1/10 on the risk scale. The rest of the countries follow a similar pattern.

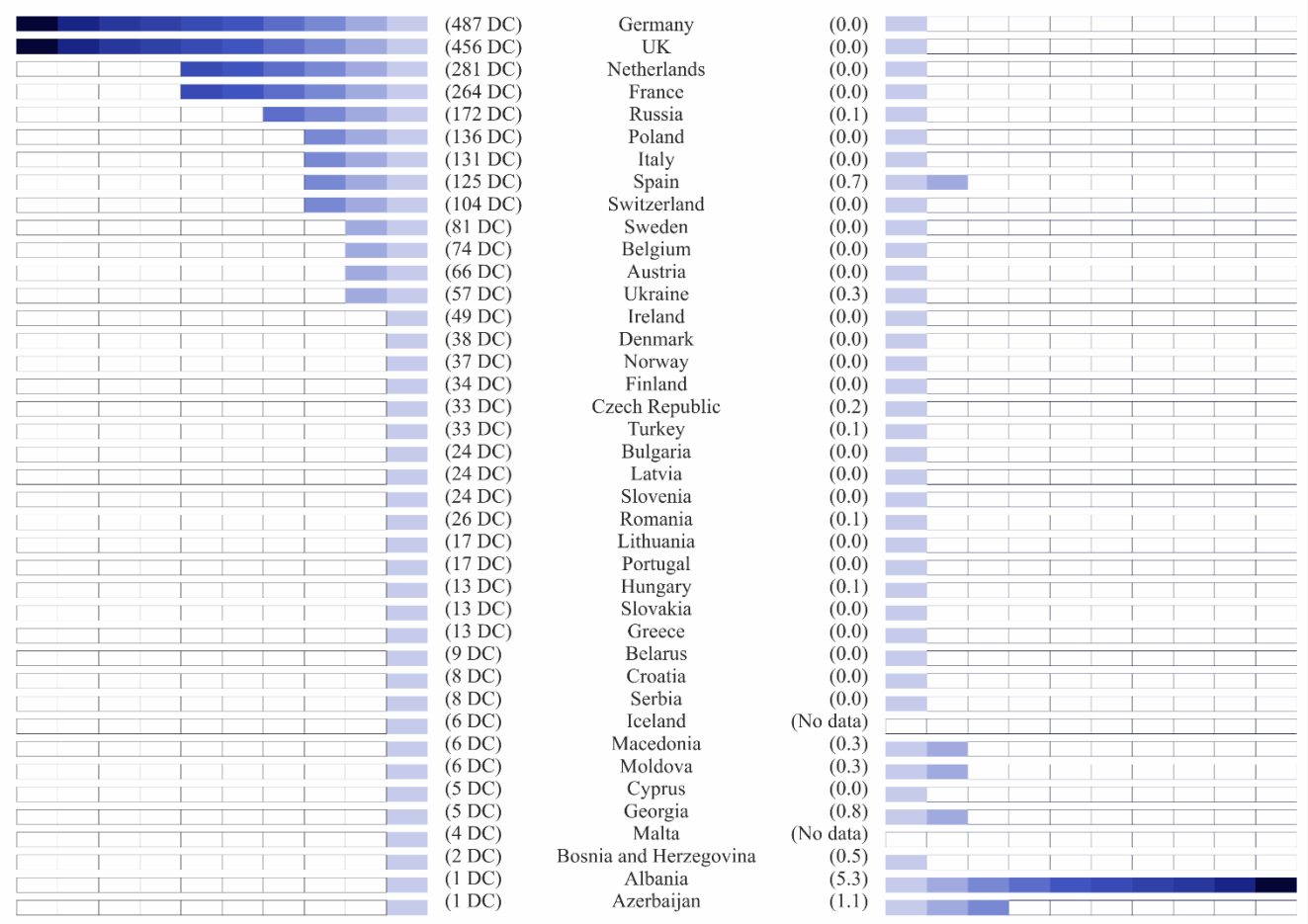


FIGURE 5. Number of data centers in Europe by country 2021 compared to risk of droughts, floods, extreme temperatures (% of population, average 1990-2009) (adapted from Statista 2021 & The World Bank 2009)

5.2.9 GDP

We continue by checking if economic factors such as GDP per capita, real estate costs, taxes, and electrical rates will also prove to show relevant international patterns and will continue by looking at these comparisons starting with GDP, illustrated in Figure 6. We can observe a clear correlation between the lower half of GDP values and lower half of existing DC industry, with the lowest GDP per capita in Moldova (6 DCs and 5,230.7 GDP) showing a value of 1/10 on DC scale and 1/10 on GDP scale, while the leading DC industry in Germany (487 DCs and 51,203.6 GDP) shows a 10/10 DC scale value and 5/10 GDP scale value. On average, the countries show a direct correlation with an average GDP value for a high DC value, but there are a few exceptions such as Ireland which holds the highest

GDP per capita (100,172.1 USD) translated to a value of 10/10, and only 49 DCs, translated to a value of 1/10, or Russia which holds a low GDP (12,194.8 USD) translated to a value of 1/10 but holding the 5th place on current local expansion scale.

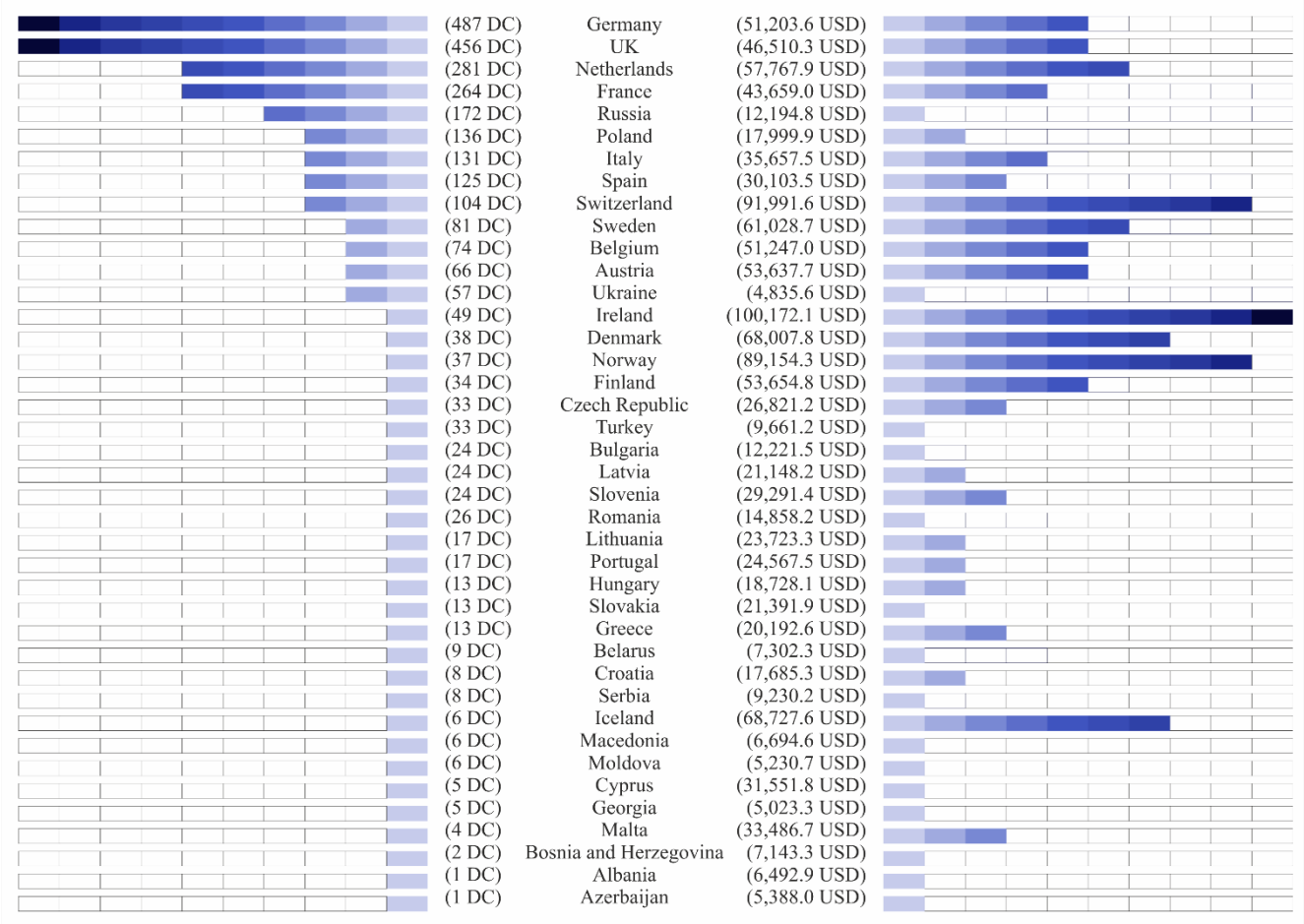


FIGURE 6. Number of data centers in Europe by country 2021 compared to GDP per capita in 2021 (adapted from Statista 2021 & The World Bank 2020)

5.2.10 Electricity rate

Another relevant economic factor is the local rate for electricity which is going to be analysed using current statistics on electricity prices for non-household customers including taxes. The Figure 7 compares these statistics and the current DC industry spread-out and it does not show a direct correlation as countries with a developed industry have average to above average electricity rates, while countries with the lowest rates do not show a high value for industry development. The country holding the

highest number of DCs (Germany, 487 DCs and 0.18 euro per KWh) has a value of 10/10 on the DC scale and 6/10 on the energy rate scale and the country with the lowest rate (Ukraine, 57 DCs and 0.03 euro per KWh) has a value of 2/10 on the DC scale and 1/10 on the energy rate scale. The conclusion is that an average rate seems to be the tendency but it does not seem to be a priority on the overall locating decision.

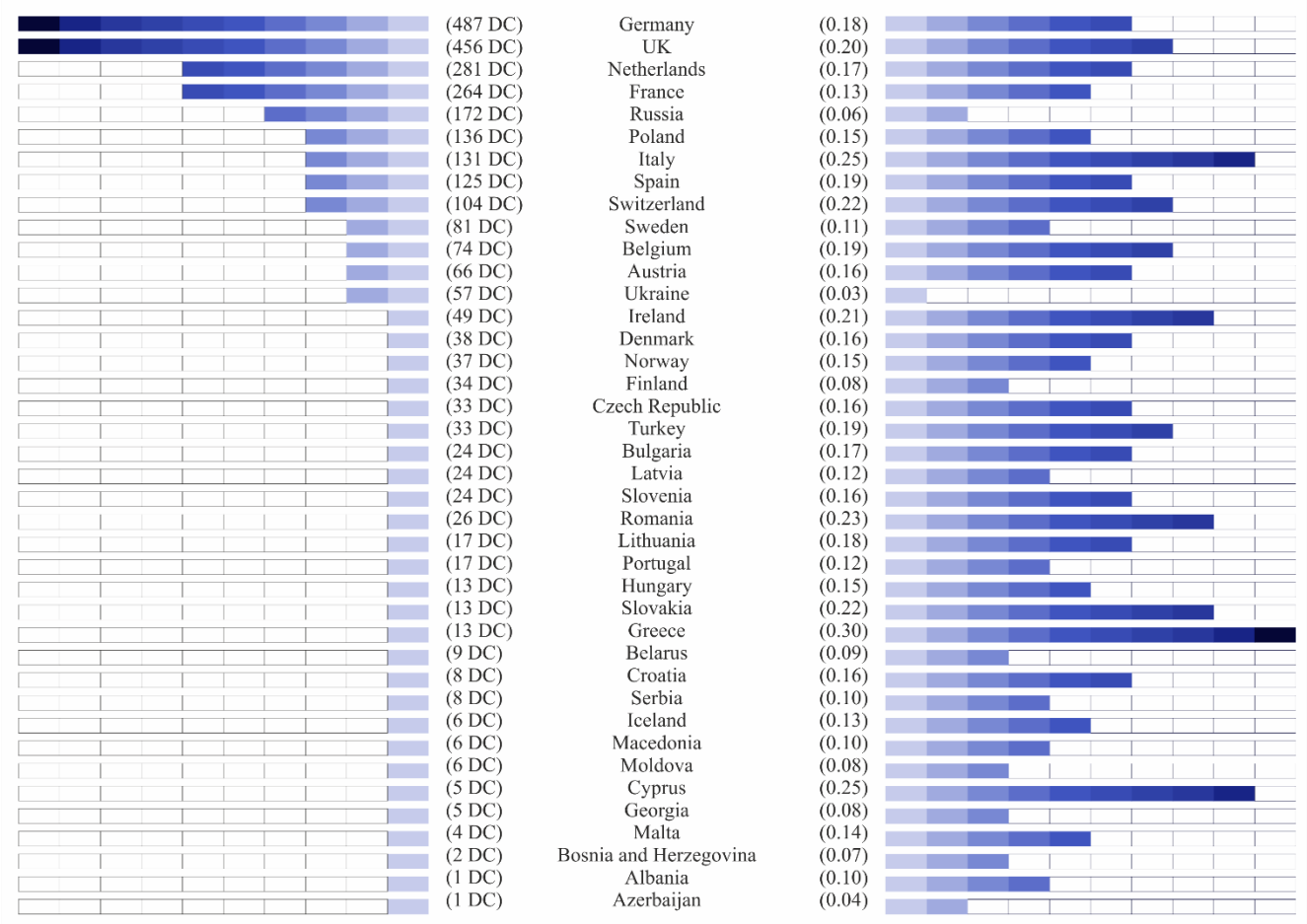


FIGURE 7. Number of data centers in Europe by country 2021 compared to electricity prices for non-household customers including taxes (euro per KWh in 2022) (adapted from Statista 2021 & Eurostat 2022)

5.2.11 Profit tax rate

Assuming that local taxes can have a high impact on the operation cost, the DC numbers will be compared to the current values of commercial profit tax. Looking at Figure 8, we see a slight correlation as

while the top 3 countries within the industry have average to high tax rates, we can see a tendency for below average tax rates in the rest of the well developed countries. However, the general tendency is that countries with developed industry have both high and low tax scale values, while countries with the lowest tax don't show a high value for industry development, with the exception of France (265 DCs and 0.2% tax) which may not be relevant on its own as France showed favourable indicators on many of the other factors we have assessed so far (such as low service interruption or hazard risk, high GDP, moderate climate and average electrical rate). The country holding the highest numbers of DCs (Germany, 487 DCs and 23.2% tax) has a value of 10/10 on the DC scale and 8/10 on the commercial profit tax scale; and the country with the lowest tax (Croatia, 8 DCs and 0.0% tax) has a value of 1/10 on the DC scale and 1/10 on the tax scale.

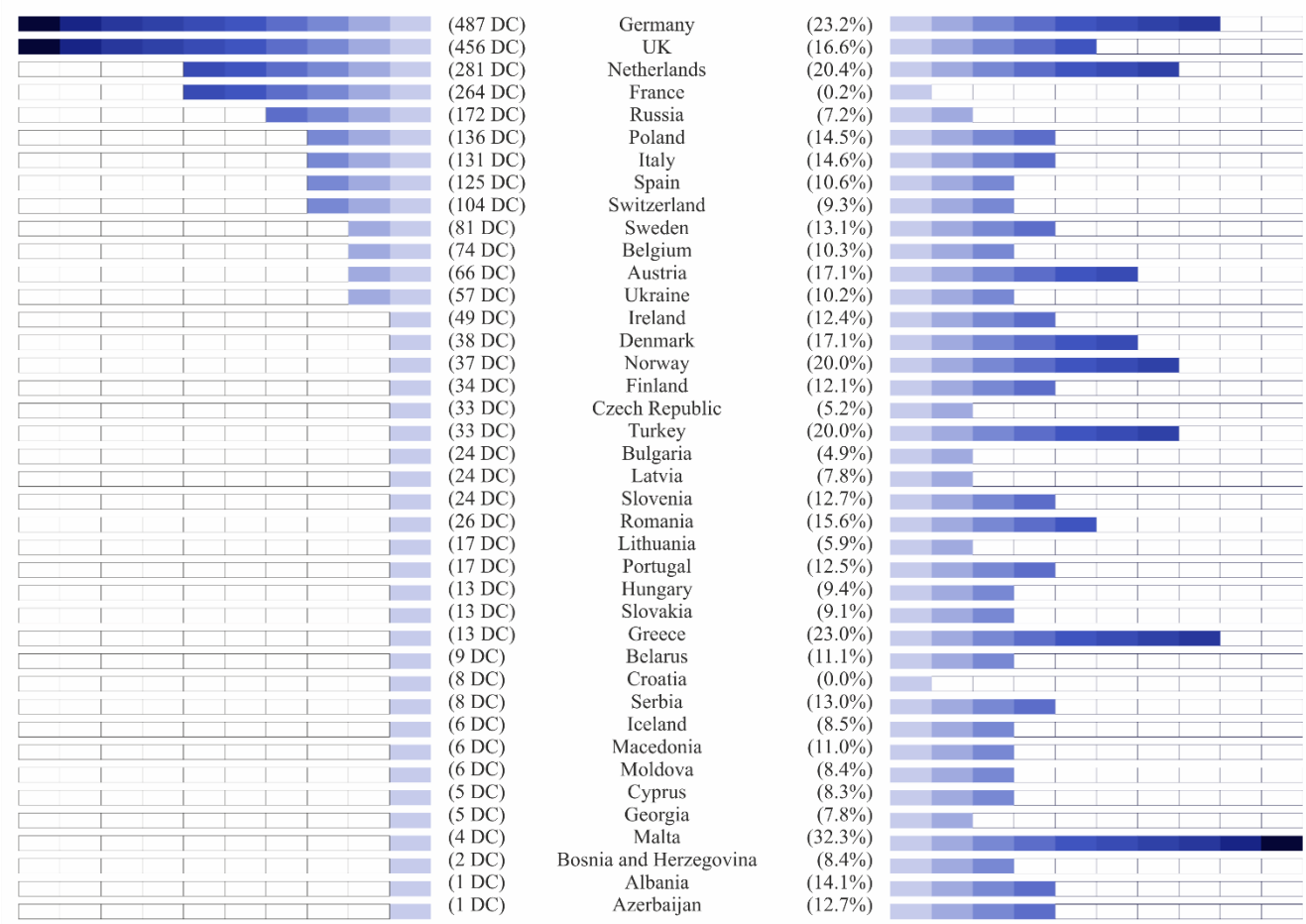


FIGURE 8. Number of data centers in Europe by country 2021 compared to commercial profit tax (percentage in 2019) (adapted from Statista 2021 & The World Bank 2021)

5.2.12 PPP

In order to compare the DC industry to the level of international economic growth, we are going to look at the purchase power parity (PPP) for each country, which per Figure 9, reveals a pattern of average values (4-6 on the 1-10 scale) in the countries with the highest local industry development, while countries with very high PPP (8 to 10 values on the 1-10 scale) or very low PPP (1 to 2 values on the 1-10 scale) have a low existing development. The country holding the highest numbers of DCs (Germany, 487 DCs and 116.2 PPP) has a value of 10/10 on the DC scale and 5/10 on the PPP scale. The country with the lowest PPP (Bulgaria, 24 DCs and 36 PPP) has a value of 1/10 on the DC scale and 1/10 on the PPP scale. The country with the highest PPP (Switzerland, 104 DCs and 196.7 PPP) has a value of 3/10 on the DC scale and 10/10 on the PPP scale.

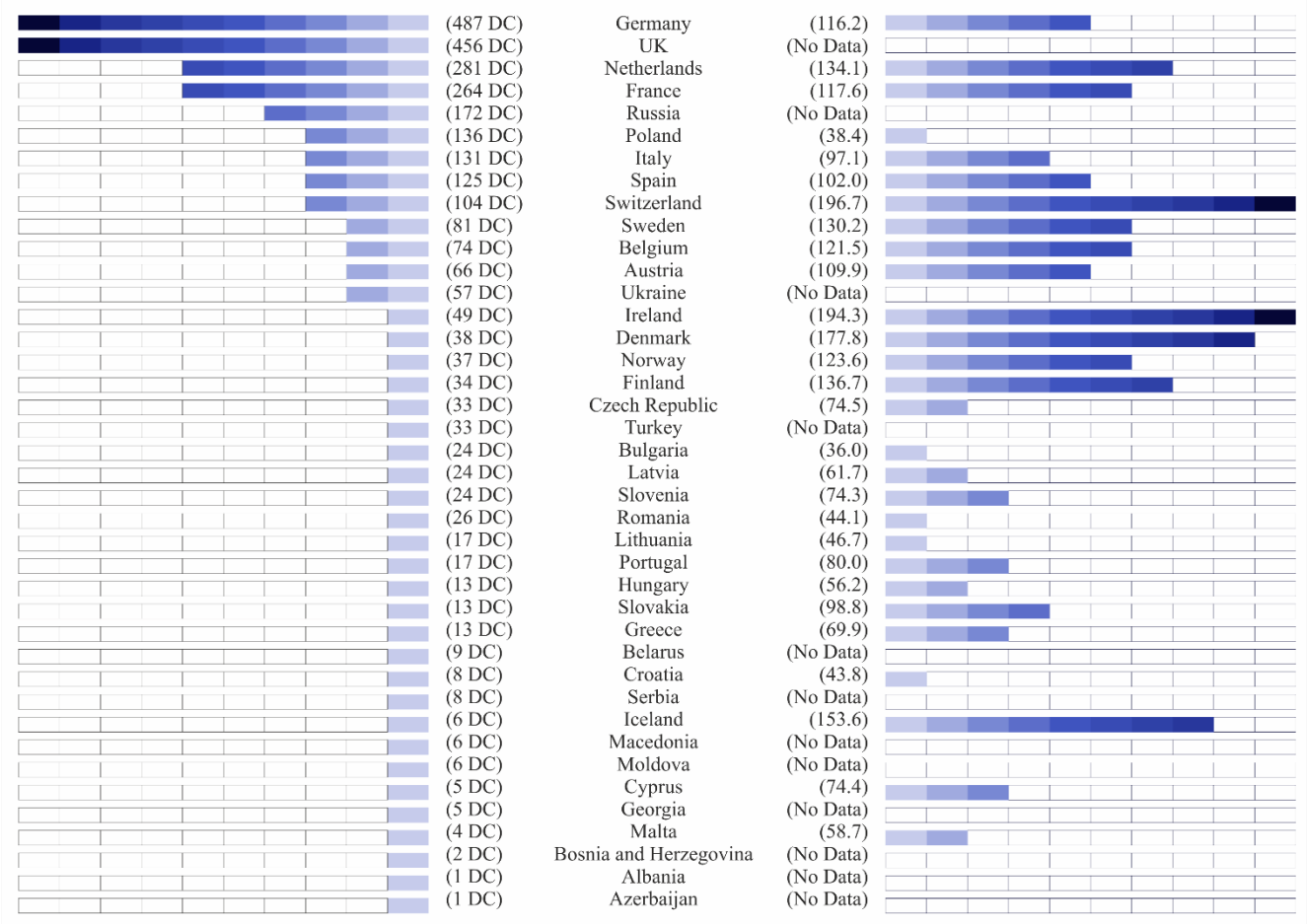


FIGURE 9. Number of data centers in Europe by country 2021 compared to purchasing power parities (PPPs) (price level indices in 2021) (adapted from Statista 2021 & Eurostat 2023)

5.2.13 Conclusions

In conclusion, the expansion of the DC industry across Europe seems to have been mostly influenced by a low risk of energy loss, moderately low temperature, low risk of catastrophic natural events, average-high GDP/capita and average PPP up until today.

5.3 Selecting the right location for a data center

We have learned that factors such as low risk of energy loss or natural disasters, moderately low temperature, average international values for PPP, taxes and GDP, have influenced the development of the European industry so far. We are going to continue the research by learning which factors are considered critical when selecting a new site. Selecting the right location for a DC requires careful consideration of a number of factors, such as the availability of power and telecommunications infrastructure, the cost of land and labour, the regulatory environment, and the risks and opportunities associated with different locations (Carter & Hines 2019). The key criteria that organizations should consider when selecting the location for a DC and how these criteria can impact the performance and cost of the DC will be next examined.

According to current trends and literature, the critical factors influencing site selection are mainly labour costs (analysing the cost of skilled labour in potential locations and assessing the availability of a qualified workforce to meet DC operational needs), accessibility (evaluating proximity to major airports and highways for efficient logistics and recognizing the importance of easy access during both construction and operation phases), real estate options (investigating the availability and cost of real estate options, deliberating the choice between retrofitting existing facilities and constructing purpose-built data centers, and considering advantages and disadvantages of each option), telecommunications infrastructure (ensuring access to a robust telecommunications infrastructure for seamless connectivity, emphasizing the significance of high quality network connectivity for DC operations, analysing the presence of competitive markets in telecommunications), utilities costs (analysing the cost of utilities, specifically electricity and water, exploring access to renewable energy sources to promote sustainability, assessing the role of utility costs in total operational expenses), tax and regulatory climate (understanding the tax and regulatory environment in potential locations, identifying incentives or tax breaks that may apply to data center operations, evaluating the impact of regulations on data center construction and operation) and proximity to suppliers (assessing the proximity of suppliers for specialized

equipment and parts, recognizing the value of a local supply chain for reduced lead times and cost efficiency, analysing the impact of supplier location on supply chain resilience) (Gigerich 2012).

Another aspect a business should consider when selecting a site location is whether to choose a retrofit or purpose-built project. While retrofit sites have the advantage of lower building cost and timeframe, utilizing vacant land offers the advantage of freely customizing the project to meet any preventive measures that may need to be taken due to various factors such as climate, natural hazards or specific client requirements. Additionally, it is easier to design a purpose-built data center (PBDC) properly equipped for high security standards and IT aspects such as high density equipment, easy facility navigation and efficient computer cooling systems (Carter & Hines 2019).

The research will continue with the assessment of the factors identified by theoretical research from the perspective of the author's work experience within the industry.

5.3.1 Energy efficiency

Seeing as DCs are virtually computer stacks, they are bound to consume a very high amount of power, not only for functioning, but also for computer cooling and cloud disconnection prevention, therefore, one of the most important design aspects to be considered is energy efficiency. Energy efficiency in buildings refers to the use of design, construction, and technology solutions to reduce the amount of energy needed to operate a building. The goal of energy efficiency in buildings is to reduce energy consumption, lower energy costs, and reduce greenhouse gas emissions, while maintaining or improving the comfort, convenience, and functionality of the building. In 2022, DCs were estimated to consume 3-4% of world's electricity (Iron Mountain 2023) which is extremely high comparing to other industries. The main mitigation practices within the industry include designing the building with economical energy consumption solutions, choosing a location with access to renewable energy and choosing a location with low electrical rates.

To achieve an energy-efficient design, a harmonious blend of creativity and innovative technology is required. A great example of such a design is currently operational in Hamina, Finland, where a DC was constructed on the site of a former paper mill by the Baltic Sea. The engineering team behind this project focused on refurbishing the mill's original pumps and pipes to channel cold seawater directly

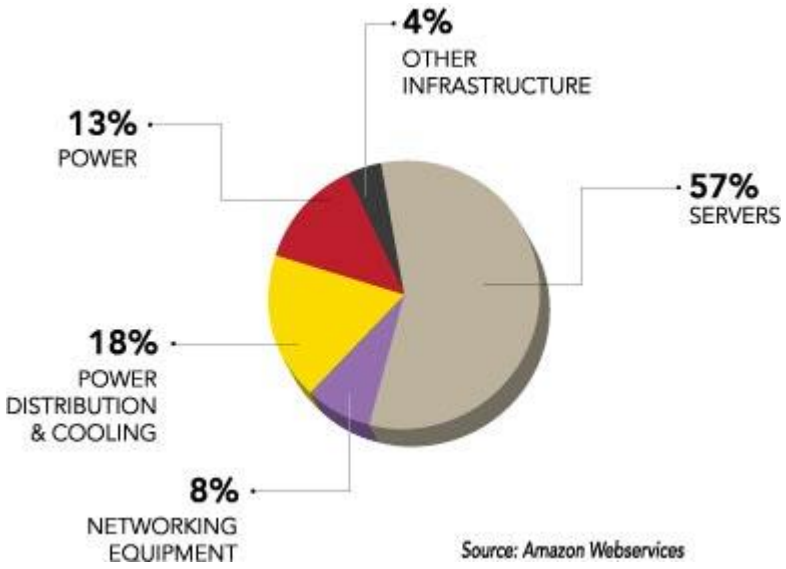
into the computer rooms, naturally cooling the air containment. This clever design significantly reduced energy consumption while ensuring zero adverse environmental effects, as the water is simply filtered and returned to the sea (Baxtel 2017).

In addition to their significant power consumption, DCs cannot tolerate any electrical disruptions once they are operational. That is why most projects are designed with two separate energy pathways: a primary and a backup, with at least one of them being uninterruptible. The engineering and maintenance of these energy supplies can increase the already high electrical costs and environmental impact, making the utilization of renewable energy sources a preferred choice. This approach has the benefit of mitigating both issues long term. DCs are known to be major contributors to pollution, with a carbon footprint surpassing that of the entire airline industry as of 2022 (Monserrate 2022).

Although the first two options are preferable due to their environmental benefits and long-term advantages, the process of selecting an appropriate site can be challenging and time-consuming due to the scarcity of the necessary criteria required for such a design. Another solution for reducing the long-term operational cost of a DC is to select a building location in an area with lower electrical rates compared to other competing sites, but this solution does not address the sustainability issues.

5.3.2 Data center construction cost

DCs experience substantial operational costs when compared to other industrial buildings. However, it is crucial to take into account the construction expenses as well since the initial capital investment ranks among the highest in today's tech industries. In addition to standard building materials, the inclusion of specialized electrical and telecom equipment, along with shipping costs (which can vary based on the building's geographical location), significantly contribute to the overall budget, accounting for more than 60% of the total investment. Moreover, labour costs tend to be above average due to the requirement for field specialists, often requiring international outsourcing.



PICTURE 1. Initial capital investment to construct and equip a data center (Gigerich 2012)

The construction cost of a DC project can be categorized in four main parts: electrical systems (40-45% of the cost), HVAC/mechanical systems (15-20% of the cost), building fit-out (20-25% of the cost) and land and shell (15-20% of the cost) (DgtlInfra 2022).

Typically, the analysis of the amount is conducted per square meter and megawatts (MW), given the variable scale of buildings ranging from 1 to 50 MW on average. A proportional assessment offers specific advantages for buildings. Large-scale projects benefit from cost reductions as a result of procuring a substantial quantity of HVAC and electrical equipment. However, a drawback is that the increased power density in large projects requires a corresponding rise in cooling capacity, leading to higher long-term costs.

The project schedule can play a crucial role in influencing costs. In many cases, these projects prioritize rapid construction, often commencing when only 60% of the design is complete. While this approach saves time, it frequently results in conflicts during the detailed design phase, leading to rework and resource inefficiencies. Building such projects at a slower pace has been demonstrated to result in cost savings.

When considering an international investment, the differences between building costs should not take decisional priority as the real estate value only sums up to 5% on average and has minimal impact on the total budget. The human resources factor is similar as the construction teams are most often made

up from various international specialists with little differences in labour pay. According to current research, some intercontinental differences can be seen in the total building cost with North America rated at approximatively 9.5m/MW and $1,000/sqft, Europe rated at 14m/MW and $1,200/sqft, Asia-Pacific rated at 12m/MW and $1,000/sqft and South America rated at 10m/MW and no data for sqft (Gigerich 2012). Based on these values we may conclude that the lowest building cost is on average in the United States while the highest one is in Europe.

5.3.3 Risk of natural disasters and weather events

When selecting a building location, it is crucial to consider local weather conditions and the risk of natural disasters, especially for DCs since computers are sensitive to factors like humidity, high temperatures, earthquakes, or any disruptive natural events. Service disruption is a significant threat that requires careful planning. In regions with extreme climates, adverse weather can impact the construction schedule from an early stage, therefore the building schedule should account for seasonal changes brought by the effects of heat, frost, or rain throughout each construction phase until the structure is weatherproof. Construction may then proceed indoors. Projects need to be meticulously planned based on the specific natural risks they might encounter. Additional measures, such as computer rack bracing in seismic areas, extra cooling in drought-prone regions, and structural reinforcement for potential destabilizing events, must be incorporated as well.

5.3.4 Access to infrastructure and supplies

Efficient business operations rely on site accessibility, including several crucial factors such as DC efficiency in order to ensure optimal performance, quality power supply that guarantees a reliable and high-quality source of power, construction facilitation for ease of construction processes and logistics, and attraction for IT talent recruitment in order to create an appealing environment for recruiting top IT talent.

It is essential for the potential location to have a high quality pre-existing telecommunications infrastructure, making markets with high competition among service carriers optimal. Such locations are known for cost-effective distribution systems, reliable conductivity, and low disruption in fiber network communication.

Energy supply is also critical as it impacts the operation efficiency. It is often measured by the cost per watt of consumed electricity and some locations can reach levels as high as 1,000W/square meter consumed. Therefore, access to a supplier capable of providing the required energy capacity is an essential consideration (Carter & Hines 2019).

Access to hard infrastructure is crucial as well, especially during the construction phase, where a continuous influx of building materials and equipment is required within tight schedules. Proximity to a major airport is advantageous for site visits by international team members. Site accessibility is important not only for current operations but also for future business expansion. Additionally, it plays an essential role in preventing man-made hazards by enabling access for emergency service vehicles.

Another important consideration is supplier proximity to the DC, as its need for specialized equipment can often become a procurement challenge. Having a network of part suppliers nearby can reduce costs, lead times for sourcing parts, and mitigate the risk of supply chain disruptions. Local supply chains also contribute to sustainability by minimizing carbon emissions associated with transportation. Moreover, local suppliers are likely to have a better understanding of the specific needs and requirements of the DC thanks to their knowledge of local codes and regulations, which increases the reliability of the provided parts.

5.3.5 Conclusions

Selecting an optimal site for building a DC should prioritize: access to a stable energy supplier, minimal risks of natural disasters and a naturally cool climate. The access to a quality electric infrastructure is essential for an efficient DC as it avoids potential service disruption caused by power outages. Challenges caused by natural disasters such as floods, earthquakes or tornadoes could be mitigated through design features, however, it would still present a risk and an increased cost compared to other markets where this type of risk is minimal. A naturally cool environment is preferred due to its direct impact on minimizing cost and energy consumption used by computer cooling which is one of the main power consumers in a DC.

6 PRELIMINARY SCREENING AND PESTEL ANALYSIS FOR DATA CENTERS IN EUROPE

In this chapter the theoretical framework described in Chapters 2 and 3 will be applied while considering the findings on the DC industry specifics described in Chapter 5. The purpose of this data triangulation is to determine which European countries are the most favourable for local DC industry expansion in the most data backed way. The systematic market selection process begins per Root's strategy rule by considering all countries within the geographical segment of the European continent as potential markets. To conduct a preliminary screening, the PESTEL elements will be employed to eliminate markets that are least likely to be favourable potential locations.

6.1 Political preliminary screening

To conduct the initial preliminary screening of the European market, the PESTEL method will be used in order to gather background information on each country and exclude from further consideration the ones with elevated levels of risk or high lack of data transparency, as well as identify the markets with the most favourable environment for local future expansion of the DC industry. The research objectives will be aligned with the location selection criteria outlined in Chapter 5 based on the findings.

The preliminary market screening will be initiated by analysing indexes related to the political environment of all the European countries. The objective is to understand the local levels of political stability, assess potential risks, and understand the regulatory environments of each country, in order to identify which markets are optimal for a potential DC investment and which are not.

6.1.1 Political stability index

In order to evaluate and rank the European countries for market opportunities for future DC industry expansion from a political perspective, the process will be initiated by examining the political stability index. This index represents the average data available from 1996 to 2021, on a scale from -2.5 to 2.5 where '-2.5' indicates the weakest political stability level and '2.5' the strongest (Global Economy 2021). The political stability index evaluates governmental stability by analysing the likelihood of its

overthrow through unconstitutional means or political violence, including terrorism. The index is determined by averaging indexes from the 'Economist Intelligence Unit,' 'World Economic Forum,' and 'Political Risk Services' (Global Economy 2021).

This index is relevant to the DC industry because it could directly impact the safety and security of a DC, as well as indicate the ease of conducting business in a specific location. A country with high political stability is less likely to face civil unrest, political disruptions or government instability (Global Economy 2021). A politically stable country is more likely to have a predictable and transparent legal and regulatory framework.

TABLE 1. Ranking of European countries by Political Stability Index in 2021 (Adapted from Global Economy 2021)

Political Stability (from highest to lowest)								
1	Liechtenstein	1.64	18	Hungary	0.86	35	Greece	0.15
2	Andorra	1.63	19	Ireland	0.86	36	North Macedonia	0.12
3	Iceland	1.37	20	Lithuania	0.82	37	Albania	0.11
4	Luxembourg	1.21	21	Estonia	0.76	38	Serbia	-0.13
5	Switzerland	1.13	22	Germany	0.76	39	Montenegro	-0.15
6	Norway	1.1	23	Slovenia	0.76	40	Moldova	-0.21
7	Sweden	1.03	24	Croatia	0.71	41	Kazakhstan	-0.25
8	Finland	0.98	25	Belgium	0.61	42	Bosnia and Herzegovina	-0.38
9	Malta	0.97	26	Italy	0.58	43	Georgia	-0.42
10	Czechia	0.96	27	Spain	0.58	44	Russian Federation	-0.65
11	Latvia	0.96	28	Slovak Republic	0.56	45	Belarus	-0.74
12	Denmark	0.95	29	United Kingdom	0.54	46	Armenia	-0.84
13	Portugal	0.95	30	Romania	0.53	47	Azerbaijan	-0.85
14	Netherlands	0.92	31	Poland	0.51	48	Turkiye	-1.1
15	Austria	0.91	32	Bulgaria	0.46	49	Ukraine	-1.1
16	Monaco	0.91	33	Cyprus	0.44	50	Kosovo	no data
17	San Marino	0.91	34	France	0.37			

Based on this ranking it is concluded that Serbia, Montenegro, Moldova, Kazakhstan, Bosnia and Herzegovina, Georgia, Russia, Belarus, Armenia, Azerbaijan, Turkey, Ukraine and Kosovo should be eliminated from consideration, while the leading markets are Lichtenstein, Andorra, Iceland, Luxembourg, Switzerland, Norway, Sweden, Finland, Malta and Czech Republic.

6.1.2 Restrictions on foreign investments

The European countries can also be evaluated based on restrictions on foreign investments, utilizing an OECD index that assesses limits on foreign ownership, preliminary market screening requirements and restrictions on foreign personnel and operational freedom. The index is based on a 0 to 1 value with 0 indicating fewer restrictions and 1 indicating more. Foreign investments are defined as the acquisition of assets or engagement in business operations by an entity from one country in another country (OECD 2002). These investments include stock purchase in a foreign company, real estate investment, or establishing a subsidiary abroad.

When evaluating a potential market for local future expansion of the DC industry, analysing the local restrictions on foreign investments is important because they can have a strong impact on the types of businesses permitted for foreign entities, limitations on the percentage of ownership foreign entities can hold in local companies, and requirements for local partnerships or joint ventures. These restrictions can potentially increase the difficulty and cost for a foreign company to build a DC in a particular country. Moreover, insight into the local laws and regulations is essential in order to ensure compliance with local laws, regulations, and taxation. It also helps recognize potential risks, including political instability, corruption, or other legal and regulatory issues that could impact the DC operations.

Due to the substantial number of countries with unavailable data, no countries were eliminated from consideration based on this index, a conclusion solely being drawn on the leading markets per the ranking illustrated in Appendix 5, which are: UK, Ireland, Netherlands, Germany, Denmark, Belgium, Italy, France, Greece and Sweden.

6.1.3 Difficulty index level for foreign controlled enterprises to invest locally

Data from the "OECD National Treatment for Foreign-Controlled Enterprises" (OECD 2002) was utilized in order to evaluate the political restrictions on foreign-controlled enterprises. Initially, the European countries were categorized by membership, and subsequently, examined by the specific restrictions applicable to each country. Based on the potential impact relevant specifically to a potential DC project, the countries were then ranked from the least to the most restrictive as potential markets for DC industry expansion.

Restrictions on foreign controlled enterprises can include regulations on the types of businesses that foreign entities are allowed to engage in, as well as limits on the percentage of ownership they can have in a local company, and requirements for local partnerships or joint ventures. These restrictions can make it more difficult or costly for a foreign entity to establish a DC in the corresponding country, and may also limit the potential for future growth or expansion. A breakdown of the restrictions per country can be seen in Appendix 6.

Based on the resulted ranking (APPENDIX 6) it is concluded that Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Georgia, Kosovo, Lichtenstein, Malta, Moldova, Monaco, Montenegro, Macedonia, Russia, San Marino and Serbia should be eliminated from consideration, while the leading markets are Czech Republic, Romania, Portugal, Slovakia, Poland, Latvia, Ireland, Italy, Belgium, Slovenia, Hungary, Netherlands, Luxembourg and Norway.

6.1.4 Corruption index

The corruption index is measured on a 0 to 100 scale where 100 indicates the highest risk. It is a crucial factor to evaluate when considering a potential market for DC construction because it can impact the overall business environment, the ease of conducting business, and the potential for encountering legal and regulatory issues. (Global Risk Profile 2022.)

Corruption is defined as the misuse of power for personal gain and it manifests in various forms such as bribery, embezzlement, and nepotism. A high corruption index suggests a higher likelihood of corruption in a country, making business operations more challenging due to potential arbitrary and discriminatory actions by government officials, along with an increased likelihood of legal and regulatory issues (Global Risk Profile 2022). Moreover, corruption can increase business costs as companies may be compelled to pay bribes or engage in illicit payments to government officials, creating difficulties in competing with other DCs in the region.

TABLE 2. Ranking of European countries by corruption in 2022 (Adapted from Global Risk Profile 2022)

Corruption index (from least to most)								
1	Norway	7,12	18	Slovenia	24,64	35	Serbia	45,04
2	Finland	7,14	19	Czechia	25,89	36	Moldova	49,19
3	Sweden	8,8	20	Latvia	25,91	37	Kazakhstan	49,28
4	Denmark	10,98	21	Poland	28,1	38	Turkiye	51,47
5	Estonia	11,13	22	Italy	29,83	39	Russian Federation	51,88
6	Netherlands	13,74	23	Greece	31,23	40	Ukraine	51,95
7	Iceland	15,23	24	Cyprus	32,31	41	Albania	52,36
8	Ireland	15,48	25	Malta	32,98	42	Belarus	53,16
9	United Kingdom	15,5	26	Slovak Republic	34,21	43	Kosovo	53,61
10	Germany	16,56	27	Georgia	34,57	44	Bosnia and Herzegovina	54,09
11	Belgium	18,7	28	Croatia	35,47	45	Azerbaijan	56,06
12	Austria	18,77	29	Bulgaria	37,61	46	Andorra	no data
13	France	18,87	30	Armenia	38,8	47	Liechtenstein	no data
14	Switzerland	18,87	31	Romania	38,89	48	Luxembourg	no data
15	Lithuania	21,79	32	Hungary	40,89	49	Monaco	no data
16	Portugal	22,22	33	North Macedonia	42,55	50	San Marino	no data
17	Spain	22,66	34	Montenegro	44,41			

Based on this ranking it is concluded that Moldova, Kazakhstan, Turkey, Russia, Ukraine, Albania, Belarus, Kosovo, Bosnia and Herzegovina, Azerbaijan, Andorra, Liechtenstein, Luxembourg, Monaco and San Marino should be eliminated from consideration, while the leading markets are Norway, Finland, Sweden, Denmark, Estonia, Netherlands, Iceland, Ireland, UK and Germany.

6.1.5 Security threat index

The following index measures security threats faced by a country, including factors such as bombings, attacks, battle related deaths, rebel movements, mutinies, coups, and terrorism. It also considers significant criminal elements, including organized crime and homicides, as well as the perceived trust of citizens in domestic security (Global Economy 2022). A higher value on this index indicates an increased threat which is relevant to a DC because it provides an understanding of potential security risks and it allows DCs to assess the need for security measures and sensitive data protection.

TABLE 3. Ranking of European countries by security threats index in 2022 (Adapted from Global Economy 2022)

Security Threat Index (from least to most)								
1	Portugal	0.3	18	Belgium	2.3	35	Albania	4.5
2	Slovenia	0.3	19	Croatia	2.3	36	Bosnia & Herz.	4.7
3	Iceland	0.4	20	Czechia	2.3	37	Italy	4.8
4	Luxembourg	0.4	21	Latvia	2.3	38	Moldova	4.8
5	Slovakia	0.9	22	Ireland	2.4	39	Belarus	5.3
6	Denmark	1.4	23	Sweden	2.4	40	Georgia	5.3
7	Norway	1.5	24	Lithuania	2.5	41	Armenia	5.4
8	Austria	1.7	25	Spain	3.1	42	Azerbaijan	6.1
9	Switzerland	1.7	26	Cyprus	3.2	43	Ukraine	6.4
10	Estonia	2	27	France	3.2	44	Turkey	6.9
11	Germany	2	28	UK	3.2	45	Russia	7.8
12	Hungary	2.1	29	Greece	3.6	46	Andorra	no data
13	Malta	2.1	30	Kazakhstan	3.7	47	Kosovo	no data
14	Netherlands	2.1	31	Bulgaria	4	48	Liechtenstein	no data
15	Poland	2.1	32	Serbia	4.2	49	Monaco	no data
16	Finland	2.2	33	Montenegro	4.3	50	San Marino	no data
17	Romania	2.2	34	North Macedonia	4.4			

Based on this ranking it is concluded that Belarus, Georgia, Armenia, Azerbaijan, Ukraine, Turkey, Russia, Andorra, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Portugal, Slovenia, Iceland, Luxembourg, Slovakia, Denmark, Norway, Austria, Switzerland, Estonia and Germany.

6.1.6 Political preliminary screening conclusion

Based on the political preliminary market screening it is concluded that the countries with either the least amount of available data or the highest political instability would present the highest potential risk to the development of a DC industry and they are: Azerbaijan, Belarus, Kosovo, Russia, Andorra, Armenia, Bosnia and Herzegovina, Georgia, Lichtenstein, Moldova, Monaco, San Marino, Turkey and Ukraine. The countries that offer the highest degree of political stability are: Norway, Denmark, Germany, Iceland, Ireland, Luxembourg, Netherlands and Sweden.

6.2 Legal preliminary screening

Indexes related to the legal frameworks and conditions in the European countries will be screened next. The objective is to analyse various jurisdictions, identifying potential challenges and opportunities that may impact the potential future expansion of the local DC industry.

6.2.1 Trade freedom index

The trade freedom index is calculated by averaging the trade-weighted tariffs and non-tariff barriers and it measures the ease of trade within a country by taking into account both tariffs (taxes on imported goods) and non-tariff barriers (such as regulations, customs procedures, and government intervention in trade) on a 0 to 100 scale with 100 being the highest level of freedom (Global Economy 2022).

Analysing a country's trade freedom index is relevant when considering building a DC in that country because it can provide insight into the ease of doing business locally. A high trade freedom index indicates that the country has relatively low tariffs and minimal non-tariff barriers, which can make it easier and less costly to import the necessary equipment and supplies for the DC. Additionally, a high trade freedom index may indicate that the country has a more stable business environment, which can be beneficial for a foreign company looking to invest in building a DC.

TABLE 4. Ranking of European countries by trade freedom in 2022 (Adapted from Global Economy 2022)

Trade Freedom Index (from highest to lowest)								
1	Georgia	87	18	Germany	79	35	Ukraine	79
2	Switzerland	87	19	Greece	79	36	North Macedonia	78
3	Norway	85	20	Hungary	79	37	Moldova	77
4	Spain	84	21	Ireland	79	38	Serbia	77
5	United Kingdom	84	22	Italy	79	39	Belarus	76
6	Albania	83	23	Latvia	79	40	Turkey	76
7	Iceland	81	24	Lithuania	79	41	Kazakhstan	75
8	Austria	79	25	Luxembourg	79	42	Armenia	74
9	Belgium	79	26	Malta	79	43	Azerbaijan	67
10	Bulgaria	79	27	Montenegro	79	44	Bosnia and Herzegovina	69
11	Croatia	79	28	Netherlands	79	45	Russia	69
12	Cyprus	79	29	Poland	79	46	Andorra	no data
13	Czechia	79	30	Portugal	79	47	Kosovo	no data
14	Denmark	79	31	Romania	79	48	Liechtenstein	no data
15	Estonia	79	32	Slovakia	79	49	Monaco	no data
16	Finland	79	33	Slovenia	79	50	San Marino	no data
17	France	79	34	Sweden	79			

Based on this ranking it is concluded that North Macedonia, Moldova, Serbia, Belarus, Turkey, Kazakhstan, Armenia, Azerbaijan, Bosnia and Herzegovina, Russia, Andorra, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Georgia, Switzerland, Norway, Spain, UK, Albania and Iceland.

6.2.2 Taxes on the income or profits of corporations

The analysis of corporate income or profit taxes is based on the latest available data of the overall tax-to-GDP ratio, calculated as the sum of taxes and net social contributions into a percentage of gross domestic product (Eurostat 2020). Evaluating this percentage is relevant when assessing a potential DC location as it offers valuable insights into the overall business climate and the associated costs of operating in that specific country.

A high percentage can increase overall construction and maintenance costs as a result of increased operational costs. Additionally, a high tax rate may discourage foreign investment, making it more challenging for a foreign company to build a DC in that specific country.

TABLE 5. Ranking of European countries by taxes on the income or profits of corporations in 2019 as % of GDP (Adapted from Eurostat 2020, 5)

Taxes on Income or Profit of Corporations (least to most)								
1	Latvia	0.2	18	France	2.8	35	Azerbaijan	no data
2	Hungary	1.2	19	Slovak Republic	3	36	Belarus	no data
3	Lithuania	1.6	20	Sweden	3	37	Bosnia and Herzegovina	no data
4	Estonia	1.8	21	Denmark	3.1	38	Georgia	no data
5	Italy	1.9	22	Ireland	3.1	39	Kazakhstan	no data
6	Bulgaria	2	23	Portugal	3.1	40	Kosovo	no data
7	Slovenia	2	24	Switzerland	3.1	41	Liechtenstein	no data
8	Iceland	2.1	25	Czechia	3.3	42	Moldova	no data
9	Romania	2.1	26	Belgium	3.7	43	Monaco	no data
10	Spain	2.1	27	Netherlands	3.7	44	Montenegro	no data
11	Greece	2.2	28	Malta	5.7	45	North Macedonia	no data
12	Poland	2.2	29	Norway	5.8	46	Russian Federation	no data
13	Croatia	2.4	30	Cyprus	5.9	47	San Marino	no data
14	United Kingdom	2.4	31	Luxembourg	5.9	48	Serbia	no data
15	Finland	2.5	32	Albania	no data	49	Turkiye	no data
16	Germany	2.7	33	Andorra	no data	50	Ukraine	no data
17	Austria	2.8	34	Armenia	no data			

Based on this ranking it is concluded that Denmark, Ireland, Portugal, Switzerland, Czech Republic, Belgium, Netherlands, Malta, Norway, Cyprus, Luxembourg and all the countries lacking data per Table 5 should be eliminated from consideration, while the leading markets are Latvia, Hungary, Lithuania, Estonia, Italy, Bulgaria, Slovenia, Iceland, Romania and Spain.

6.2.3 Investment freedom index

The following index evaluates various investment restrictions, including bureaucracy, land ownership, foreign exchange control, capital control, security issues, absence of investment infrastructure, and expropriation of investments without fair compensation (Global Economy 2022). A higher value on the

index indicates greater investment freedom which is relevant for a DC because it has a direct impact on the ability to secure funding, sustain growth and technological advancement.

TABLE 6. Ranking of European countries by Investment freedom index in 2022 (Adapted from Global Economy 2022)

Investment Freedom (from most to least)								
1	Luxembourg	95	18	Poland	80	35	Slovenia	70
2	Denmark	90	19	UK	80	36	Turkey	70
3	Estonia	90	20	Armenia	75	37	Kazakhstan	50
4	Ireland	90	21	Croatia	75	38	Bosnia & Herz.	65
5	Netherlands	90	22	Cyprus	75	39	North Macedonia	65
6	Belgium	85	23	France	75	40	Bulgaria	60
7	Finland	85	24	Montenegro	75	41	Greece	55
8	Latvia	85	25	Norway	75	42	Moldova	55
9	Spain	85	26	Slovakia	75	43	Ukraine	35
10	Sweden	85	27	Albania	70	44	Belarus	30
11	Switzerland	85	28	Azerbaijan	70	45	Russia	30
12	Austria	80	29	Czechia	70	46	Andorra	no data
13	Georgia	80	30	Lithuania	70	47	Kosovo	no data
14	Germany	80	31	Malta	70	48	Liechtenstein	no data
15	Hungary	80	32	Portugal	70	49	Monaco	no data
16	Iceland	80	33	Romania	70	50	San Marino	no data
17	Italy	80	34	Serbia	70			

Based on this ranking it is concluded that Bosnia and Herzegovina, North Macedonia, Bulgaria, Greece, Moldova, Ukraine, Belarus, Russia, Andorra, Kosovo, Liechtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Luxembourg, Denmark, Estonia, Ireland, Netherlands, Belgium, Finland, Latvia, Spain, Sweden and Switzerland.

6.2.4 Fiscal freedom index

The following index measures the government imposed taxes, considering factors such as the top marginal tax rate on individual income, the top marginal tax rate on corporate income, and the total tax burden as a percentage of GDP (Global Economy 2022). A higher percentage indicates greater fiscal freedom in the corresponding country which is relevant for a DC as it impacts costs, profitability, and the ability to retain both foreign investments and skilled workforce.

TABLE 7. Ranking of European countries by fiscal freedom index in 2022 (Adapted from Global Economy 2022)

Fiscal Freedom (from most to least)								
1	Azerbaijan	99	18	Lithuania	87	35	Greece	68
2	Luxembourg	99	19	Moldova	87	36	Georgia	67
3	Russia	99	20	Malta	86	37	Turkey	59
4	Norway	97	21	Serbia	86	38	Hungary	58
5	Bosnia & Herz.	96	22	Finland	83	39	Belgium	50
6	Bulgaria	96	23	Poland	78	40	Italy	49
7	Denmark	96	24	Slovenia	77	41	Romania	43
8	Sweden	96	25	Iceland	76	42	France	39
9	Switzerland	96	26	Armenia	76	43	Spain	30
10	Belarus	95	27	Slovakia	76	44	UK	23
11	Kazakhstan	94	28	Croatia	75	45	Montenegro	12
12	Netherlands	94	29	Ukraine	74	46	Andorra	no data
13	Czechia	93	30	Portugal	73	47	Kosovo	no data
14	Estonia	93	31	Austria	72	48	Liechtenstein	no data
15	Latvia	91	32	Albania	71	49	Monaco	no data
16	Germany	90	33	Cyprus	71	50	San Marino	no data
17	Ireland	89	34	North Macedonia	70			

Based on this ranking it is concluded that North Macedonia, Greece, Georgia, Turkey, Hungary, Belgium, Italy, Romania, France, Spain, UK, Montenegro, Andorra, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Azerbaijan, Luxembourg, Russia, Norway, Bosnia, Bulgaria, Denmark, Sweden, Switzerland and Belarus.

6.2.5 Legal preliminary screening conclusion

Based on the legal preliminary screening it can be concluded that the countries with either the least amount of available data or the highest legal potential risk to the development of a DC industry are: Andorra, Kosovo, Lichtenstein, Monaco, North Macedonia, San Marino, Belarus, Bosnia and Herzegovina, Moldova, Russia and Turkey, while the countries that offer the highest degree of legal stability are Spain and Switzerland.

6.3 Ecological preliminary screening

The preliminary screening will continue by evaluating indexes related to the ecological sustainability and impact of the European countries. The objective is to identify environmentally conscious and sustainable markets for potential future expansion of the DC industry.

6.3.1 Share of renewable energy

The share of renewable energy indicates the proportion of energy generated from renewable sources within a country and it is measured as a percentage of the total electricity generation. Renewable energy sources include solar, wind, hydro, geothermal, and bio-energy (International Renewable Energy Agency 2022). Analysing this percentage is relevant when considering building a DC in a certain country because it can affect the overall energy costs, the energy reliability and the environmental impact of the DC.

DCs are substantial consumers of energy, and the cost and reliability of energy play an important role in influencing overall operating costs and profitability. A high proportion of renewable energy in a country's energy mix indicates potential benefits such as lower energy costs, a more reliable energy supply, and a reduced environmental impact. This not only increases the feasibility of a country for companies investing in and building DCs but also contributes to the building's overall profitability.

Contrarily, a low share of renewable energy in the country's energy mix indicates higher energy costs, a less stable energy supply, and an increased environmental impact. This makes it less appealing for companies to invest in the country and construct DCs. Furthermore, there is a growing emphasis on sustainability in DC operations, with companies actively seeking ways to minimize their carbon footprint. Using renewable energy is a key strategy in achieving this objective, as it effectively reduces the carbon emissions associated with DC operations

TABLE 8. Ranking of European countries by share of renewable energy in 2020 (Adapted from Balkan Green Energy News 2022; Cahill 2022; Deutsche Energie Agentur GmbH 2021, 1; Eurostat 2020; IEA 2020; IEA 2021; IEA 2021, 7; International Renewable Energy Agency 2022, 1; International Trade Administration 2022; Macrotrends 2023; UNECE REUptake 2021, 1; The Ministry of Energy of The Republic of Azerbaijan 2022; Ritchie & Roser 2021; World Data 2020)

Share of Energy from Renwable Sources (from highest to lowest)								
1	Iceland	83.70%	18	Kosovo	25.69%	35	Ireland	16.20%
2	Norway	77.40%	19	Slovenia	25.00%	36	Poland	16.10%
3	Switzerland	62.20%	20	United Kingdom	24.84%	37	Andorra	15%
4	Sweden	60.01%	21	Romania	24.50%	38	Netherlands	14.00%
5	Albania	45%	22	Liechtenstein	24.21%	39	Hungary	13.90%
6	Finland	43.80%	23	Armenia	24.00%	40	Belgium	13.00%
7	Latvia	42.10%	24	Bulgaria	23.30%	41	Ukraine	12.40%
8	Montenegro	39.00%	25	Greece	21.70%	42	Luxembourg	11.70%
9	Bosnia and Herzegovina	37.00%	26	Spain	21.20%	43	Malta	10.70%
10	Austria	36.50%	27	Georgia	20.50%	44	Russian Federation	6.62%
11	Portugal	34.00%	28	Italy	20.40%	45	Belarus	6.00%
12	Denmark	31.60%	29	Germany	19.30%	46	Moldova	6.00%
13	North Macedonia	31.40%	30	France	19.10%	47	Kazakhstan	0.60%
14	Croatia	31.00%	31	Azerbaijan	17.30%	48	San Marino	0%
15	Estonia	30.20%	32	Czechia	17.30%	49	Turkiye	0%
16	Lithuania	26.80%	33	Slovak Republic	17.30%	50	Monaco	no data
17	Serbia	26.30%	34	Cyprus	16.90%			

Based on this ranking it is concluded that Belgium, Ukraine, Luxembourg, Malta, Russia, Belarus, Moldova, Kazakhstan, San Marino, Turkey and Monaco should be eliminated from consideration, while the leading markets are Iceland, Norway, Switzerland, Sweden, Albania, Finland, Latvia, Montenegro, Bosnia and Herzegovina and Austria.

6.3.2 Emissions index

The emissions index is calculated based on the weighting of carbon and methane emissions and it is ranging from 0 to 100, with 0 indicating the highest risk and 100 the lowest (World Economics 2020). Analysing this index during a DC location selection process is important because it provides insights into the environmental impact of the energy utilized by the potential DC. The emissions index quanti-

fies the volume of GHG produced by a country, region, or sector, typically measured in CO2 equivalent (World Economics 2020). High emission values can mean a greater environmental impact caused by the DC's energy usage, making it less appealing for companies trying to reduce their carbon footprint. A high emissions index also implies that the country's electricity likely originates from sources emitting substantial GHG, such as coal, oil, or natural gas (World Economics 2020).

Operating a DC in a country with a high index value would result in a larger carbon footprint, contributing to climate change. A low index value indicates that the country generates a significant portion of electricity from renewable sources such as wind or solar power, resulting in a lower environmental impact. Considering these values is crucial when constructing a DC, as it profoundly influences its overall sustainability (Subchapter 532.1.). Moreover, many countries are starting to implement carbon taxation and regulations to minimize emissions and climate change. A high emission index in Table 9 can signify higher costs associated with these measures, potentially impacting the profitability of a DC.

TABLE 9. Ranking of European countries by emissions index in 2020 (Adapted from World Economics 2020)

Environmental Susteinability Index (from highest to lowest)								
1	Iceland	100.00%	18	Finland	99.60%	35	Spain	97.20%
2	Malta	100.00%	19	Norway	99.60%	36	Kazakhstan	96.80%
3	Albania	99.90%	20	Sweden	99.60%	37	Italy	96.60%
4	Armenia	99.90%	21	Switzerland	99.60%	38	Poland	96.50%
5	Cyprus	99.90%	22	Bulgaria	99.50%	39	Ukraine	96.40%
6	Estonia	99.90%	23	Hungary	99.50%	40	France	96.10%
7	Latvia	99.90%	24	Austria	99.40%	41	Turkiye	96.10%
8	Luxembourg	99.90%	25	Greece	99.30%	42	United Kingdom	96.10%
9	North Macedonia	99.90%	26	Portugal	99.30%	43	Germany	94.40%
10	Slovenia	99.90%	27	Belgium	99.20%	44	Russian Federation	57.30%
11	Croatia	99.80%	28	Serbia	99.20%	45	Andorra	no data
12	Lithuania	99.80%	29	Ireland	99.10%	46	Kosovo	no data
13	Moldova	99.80%	30	Belarus	99.00%	47	Liechtenstein	no data
14	Bosnia and Herzegovina	99.70%	31	Czechia	99.00%	48	Monaco	no data
15	Georgia	99.70%	32	Romania	98.70%	49	Montenegro	no data
16	Slovak Republic	99.70%	33	Netherlands	98.50%	50	San Marino	no data
17	Denmark	99.60%	34	Azerbaijan	98.10%			

Based on this ranking it is concluded that Spain, Kazakhstan, Italy, Poland, Ukraine, France, Turkey, UK, Germany, Russia, Andorra, Kosovo, Lichtenstein, Monaco, Montenegro and San Marino should

be eliminated from consideration, while the leading markets are Iceland, Malta, Albania, Armenia, Cyprus, Estonia, Latvia, Luxembourg, North Macedonia and Slovenia.

6.3.3 Ecological preliminary screening conclusion

Based on the ecological preliminary screening it can be concluded that the countries with either the least amount of available data or the highest ecological risk to the development of a DC industry are: Belgium, followed by Kazakhstan, Monaco, Russia, San Marino, Turkey and Ukraine, while the countries that offer the highest degree of ecological stability are: Albania, Iceland and Latvia.

6.4 Technological preliminary screening

The preliminary screening will continue by assessing technological indicators related to the digital infrastructure and innovation readiness of the European countries. By evaluating these indexes, the objective is to identify markets that offer high quality technological environments, promoting a feasible location for the efficient and sustainable future expansion of the DC industry.

6.4.1 Internet speed

Internet speed is a relevant factor for the comparative analysis of European countries, particularly in the selection of DC locations because it significantly influences the performance and reliability of the DC. A country with high internet speed can facilitate faster data transfer and enhance connectivity for users accessing the data, ultimately improving the user experience and overall operational efficiency.

In today's highly interconnected and fast paced digital environment, building a DC in a country with high internet speed offers a competitive advantage thanks to the ability to achieve faster data transfer and processing, which is vital for most businesses. A DC in a country with low internet speed may lead to delays and disruptions in data transfer, negatively impacting the performance and reliability of the DC.

TABLE 10. Ranking of European countries by internet speed in 2023 (Adapted from World Population Review 2023)

Internet Speed (from highest megabits/second to lowest)								
1	Monaco	261.82	18	Germany	136.66	35	Croatia	69.09
2	Romania	232.17	19	Latvia	135.22	36	Kazakhstan	63.28
3	Switzerland	229.96	20	Finland	135.05	37	Montenegro	60.03
4	Denmark	227.91	21	Belgium	125.12	38	Cyprus	55.11
5	France	214.04	22	Ireland	122.55	39	Bosnia and Herzegovina	48.51
6	Hungary	210.55	23	Slovenia	115.61	40	Albania	45.55
7	Spain	201.47	24	Slovak Republic	115.11	41	Turkiye	43.48
8	Sweden	174.9	25	Italy	104.09	42	North Macedonia	43.24
9	Luxembourg	172.05	26	United Kingdom	102.24	43	Greece	39.08
10	Andorra	171.44	27	Russian Federation	95.96	44	Armenia	38.95
11	Norway	168.25	28	Austria	94.31	45	Iceland	32.13
12	Netherlands	165	29	Estonia	88.49	46	Georgia	28.61
13	Portugal	162.55	30	Serbia	86.77	47	Azerbaijan	25.1
14	Poland	156.33	31	Bulgaria	86.75	48	Kosovo	no data
15	Moldova	154.56	32	Ukraine	76.82	49	Liechtenstein	no data
16	Lithuania	147.05	33	Czechia	74.8	50	San Marino	no data
17	Malta	144.06	34	Belarus	69.41			

Based on this ranking it is concluded that Cyprus, Bosnia and Herzegovina, Albania, Turkey, North Macedonia, Greece, Armenia, Iceland, Georgia, Azerbaijan, Kosovo, Lichtenstein and San Marino should be eliminated from consideration, while the leading markets are Monaco, Romania, Switzerland, Denmark, France, Hungary, Spain, Sweden, Luxembourg and Andorra.

6.4.2 Internet bandwidth

The internet bandwidth indicator represented in Table 11 is the sum of the capacity of all internet exchanges offering international bandwidth and is measured in kilobits per second (kb/s) (Global Economy 2016). Bandwidth and internet speed are often mistaken but they are different concepts, as bandwidth refers to the volume of information that can be sent over a connection in a given time, measured in megabits per second (Mbps) (Verizon 2022). On the other hand, internet speed measures how fast information can be received or downloaded (Parrish, Holslin & Armstrong 2024). Internet bandwidth is an important factor to consider during the DC location selection process because it affects performance, scalability, reliability and user experience for the DC' services and operations.

TABLE 11. Ranking of European countries by internet bandwidth in 2016 (Adapted from Global Economy 2016)

Internet Bandwidth (from best to worst)								
1	Luxembourg	6887.71	18	Lithuania	125.45	35	Bosnia & Herz.	43
2	Malta	1178.76	19	Slovenia	121.14	36	Turkey	42.91
3	Sweden	527.45	20	Romania	117.32	37	North Macedonia	41.81
4	Iceland	519.87	21	Czechia	116.81	38	Ukraine	40.7
5	UK	429.83	22	Serbia	112.37	39	Hungary	37.03
6	Switzerland	352.24	23	Spain	111.55	40	Azerbaijan	32.22
7	Denmark	341.71	24	Greece	99.51	41	Albania	32.08
8	Netherlands	281.06	25	Latvia	93.68	42	Russia	29.86
9	Belgium	263.91	26	Italy	92.5	43	Estonia	28.67
10	France	221.66	27	Poland	90.36	44	Slovakia	11.46
11	Portugal	218.88	28	Austria	79.64	45	Andorra	no data
12	Finland	218.74	29	Montenegro	77.02	46	Belarus	no data
13	Norway	203.94	30	Cyprus	75.05	47	Kosovo	no data
14	Ireland	160.97	31	Georgia	70.97	48	Liechtenstein	no data
15	Moldova	152.36	32	Croatia	58.03	49	Monaco	no data
16	Germany	145.99	33	Kazakhstan	51.49	50	San Marino	no data
17	Bulgaria	135.11	34	Armenia	44.53			

Based on this ranking it is concluded that Bosnia and Herzegovina, Turkey, North Macedonia, Ukraine, Hungary, Azerbaijan, Albania, Russia, Estonia, Slovakia, Andorra, Belarus, Kosovo, Liechtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Luxembourg, Malta, Sweden, Iceland, UK, Switzerland, Denmark, Netherlands, Belgium and France.

6.4.3 Electricity production capacity

Another relevant technological index is the country's electricity production capacity because a high value can indicate a local good quality, reliable electrical source which is one of the most important factors to consider during the DC location selection process (Subchapter 5.3.1.). Table 12 ranks the European countries based on their capacity, measured in million kilowatts.

TABLE 12. Ranking of European countries by electricity production capacity in 2020 (Adapted from Global Economy 2020)

Electricity Production Capacity (from highest to lowest)								
1	Russia	276.9	18	Romania	20.93	35	Latvia	3.07
2	Germany	242.24	19	Greece	20.61	36	Estonia	3.02
3	France	138.39	20	Finland	19.79	37	Iceland	2.98
4	Italy	120.72	21	Denmark	17.15	38	Albania	2.33
5	United Kingdom	112.34	22	Bulgaria	11.32	39	North Macedonia	1.86
6	Spain	111.18	23	Ireland	11.28	40	Cyprus	1.83
7	Turkiye	92.04	24	Hungary	10.32	41	Luxembourg	1.82
8	Ukraine	55.19	25	Belarus	10.24	42	Montenegro	1
9	Poland	44.42	26	Serbia	7.9	43	Malta	0.75
10	Sweden	42.58	27	Slovak Republic	7.85	44	Moldova	0.58
11	Netherlands	38.25	28	Azerbaijan	7.66	45	Andorra	no data
12	Norway	36.86	29	Croatia	4.85	46	Kazakhstan	no data
13	Austria	27.82	30	Bosnia and Herzegovina	4.76	47	Kosovo	no data
14	Belgium	25.16	31	Georgia	4.35	48	Liechtenstein	no data
15	Czechia	22.5	32	Slovenia	3.87	49	Monaco	no data
16	Portugal	22.29	33	Armenia	3.59	50	San Marino	no data
17	Switzerland	21.88	34	Lithuania	3.47			

Based on this ranking it is concluded that Latvia, Estonia, Iceland, Albania, North Macedonia, Cyprus, Luxembourg, Montenegro, Malta, Moldova, Andorra, Kazakhstan, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Russia, Germany, France, Italy, UK, Spain, Turkey, Ukraine, Poland and Sweden.

6.4.4 Renewable power capacity

The following index measures the European countries' overall capacity to generate electricity from renewable sources and is measured in million kilowatts (Global Economy 2020). Access to renewable power allows DCs to minimize their environmental impact, reduce costs, increase reliability, meet regulatory requirements and demonstrate social responsibility.

TABLE 13. Ranking of European countries by renewable power capacity in 2020 (Adapted from Global Economy 2020)

Renwable Power Capacity (from most to least)								
1	Germany	131.4	18	Denmark	9.68	35	Azerbaijan	1.28
2	Spain	56.78	19	Finland	8.73	36	Lithuania	0.95
3	Italy	52.47	20	Switzerland	7.85	37	North Macedonia	0.82
4	Russia	52.35	21	Ireland	4.72	38	Montenegro	0.78
5	France	51.61	22	Czechia	4.35	39	Estonia	0.73
6	Turkey	49.56	23	Bulgaria	3.59	40	Luxembourg	0.45
7	UK	48.05	24	Georgia	3.47	41	Belarus	0.43
8	Norway	35.85	25	Serbia	2.93	42	Cyprus	0.37
9	Sweden	33.54	26	Hungary	2.89	43	Malta	0.19
10	Netherlands	18.11	27	Croatia	2.88	44	Moldova	0.12
11	Austria	16.4	28	Iceland	2.85	45	Andorra	no data
12	Ukraine	13.61	29	Albania	2.41	46	Kazakhstan	no data
13	Poland	11.85	30	Slovakia	2.38	47	Kosovo	no data
14	Belgium	11.47	31	Bosnia & Herz.	2.22	48	Liechtenstein	no data
15	Portugal	11.38	32	Latvia	1.82	49	Monaco	no data
16	Romania	10.77	33	Slovenia	1.68	50	San Marino	no data
17	Greece	10.2	34	Armenia	1.39			

Based on this ranking it is concluded that Lithuania, North Macedonia, Montenegro, Estonia, Luxembourg, Belarus, Cyprus, Malta, Moldova, Andorra, Kazakhstan, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Germany, Spain, Italy, Russia, France, Turkey, UK, Norway, Sweden and Netherlands.

6.4.5 Road quality index

The following index assesses the quality of the roads in the European countries based on data from the WEF Executive Opinion Survey, including the opinions of over 14,000 business leaders in 144 countries. The score for road quality is based on the respondents' 1 to 7 ranking of the roads in their country of operation, with 1 meaning underdeveloped and 7 meaning efficient by international standards. The individual responses were compiled to produce a country score. (Global Economy 2019.)

Evaluating the access to quality road infrastructure is relevant because it supports the operational efficiency, it facilitates transportation of equipment and personnel and it supports emergency responses, making it an important consideration in site selection and infrastructure planning.

TABLE 14. Ranking of European countries by roads quality in 2019 (Adapted from Global Economy 2019)

Road Infrastructure Quality (from best to worst)								
1	Netherlands	6.4	18	Lithuania	4.8	35	Latvia	3.6
2	Switzerland	6.3	19	Estonia	4.7	36	Russia	3.5
3	Austria	6	20	Greece	4.6	37	Serbia	3.5
4	Portugal	6	21	Norway	4.5	38	Bulgaria	3.4
5	Spain	5.7	22	Belgium	4.4	39	North Macedonia	3.4
6	Croatia	5.6	23	Ireland	4.4	40	Malta	3.3
7	Denmark	5.6	24	Italy	4.4	41	Romania	3
8	Luxembourg	5.5	25	Poland	4.3	42	Ukraine	3
9	France	5.4	26	Iceland	4.1	43	Bosnia & Herz.	2.8
10	Finland	5.3	27	Hungary	4	44	Moldova	2.6
11	Germany	5.3	28	Slovakia	4	45	Andorra	no data
12	Sweden	5.3	29	Albania	3.9	46	Belarus	no data
13	Azerbaijan	5.2	30	Czechia	3.9	47	Kosovo	no data
14	Cyprus	5.1	31	Montenegro	3.9	48	Liechtenstein	no data
15	Turkey	5	32	Georgia	3.8	49	Monaco	no data
16	Slovenia	4.9	33	Armenia	3.6	50	San Marino	no data
17	UK	4.9	34	Kazakhstan	3.6			

Based on this ranking it is concluded that Russia, Serbia, Bulgaria, North Macedonia, Malta, Romania, Ukraine, Bosnia and Herzegovina, Moldova, Andorra, Belarus, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Netherlands, Switzerland, Austria, Portugal, Spain, Croatia, Denmark, Luxembourg, France, Finland, Germany and Sweden.

6.4.6 Railroad quality index

The following index assesses the quality of the railroads in the European countries based on data from the WEF Executive Opinion Survey, including the opinions of over 14,000 business leaders in 144 countries. The score for railroad quality is based on the respondents' 1 to 7 ranking of the railroads in their country of operation, with 1 meaning underdeveloped and 7 meaning efficient by international standards. The individual responses were compiled to produce a country score. (Global Economy 2019.)

Evaluating the access to quality railroad infrastructure is relevant because it supports the operational efficiency and global connectivity of DCs, making it an important consideration in site selection and infrastructure planning.

TABLE 15. Ranking of European countries by railroads quality in 2019 (Adapted from Global Economy 2019)

Railroad Infrastructure Quality (from best to worst)								
1	Switzerland	6.4	18	Ukraine	4.2	35	Romania	2.8
2	Netherlands	5.7	19	Belgium	4.1	36	Serbia	2.6
3	Finland	5.5	20	Italy	4.1	37	Croatia	2.4
4	Spain	5.4	21	Ireland	4	38	Bosnia & Herz.	2.2
5	Austria	5.3	22	Slovakia	4	39	North Macedonia	2.1
6	France	5	23	Sweden	4	40	Albania	1.2
7	Luxembourg	5	24	Georgia	3.9	41	Andorra	no data
8	Germany	4.9	25	Poland	3.9	42	Azerbaijan	no data
9	Russia	4.9	26	Hungary	3.8	43	Belarus	no data
10	Latvia	4.6	27	Turkey	3.5	44	Cyprus	no data
11	Lithuania	4.6	28	Armenia	3.1	45	Iceland	no data
12	Czechia	4.5	29	Bulgaria	3.1	46	Kosovo	no data
13	Denmark	4.5	30	Estonia	3.1	47	Liechtenstein	no data
14	Norway	4.5	31	Montenegro	3.1	48	Malta	no data
15	UK	4.3	32	Slovenia	3.1	49	Monaco	no data
16	Kazakhstan	4.2	33	Greece	3	50	San Marino	no data
17	Portugal	4.2	34	Moldova	3			

Based on this ranking it is concluded that Montenegro, Slovenia, Greece, Moldova, Romania, Serbia, Croatia, Bosnia and Herzegovina, North Macedonia, Albania, Andorra, Azerbaijan, Belarus, Cyprus, Iceland, Kosovo, Lichtenstein, Malta, Monaco and San Marino should be eliminated from consideration, while the leading markets are Switzerland, Netherlands, Finland, Spain, Austria, France, Luxembourg, Germany, Russia, Latvia and Lithuania.

6.4.7 Port infrastructure quality index

The following index assesses the quality of the ports in the European countries based on data from the WEF Executive Opinion Survey, including the opinions of over 14,000 business leaders in 144 countries. The score for port infrastructure quality is based on the respondents' 1 to 7 ranking of the port facilities and inland waterways in their country of operation, with 1 meaning underdeveloped and 7 meaning efficient by international standards. For landlocked countries, the respondents were asked to rate the access to port facilities and inland waterways on a scale from 1 meaning impossible, to 7 meaning easy. The individual responses were compiled to produce a country score. (Global Economy 2019.)

Evaluating the access to quality port infrastructure is relevant because it supports the operational efficiency and global connectivity of DCs, making it an important consideration in site selection and infrastructure planning.

TABLE 16. Ranking of European countries by port infrastructure quality in 2019 (Adapted from Global Economy 2019)

Port Infrastructure Quality (from best to worst)								
1	Finland	6.4	16	Latvia	4.9	31	Montenegro	4.2
2	Netherlands	6.4	17	Portugal	4.9	32	Romania	3.9
3	Denmark	5.8	18	Greece	4.8	33	Ukraine	3.9
4	Belgium	5.6	19	Lithuania	4.8	34	Georgia	3.8
5	Estonia	5.6	20	Croatia	4.7	35	Austria	3.7
6	Iceland	5.4	21	Italy	4.7	36	Kazakhstan	3.3
7	Spain	5.4	22	Russia	4.7	37	Czechia	3.2
8	Sweden	5.3	23	Slovenia	4.7	38	Hungary	3.2
9	France	5.2	24	Turkey	4.7	39	Serbia	3.1
10	Germany	5.2	25	Poland	4.5	40	Slovakia	3.1
11	UK	5.2	26	Switzerland	4.5	41	Armenia	2.4
12	Azerbaijan	5.1	27	Luxembourg	4.4	42	North Macedonia	2.4
13	Malta	5.1	28	Albania	4.3	43	Moldova	2.3
14	Norway	5.1	29	Bulgaria	4.3	44	Bosnia & Herz.	2.1
15	Ireland	5	30	Cyprus	4.3			

Based on this ranking it is concluded that Georgia, Austria, Kazakhstan, Czech, Hungary, Serbia, Slovakia, Armenia, North Macedonia, Moldova and Bosnia and Herzegovina should be eliminated from consideration, while the leading markets are Finland, Netherlands, Denmark, Belgium, Estonia, Iceland, Spain, Sweden, France, Germany and UK.

6.4.8 Air infrastructure quality index

The following index assesses the quality of the airports in the European countries based on data from the WEF Executive Opinion Survey, including the opinions of over 14,000 business leaders in 144 countries. The score for air transport infrastructure quality is based on the respondents' 1 to 7 ranking of the passenger air transport in their country of operation, with 1 meaning underdeveloped and 7 meaning efficient by international standards. The individual responses were compiled to produce a country score. (Global Economy 2019.)

Evaluating the access to quality air infrastructure is relevant because it supports the operational efficiency and global connectivity of DCs, making it an important consideration in site selection and infrastructure planning.

TABLE 17. Ranking of European countries by air infrastructure quality in 2019 (Adapted from Global Economy 2019)

Air Infrastructure Quality (from best to worst)								
1	Netherlands	6.4	18	Turkey	5.4	35	Bulgaria	4.5
2	Finland	6.3	19	UK	5.3	36	Georgia	4.4
3	Switzerland	6.1	20	Austria	5.2	37	Moldova	4.4
4	Azerbaijan	5.8	21	Cyprus	5.1	38	Kazakhstan	4.3
5	Denmark	5.8	22	Czechia	5	39	North Macedonia	4.3
6	Latvia	5.7	23	Portugal	5	40	Serbia	4.3
7	Sweden	5.7	24	Russia	5	41	Albania	4.1
8	Belgium	5.6	25	Italy	4.9	42	Ukraine	4
9	Iceland	5.6	26	Lithuania	4.9	43	Slovakia	3.8
10	Luxembourg	5.6	27	Croatia	4.8	44	Bosnia & Herzegovina	3.5
11	Norway	5.6	28	Poland	4.8	45	Andorra	no data
12	Spain	5.6	29	Armenia	4.6	46	Belarus	no data
13	France	5.5	30	Estonia	4.6	47	Kosovo	no data
14	Germany	5.5	31	Hungary	4.6	48	Liechtenstein	no data
15	Ireland	5.5	32	Montenegro	4.6	49	Monaco	no data
16	Malta	5.5	33	Romania	4.6	50	San Marino	no data
17	Greece	5.4	34	Slovenia	4.6			

Based on this ranking it is concluded that Bulgaria, Georgia, Moldova, Kazakhstan, North Macedonia, Serbia, Albania, Ukraine, Slovakia, Bosnia and Herzegovina, Andorra, Belarus, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Netherlands, Finland, Switzerland, Azerbaijan, Denmark, Latvia, Sweden, Belgium, Iceland, Luxembourg, Norway and Spain.

6.4.9 Technological preliminary screening conclusion

Based on the technological preliminary screening it can be concluded that the countries with either the least amount of available data or lowest level of technological development relevant to the DC industry are: North Macedonia, Kosovo, Lichtenstein, San Marino, followed by Andorra, Bosnia and Herzegovina, Moldova, Monaco, Albania and Belarus, while the countries that offer the highest degree of technological development are: France, Spain, Sweden, followed by Netherlands.

6.5 Socio-cultural preliminary screening

The preliminary screening will continue by assessing socio-cultural indicators to evaluate the social and cultural environment of the European countries. The objective is to identify markets that offer a supportive and inclusive socio-cultural environment for the successful establishment and operation of new DCs.

6.5.1 Rule of law

The first socio-cultural index to be investigated is the rule of law which is a statistic based on the average available data between 1996 and 2021, with '-2.5' as the weakest value and '2.5' as the strongest value. According to Global Economy (2021), this index shows the likelihood of a society to abide by rules and laws and it can give a good indication of the quality of contract enforcements, rights, courts, police and likelihood of crime.

A country with a strong rule of law should have a predictable legal framework that can be relied upon to protect property rights, enforce contracts and provide security for investments. This will make it more feasible for foreign companies to invest and operate in the country, as they will have a higher degree of confidence in the security of their investments. A strong rule of law also promotes stability by reducing the risk of arbitrary or discriminatory actions by government officials or other entities. On the other hand, a weak rule of law can lead to instability, unpredictability and insecurity in the business environment. This can create uncertainty and increase the risk of arbitrary or discriminatory actions by government officials, which can lead to delays or cancellations of potential projects, loss of property rights and increased business risks (Global Economy 2021).

In the context of a DC, the rule of law plays a critical role in protecting the DC and the data stored in it. It ensures that the DC is protected by a legal framework, the rights and obligations of the parties are clearly defined and that disagreements are resolved fairly and in a timely manner.

TABLE 18. Ranking of European countries by rule of law in 2021 (Adapted from Global Economy 2021)

Rule of Law Index (from highest to lowest)								
1	Finland	2.06	18	Czechia	1.13	35	Montenegro	-0.06
2	Norway	1.95	19	Portugal	1.13	36	North Macedonia	-0.08
3	Denmark	1.94	20	Lithuania	1.11	37	Serbia	-0.09
4	Switzerland	1.81	21	Slovenia	1.03	38	Armenia	-0.1
5	Austria	1.79	22	Latvia	0.98	39	Albania	-0.26
6	Luxembourg	1.79	23	Spain	0.88	40	Bosnia and Herzegovina	-0.28
7	Iceland	1.75	24	Malta	0.86	41	Moldova	-0.33
8	Liechtenstein	1.74	25	Slovak Republic	0.71	42	Turkiye	-0.42
9	Netherlands	1.74	26	Cyprus	0.64	43	Kazakhstan	-0.49
10	Sweden	1.73	27	Hungary	0.53	44	Azerbaijan	-0.58
11	Andorra	1.72	28	Poland	0.44	45	Ukraine	-0.66
12	Germany	1.61	29	Romania	0.41	46	Russian Federation	-0.87
13	Ireland	1.53	30	Greece	0.35	47	Belarus	-1.1
14	Estonia	1.43	31	Croatia	0.3	48	Kosovo	no data
15	United Kingdom	1.43	32	Italy	0.27	49	Monaco	no data
16	Belgium	1.33	33	Georgia	0.17	50	San Marino	no data
17	France	1.29	34	Bulgaria	-0.04			

Based on this ranking it is concluded that Bulgaria, Montenegro, North Macedonia, Serbia, Armenia, Albania Bosnia and Herzegovina, Moldova, Turkey, Kazakhstan, Azerbaijan, Ukraine, Russia, Belarus, Kosovo, Monaco and San Marino should be eliminated from consideration, while the leading markets are Finland, Norway, Denmark, Switzerland, Austria, Luxembourg, Iceland, Lichtenstein, Netherlands and Sweden.

6.5.2 Globalization index

Another important socio-cultural evaluation is the social globalization index, shown in Table 19 as percentages of the average data available in 2020. Global Economy indicates that social globalization

is the process by which people, information and culture become more interconnected and interdependent. It can be broken down into three dimensions: personal contacts, information flows and cultural proximity. Analysing this indicator is relevant when considering building a DC in a certain country because it can affect the accessibility and connectivity of the location.

TABLE 19. Ranking of European countries by social globalization in 2020 (Adapted from Global Economy 2020)

Social Globalization Index (from highest to lowest)								
1	Luxembourg	90	18	Malta	85	35	Poland	77
2	Monaco	90	19	Croatia	84	36	Serbia	77
3	Switzerland	90	20	Czechia	84	37	Romania	76
4	Liechtenstein	89	21	Estonia	84	38	Georgia	73
5	Norway	89	22	Greece	84	39	Bosnia and Herzegovina	69
6	United Kingdom	89	23	Iceland	84	40	Moldova	69
7	Austria	88	24	Lithuania	84	41	Ukraine	69
8	Germany	88	25	San Marino	84	42	Russia	68
9	Ireland	88	26	Slovakia	84	43	North Macedonia	67
10	Sweden	88	27	Portugal	83	44	Albania	66
11	Andorra	87	28	Spain	83	45	Kazakhstan	66
12	Denmark	87	29	Latvia	82	46	Armenia	65
13	Netherlands	87	30	Hungary	80	47	Turkey	65
14	Cyprus	86	31	Italy	80	48	Belarus	64
15	Finland	86	32	Slovenia	80	49	Azerbaijan	57
16	France	86	33	Bulgaria	77	50	Kosovo	no data
17	Belgium	85	34	Montenegro	77			

Based on this ranking it is concluded that Bosnia and Herzegovina, Moldova, Ukraine, Russia, North Macedonia, Albania, Kazakhstan, Armenia, Turkey, Belarus, Azerbaijan and Kosovo should be eliminated from consideration, while the leading markets are Luxembourg, Monaco, Switzerland, Lichtenstein, Norway, UK, Austria, Germany, Ireland and Sweden.

6.5.3 Positive attitude towards immigrants index

In order to measure the local level of positive attitude towards immigrants, statistics from a report that gathered data on a 0 to 10 scale by asking locals “Do immigrants make the country a better place to

live in?" will be used (Ruelens & Nicaise 2022). This is relevant when considering building a DC in a certain country because it can affect the availability and diversity of the workforce. The attitude towards immigrants in a country can indicate the level of acceptance and inclusion of foreign workers in the local market. A positive attitude towards immigrants can result in a more diverse and inclusive workforce, which can provide a wider range of skill sets and perspectives, and can also improve the ability to attract and retain employees from different countries and backgrounds.

On the other hand, a negative attitude towards immigrants can make it more difficult for employers to retain foreign skilled workers, which can limit the skill sets and perspectives available to the company. Additionally, the local attitude towards immigrants can also affect the ability of employees to integrate into the local community, which can have an impact on their mental and emotional well being, and their ability to perform their job.

TABLE 20. Ranking of European countries by positive general attitude towards immigrants in 2022 (Adapted from Goubin, Ruelens & Nicaise 2022, 16)

Attitude Towards Immigrants (from best to worst)								
1	Iceland	7,2	18	Lithuania	5	35	Bosnia and Herzegovina	no data
2	Ireland	6,3	19	Montenegro	4,6	36	Georgia	no data
3	Sweden	6,3	20	Serbia	4,5	37	Greece	no data
4	Norway	5,9	21	Austria	4,4	38	Kazakhstan	no data
5	Denmark	5,85	22	Cyprus	4,3	39	Kosovo	no data
6	Portugal	5,8	23	Estonia	4,3	40	Liechtenstein	no data
7	United Kingdom	5,8	24	Slovenia	4,3	41	Luxembourg	no data
8	Netherlands	5,7	25	Italy	4,1	42	Malta	no data
9	Finland	5,5	26	Bulgaria	3,9	43	Moldova	no data
10	Poland	5,5	27	Hungary	3,9	44	Monaco	no data
11	Spain	5,5	28	Slovak Republic	3,9	45	North Macedonia	no data
12	Switzerland	5,5	29	Czechia	3,8	46	Romania	no data
13	Germany	5,3	30	Albania	no data	47	Russian Federation	no data
14	Latvia	5,3	31	Andorra	no data	48	San Marino	no data
15	Belgium	5,2	32	Armenia	no data	49	Turkiye	no data
16	Croatia	5	33	Azerbaijan	no data	50	Ukraine	no data
17	France	5	34	Belarus	no data			

Based on this ranking it is concluded that Montenegro, Serbia, Austria, Cyprus, Estonia, Slovenia, Italy, Bulgaria, Hungary, Slovakia, Czech and all the countries with no available data should be eliminated from consideration, while the leading markets are Iceland, Ireland, Sweden, Norway, Denmark, Portugal, UK, Netherlands, Finland and Poland.

6.5.4 Socio-cultural preliminary screening conclusion

Based on the socio-cultural preliminary screening it can be concluded that the countries with the highest level of socio-cultural risks relevant to the DC industry are: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Kazakhstan, Kosovo, Moldova, North Macedonia, Russia, Turkey and Ukraine; while the countries with the lowest level of socio-cultural risks are: Norway and Sweden.

6.6 Economic preliminary screening

Lastly, the preliminary screening will be finalized by assessing economic indexes to evaluate the economic environment of all the European countries. The objective is to identify markets where the current state of their economic factors create a favourable environment for building local DCs, as well as identify the markets that are least feasible.

6.6.1 Labour cost index

The first economic index evaluated is the labour cost which measures the total compensation of employees, including salaries, employers' social security contributions and employment taxes (Global Economy 2022). Analysing local labour costs is relevant when considering building a DC in a certain country because it can affect the overall operating costs and profitability. High labour costs can make it more expensive to hire and retain employees, as well as lower regional competitiveness. On the other hand, low labour costs can make it more affordable to hire and retain employees, which can lower the overall operating costs of a DC, and make it more competitive in the region.

TABLE 21. Ranking of European countries by labour cost in 2022 (Adapted from Global Economy 2022)

Labor Cost (from lowest to highest)								
1	Finland	107.2	18	Croatia	128.1	35	North Macedonia	230.08
2	Italy	109.1	19	Greece	129.2	36	Moldova	247.62
3	Spain	112.4	20	Slovenia	130.4	37	Belarus	249.85
4	Denmark	112.7	21	Albania	134.05	38	Azerbaijan	270.3
5	France	113.7	22	Czechia	139.9	39	Turkiye	554.34
6	Belgium	115.2	23	Iceland	144.4	40	Ukraine	4541.22
7	Montenegro	115.49	24	Estonia	144.8	41	Andorra	no data
8	Germany	116.5	25	Latvia	148.7	42	Armenia	no data
9	Sweden	116.7	26	Slovak Republic	149.5	43	Kazakhstan	no data
10	Luxembourg	116.9	27	Poland	159.2	44	Kosovo	no data
11	Russian Federation	117.09	28	Hungary	170.2	45	Liechtenstein	no data
12	Malta	118	29	Lithuania	170.2	46	Monaco	no data
13	Netherlands	118.8	30	Bosnia and Herzegovina	177.3	47	Norway	no data
14	Portugal	121.6	31	Bulgaria	181.5	48	San Marino	no data
15	Ireland	121.8	32	Romania	191	49	Serbia	no data
16	Cyprus	123.3	33	United Kingdom	198.04	50	Switzerland	no data
17	Austria	124	34	Georgia	200.51			

Based on this ranking it can be concluded that Bulgaria, Romania, UK, Georgia, North Macedonia, Moldova, Belarus, Azerbaijan, Turkey, Ukraine and all the countries with no available data should be eliminated from consideration, while the leading markets are Finland, Italy, Spain, Denmark, France, Belgium, Montenegro, Germany, Sweden and Luxembourg.

6.6.2 Transport prices

The following index evaluates the cost of transportation, including road, rail, and air transport expenses (Global Economy 2017). By comparing values across countries, relative price levels can be determined which is relevant for a DC as transport prices have a high impact on the building's financial feasibility, including its operational efficiency and sustainability.

TABLE 22. Ranking of European countries by transport prices in 2017 (Adapted from Global Economy 2017)

Cost of Transport (lowest to highest)								
1	Azerbaijan	52.79	18	Serbia	98.5	35	Germany	141.33
2	Kazakhstan	55.99	19	Latvia	102.02	36	France	141.89
3	Georgia	59.28	20	Lithuania	102.02	37	Ireland	142.3
4	Belarus	59.62	21	Slovakia	105.37	38	Austria	143.7
5	Armenia	64.05	22	Hungary	107.04	39	Finland	152.76
6	Ukraine	65.43	23	Estonia	107.95	40	Netherlands	154.57
7	Moldova	67.75	24	Croatia	112.89	41	Sweden	160.4
8	Russia	71.51	25	Malta	114.37	42	Switzerland	160.56
9	North Macedonia	82.59	26	Cyprus	116.86	43	Denmark	173.28
10	Romania	87.59	27	Spain	117.72	44	Iceland	194.11
11	Bulgaria	89.35	28	Slovenia	119.8	45	Norway	194.38
12	Bosnia and Herzegovina	89.74	29	Greece	120.91	46	Andorra	no data
13	Poland	93.44	30	Portugal	123.44	47	Kosovo	no data
14	Turkey	95.17	31	Luxembourg	124.81	48	Liechtenstein	no data
15	Albania	95.5	32	Italy	135.37	49	Monaco	no data
16	Montenegro	97.47	33	UK	138.72	50	San Marino	no data
17	Czechia	97.56	34	Belgium	141.05			

Based on this ranking it is concluded that France, Ireland, Austria, Finland, Netherlands, Sweden, Switzerland, Denmark, Iceland, Norway, Andorra, Kosovo, Lichtenstein, Monaco and San Marino data should be eliminated from consideration, while the leading markets are Azerbaijan, Kazakhstan, Georgia, Belarus, Armenia, Ukraine, Moldova, Russia, North Macedonia and Romania.

6.6.3 Business freedom index

The business freedom index presented in Table 23 encompasses ten different indicators, including the aspect of starting a business (number of procedures, time measured in days, cost measured in percentage of income per capita, and minimum capital measured in percentage of income per capita), ease of obtaining a license (number of procedures, time measured in days, and cost measured in percentage of income per capita) and ease of closing a business (time measured in years, cost measured in percentage of estate, and recovery rate measured in cents on the dollar). (Global Economy 2022.)

The business freedom index is relevant to the DC industry because it provides insights into the business environment, its regulations, and investment opportunities, which can help make an informed decision on optimizing business operations, mitigating risks and capitalizing on growth opportunities.

TABLE 23. Ranking of European countries by business freedom index in 2022 (Adapted from Global Economy 2022)

Business Freedom (from most to least)								
1	Norway	91	18	Slovenia	80	35	Greece	70
2	Denmark	89	19	Poland	79	36	Bosnia & Herz.	67
3	Finland	89	20	UK	79	37	Montenegro	67
4	Luxembourg	89	21	Hungary	77	38	Armenia	65
5	Netherlands	88	22	Malta	76	39	Azerbaijan	65
6	Estonia	87	23	Portugal	76	40	Kazakhstan	65
7	Germany	87	24	Slovakia	76	41	Moldova	64
8	Ireland	87	25	Cyprus	75	42	Russia	63
9	Lithuania	87	26	Spain	75	43	Turkey	63
10	Sweden	85	27	Georgia	74	44	Ukraine	61
11	Switzerland	84	28	Italy	74	45	Belarus	55
12	Belgium	83	29	North Macedonia	74	46	Andorra	no data
13	Iceland	83	30	Serbia	74	47	Kosovo	no data
14	Austria	82	31	Bulgaria	72	48	Liechtenstein	no data
15	France	82	32	Croatia	72	49	Monaco	no data
16	Latvia	82	33	Albania	71	50	San Marino	no data
17	Czechia	81	34	Romania	71			

Based on this ranking it is concluded that Bosnia and Herzegovina, Montenegro, Armenia, Azerbaijan, Kazakhstan, Moldova, Russia, Turkey, Ukraine, Belarus, Andorra, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Norway, Denmark, Finland, Luxembourg, Netherlands, Estonia, Germany, Ireland, Lithuania and Sweden.

6.6.4 Communication prices

The following communication services index measures the price for internet connection, mobile plans and all other communication services. This factor is relevant to the DC industry because it has a big impact on the operational costs as well as global connectivity and operational efficiency of DCs.

TABLE 24. Ranking of European countries by communication prices in 2017 (Adapted from Global Economy 2017)

Communication Prices (from lowest to highest)								
1	Ukraine	22.55	18	Finland	91.86	35	Luxembourg	130.98
2	Azerbaijan	28.7	19	Turkey	91.97	36	Portugal	131.18
3	Belarus	29.95	20	Bosnia & Herz.	93.35	37	Sweden	136.86
4	Russia	34.81	21	Slovakia	95.08	38	Norway	139.76
5	Moldova	37.92	22	Austria	95.98	39	Switzerland	140.61
6	Armenia	38.79	23	Cyprus	100.74	40	Netherlands	144.37
7	Kazakhstan	41.97	24	Hungary	101.74	41	Ireland	152
8	Poland	51.3	25	Croatia	103.02	42	Spain	155.23
9	Romania	56.75	26	Albania	108.62	43	Belgium	164.29
10	Georgia	57	27	France	109.61	44	Iceland	170.54
11	Lithuania	68.8	28	Malta	111.12	45	Greece	171.14
12	North Macedonia	69.13	29	Czechia	112.12	46	Andorra	no data
13	Serbia	72.23	30	Germany	113.92	47	Kosovo	no data
14	Estonia	73.92	31	Denmark	114.5	48	Liechtenstein	no data
15	Bulgaria	74.02	32	UK	122.19	49	Monaco	no data
16	Latvia	79.46	33	Slovenia	124.17	50	San Marino	no data
17	Montenegro	90.75	34	Italy	124.31			

Based on this ranking it is concluded that Portugal, Sweden, Norway, Switzerland, Netherlands Ireland, Spain, Belgium, Iceland, Greece, Andorra, Kosovo, Lichtenstein, Monaco and San Marino should be eliminated from consideration, while the leading markets are Ukraine, Azerbaijan, Belarus, Russia, Moldova, Armenia, Kazakhstan, Poland, Romania and Georgia.

6.6.5 Machinery and equipment prices

The following index measures the general price for machinery and equipment. This factor is relevant to the DC industry because it has a big impact on the initial investment costs as well as operational expenses, technology upgrades and efficiency of DCs.

TABLE 25. Ranking of European countries by machinery and equipment prices in 2017 (Adapted from Global Economy 2017)

Machinery and Equipment Prices (form lowest to highest)								
1	Russia	79.67	18	Romania	88	35	Netherlands	96.12
2	Ukraine	80.99	19	Slovenia	88.44	36	Austria	96.18
3	Georgia	81.55	20	Estonia	88.72	37	Sweden	97.51
4	Poland	81.64	21	Moldova	89.12	38	Malta	97.99
5	Hungary	83.07	22	Slovakia	89.42	39	Greece	98.29
6	UK	83.89	23	Czechia	89.57	40	Switzerland	100.03
7	Lithuania	84.18	24	Latvia	90.49	41	Finland	100.44
8	Bulgaria	84.29	25	Azerbaijan	90.62	42	Portugal	103.13
9	North Macedonia	85.25	26	Cyprus	90.77	43	Denmark	106.04
10	Belarus	85.69	27	Armenia	91.34	44	Norway	110.82
11	Turkey	85.88	28	Serbia	91.81	45	Iceland	114.04
12	Albania	86.72	29	Bosnia & Herz.	92.55	46	Andorra	no data
13	Croatia	86.83	30	Kazakhstan	92.64	47	Kosovo	no data
14	Italy	86.97	31	Ireland	92.83	48	Liechtenstein	no data
15	Montenegro	87.25	32	Belgium	92.95	49	Monaco	no data
16	Spain	87.41	33	Luxembourg	94.31	50	San Marino	no data
17	Germany	87.62	34	France	95.16			

Based on this ranking it is concluded that Austria, Sweden, Malta, Greece, Switzerland, Finland, Portugal, Denmark, Norway, Iceland, Andorra, Kosovo, Lichtenstein, Monaco, San Marino should be eliminated from consideration, while the leading markets are Russia, Ukraine, Georgia, Poland, Hungary, UK, Lithuania, Bulgaria, North Macedonia and Belarus.

6.6.6 Economic preliminary screening conclusion

Based on the economic preliminary screening it can be concluded that the countries with the highest level of economic risks relevant to the DC industry are: Andorra, Kosovo, Lichtenstein, Monaco, San Marino, followed by Norway, Switzerland, Iceland and Sweden; while the countries with the lowest level of socio-cultural risks are: Belarus and Russia.

6.7 Preliminary screening conclusion

Based on the data gathered in this chapter, it can be concluded that the countries with the highest overall number of risks, as illustrated in Figure 10, include Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, Estonia, Georgia, Greece, Hungary, Iceland, Kazakhstan, Kosovo, Liechtenstein, Luxembourg, Malta, Moldova, Monaco, Montenegro, North Macedonia, Norway, Romania, Russian Federation, San Marino, Serbia, Slovakia, Switzerland, Turkey, and Ukraine. Therefore, these countries will be excluded from further consideration.

On the contrary, the markets leading in most ranks, as illustrated in Figure 11, are: Sweden being number 1, Luxembourg number 2, Denmark number 3, Netherlands number 4, Norway number 5, Switzerland number 6, Finland number 7, Iceland number 8, Germany number 9, Spain number 10, United Kingdom number 11 and France number 12.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Albania	x	x	x	x	x	x	x	x	x	x	x													
Andorra	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
Armenia	x	x	x	x	x	x	x	x	x	x	x	x												
Austria	x	x	x	x																				
Azerbaijan	x	x	x	x	x	x	x	x	x	x	x	x	x	x										
Belarus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
Belgium	x	x	x	x																				
Bosnia and Herzegovina	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
Bulgaria	x	x	x	x	x	x	x																	
Croatia	x	x																						
Cyprus	x	x	x	x	x	x	x																	
Czechia	x	x	x																					
Denmark	x	x	x																					
Estonia	x	x	x	x																				
Finland	x	x																						
France	x	x	x																					
Georgia	x	x	x	x	x	x	x	x	x	x														
Germany	x																							
Greece	x	x	x	x	x	x	x																	
Hungary	x	x	x	x																				
Iceland	x	x	x	x	x	x																		
Ireland	x	x	x																					
Italy	x	x	x																					
Kazakhstan	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x									
Kosovo	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Latvia	x																							
Liechtenstein	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Lithuania	x																							
Luxembourg	x	x	x	x	x	x																		
Malta	x	x	x	x	x	x	x	x	x															
Moldova	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x						
Monaco	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Montenegro	x	x	x	x	x	x	x	x	x	x	x													
Netherlands	x	x	x																					
North Macedonia	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x							
Norway	x	x	x	x	x																			
Poland	x																							
Portugal	x	x	x																					
Romania	x	x	x	x	x																			
Russian Federation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x									
San Marino	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Serbia	x	x	x	x	x	x	x	x	x	x	x													
Slovak Republic	x	x	x	x																				
Slovenia	x	x																						
Spain	x	x	x																					
Sweden	x	x	x																					
Switzerland	x	x	x	x	x																			
Turkiye	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x									
Ukraine	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x									
United Kingdom	x	x	x																					

Political
Legal
Ecological
Technological
Socio-cultural
Economc

FIGURE 10. Preliminary screening conclusion – number and type of identified risks for European countries

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Albania	x	x	x															
Andorra	x	x																
Armenia	x	x	x															
Austria	x	x	x	x	x	x												
Azerbaijan	x	x	x	x														
Belarus	x	x	x	x														
Belgium	x	x	x	x	x	x	x											
Bosnia and Herzegovina	x	x																
Bulgaria	x	x	x															
Croatia	x																	
Cyprus	x																	
Czechia	x	x																
Denmark	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
Estonia	x	x	x	x	x	x	x											
Finland	x	x	x	x	x	x	x	x	x	x	x	x						
France	x	x	x	x	x	x	x	x	x									
Georgia	x	x	x	x														
Germany	x	x	x	x	x	x	x	x	x	x	x							
Greece	x																	
Hungary	x	x	x	x														
Iceland	x	x	x	x	x	x	x	x	x	x	x	x						
Ireland	x	x	x	x	x	x	x											
Italy	x	x	x	x	x	x												
Kazakhstan	x	x																
Kosovo																		
Latvia	x	x	x	x	x	x	x											
Liechtenstein	x	x	x															
Lithuania	x	x	x	x														
Luxembourg	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
Malta	x	x	x															
Moldova	x	x																
Monaco	x	x																
Montenegro	x	x																
Netherlands	x	x	x	x	x	x	x	x	x	x	x	x	x					
North Macedonia	x	x	x															
Norway	x	x	x	x	x	x	x	x	x	x	x	x	x					
Poland	x	x	x	x	x													
Portugal	x	x	x	x														
Romania	x	x	x	x	x													
Russian Federation	x	x	x	x	x	x	x											
San Marino																		
Serbia																		
Slovak Republic	x	x																
Slovenia	x	x	x	x														
Spain	x	x	x	x	x	x	x	x	x	x	x							
Sweden	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Switzerland	x	x	x	x	x	x	x	x	x	x	x	x	x					
Turkiye	x	x																
Ukraine	x	x	x	x														
United Kingdom	x	x	x	x	x	x	x	x	x	x								

Political
Legal
Ecological
Technological
Socio-cultural
Economc

FIGURE 11. Preliminary screening conclusion – ranking of leading European countries

The markets that we will continue to consider for the market opportunity analysis are: Croatia, Czechia, Denmark, Finland, France, Germany, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and United Kingdom.

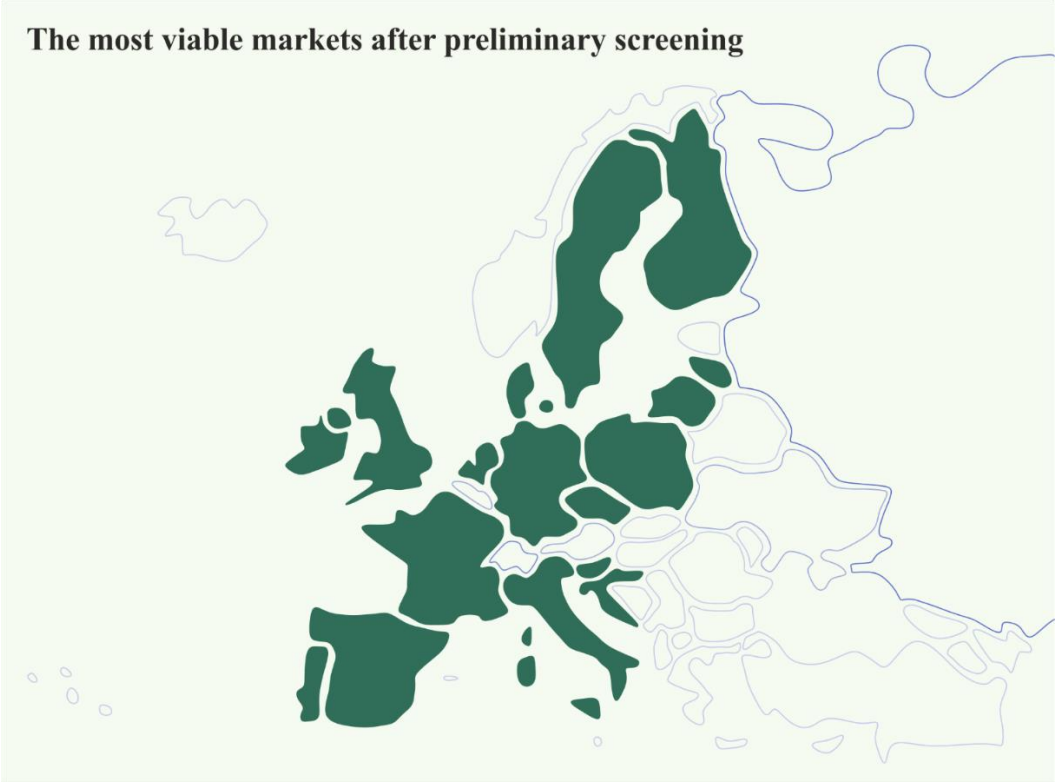


FIGURE 12. The most viable markets after preliminary screening

7 MARKET ENTRY CONSIDERATIONS FOR DATA CENTER EXPANSION

Europe offers a wide range of opportunities for local DC industry expansion thanks to its well-developed digital infrastructure. An effective market opportunity analysis is crucial to navigate the wide range of local market specifics and identify the optimal ones. Based on the results of the market selection analysis, the most viable identified options will be considered, excluding the markets that are already part of the most developed industries in order to achieve the thesis purpose of continuing the industry expansion in an uniform, equitable way. Therefore the countries analysed in this chapter will be: Croatia, Czechia, Denmark, Finland, Ireland, Latvia, Lithuania, Portugal and Slovenia. For each of these countries, considerations regarding market entry and marketing mix strategy will be discussed.

7.1 Croatia

Croatia's market has been experiencing significant growth due to several key factors including its developing digital infrastructure, its strategic geographic location between Western Europe and the Balkans and its sustainable energy resources (Statista 2023). While the current local DC industry is not as well developed as in other European countries (Figure 1), there has been a rising demand for DC services, especially in large cities, like Zagreb and Split, from companies looking to outsource their digital infrastructure and storage needs (Statista 2023). Croatia's growing touristic industry could also lead to a future increased need for cloud services to support the hospitality, leisure and related sectors (Datacenters 2022).

Partnerships or joint ventures could be the best market entry mode thanks to the wide range of available local expertise. Focusing on reliability and security in data handling could be a key selling point for Croatia, as the tourism industry is highly dependent on customer trust and reputation regarding secure data handling (Wiboonrat 2014). A local DC with high quality data security measures would help build trust amongst local businesses handling sensitive customer information, such as hotels, tour operators and travel agencies. Ensuring a stable and secure data handling environment minimizes the risk of system failures or data loss, thereby ensuring smoother business operations and continuity. In a market where digital services are growing but might not yet be fully matured, highlighting a strong emphasis on data reliability and security can be a competitive advantage as it allows DC service providers to

create a niche by offering a higher level of assurance compared to in house management (Statista 2023).

The product offerings should be focused on cloud services that ensure secure and reliable data management for hospitality businesses. The pricing model should be competitive and flexible enough to accommodate the financial constraints of smaller businesses within the tourism industry (Mohamed 2014). The promotional strategies should focus on highlighting the reliability and security of the data management, including targeted digital campaigns.

7.2 Czechia

Czechia is reported to have one of the most powerful IT sectors in the world (ReportLinker 2022) and a growing demand for DC services (Arizton 2021). Its strategic location in Central Europe makes for a good opportunity to open a hub supporting future regional expansion, as the country is already connected to the major European computing nodes via fiber networks (Arizton 2021). Industries like automotive, manufacturing, gaming and IT could be potential beneficiaries of local DCs, as these sectors require a data infrastructure capable of handling complex technological demands.

The best market entry modes would be a direct investment approach, possibly establishing wholly-owned subsidiaries due to the country's developed tech infrastructure, as well as local partnerships or joint ventures thanks to its low amount of restrictions per “OECD National Treatment for Foreign-Controlled Enterprises” (Appendix 6). The pricing strategies should be flexible and accommodate the wide range of demands of the industries on the Czech market. Promotional efforts should focus on cutting-edge technology and data security through industry specific events and targeted advertising. Leveraging Czechia’s reputation as a technology driven nation provides a competitive advantage (Embassy of Czech Republic 2024) as it positions DC service providers as industry leaders capable of offering advanced data solutions.

Czechia’s main selling point as a connecting IT hub in Central Europe with one of the best IT sectors and technological expertise in Europe (Embassy of Czech Republic 2024), provide a strong foundation for DC service providers to offer cutting-edge solutions tailored to the various demands of the market and establish a distinct competitive advantage.

7.3 Denmark

Denmark has a focus on sustainability and innovation, constantly ranking first in the environmental performance index (Ministry of Foreign Affairs of Denmark 2022) and the European innovation scoreboard (Ministry of Foreign Affairs of Denmark 2023). A DC designed for energy efficiency and high speed connectivity would align well with its environmentally conscious and tech savvy population (Chapter 7). Creating a digital hub in the Copenhagen region would be a compelling market opportunity considering the favourable infrastructure and the government's support for local tech innovation (International Trade Administration 2024).

Entering the Danish market could be done through a combination of wholly-owned subsidiaries and partnerships thanks to the local abundance of know-how and quality infrastructure (Barnett & Casasbuenas 2019). The DC design should focus on sustainability, energy efficiency, high speed connectivity and data security. Pricing strategies should reflect the value of a reliable, sustainable design. The promotion should be done via targeted digital campaigns and industry forums and they should focus on the use of green technology and high speed connectivity.

The Danish government actively supports technological innovation and provides a business friendly environment (APPENDIX 6), favourable tax policies and supportive regulations for the tech industry, encouraging business investment and growth. Denmark's strategic geographic location in Northern Europe offers good connectivity with both the Scandinavian countries and continental European markets. Its proximity to major European cities makes a good opportunity for establishing a DC that could serve a broad regional market.

Overall, Denmark's competitive advantage is its commitment to sustainability, tech savvy population, supportive government policies, strategic geographic location, and reliable infrastructure. These factors make Denmark a good opportunity for local DC industry expansion.

7.4 Finland

Finland is renowned for its tech industry driven by innovation (World Intellectual Property Organization 2022) and it has a high demand for strong data infrastructure focused on innovation, security (Table 18) and sustainability (Table 8). Its tech industry is thriving thanks to its innovative yet sustainable

practices and the Helsinki digital hub would provide a great opportunity for DC expansion. Focusing on tailored solutions for the gaming and IoT sectors could be its main selling point (Angesleva 2023).

Finland's large share of renewable energy sources (mainly hydro and wind power) could significantly reduce DC carbon footprints which is a great competitive advantage when it comes to offering sustainable and economic energy solutions for DCs (Statistics Finland 2021). Its commitment to eco-friendly practices and design is well suited to the increasing global demand for sustainable data solutions (Munde 2024). The Finnish population is one of the most tech literate populations globally, which also plays an important role in facilitating the adoption and implementation of advanced technologies within the DC sector and it provides a pool of skilled workforce as well as a receptive market for innovative data services (Sear 2023).

Entering the Finnish market could be done through a direct investment strategy thanks to its tech-savvy population. The new DCs should focus on innovation, security, sustainability and efficient cooling technologies. Furthermore, the Finnish government actively supports technology and innovation, offering incentives, funding, and favourable policies for tech related ventures (Technology Industries of Finland 2020) which contributes to an optimal environment for technological advancements and it attracts businesses looking for supportive regulations (Technology Industries of Finland 2023). Product offerings should be focused on innovation and security for industries like gaming and IoT (Neogames 2018). The pricing model should be flexible and reflect scalability and innovation. Promotional strategies should also revolve around innovation and security features in tech oriented events and targeted advertising.

Finland's main selling point in the DC industry is its innovative technological environment, well developed infrastructure, commitment to sustainability, tech-savvy population and government support, making it an optimal market for advanced DCs. The country is home to a wide range of startups as well as renowned tech companies thanks to its innovative culture, making it an ideal location for cutting-edge DC technologies (Rihti 2019). Finland's expertise in tech innovation positions it as a hub for pioneering solutions in data management and infrastructure and its high-quality infrastructure, including reliable energy sources and advanced telecommunications networks, along with its strategic geographic location provides favourable access to both European and global markets, making it an appealing choice for businesses looking for efficient connectivity (Haaramo 2015).

7.5 Ireland

Ireland has a favourable business environment thanks to its pool of skilled workforce and favourable tax policies proven by the fact that it already hosts multiple major tech companies in its existing DC hub (Stenson 2019). The local DC market is known to be on a continuous growth track (Miller 2013) which offers great expansion opportunities focused on the scalability of the data infrastructure. New DCs would be required to respond to local needs of rapid growth in order to keep up with the evolving cloud services. Ireland's business-friendly environment encourages expansion and innovation (Tech Central 2020) as both local companies and MNCs are looking for data solutions that would be capable of scaling along with their business growth. Scalable data services allow companies to innovate without being limited by the infrastructure (GemPool 2021).

Entering the market could be done through wholly-owned subsidiaries that could benefit from Ireland's well established infrastructure as well as local partnerships or joint ventures thanks to its low amount of restrictions per "OECD National Treatment for Foreign-Controlled Enterprises" (Appendix 6). The marketing mix could centre on providing high quality services, secure data management and scalability to meet the demands of tech companies and cloud services. A reliable value based pricing would be recommended for this market considering the local competition. Promotion strategies that could work best should be done through digital marketing campaigns and at industry specific events.

Ireland's tech hub position, its prioritization of cloud services and the digital economy, its business friendly environment, and the diverse industry presence collectively show the importance of scalability (Savvas 2021). Offering scalable data services addresses the varying and growing needs of businesses, making Ireland an optimal market for companies looking for flexibility and adaptability.

7.6 Latvia

Positioned between the Nordic and Eastern European countries, Latvia's strategic location in the Baltic area makes it an ideal regional hub for DCs that could bridge the neighbouring areas and cover a wide customer base (Dolzhenkova & Mokhorov 2020). The geographic advantages facilitate efficient connectivity and data transmission, making Latvia an optimal market for expanding the DC industry in the region, allowing opportunities for future growth. Furthermore, the country's technological industry has

been thriving in recent years and the e-government initiatives (OECD Library 2021) offer strong regional connectivity and innovation opportunities for potential DC operations (Institute of Economics of the Latvian Academy of Sciences 2023).

Entering the market with new DCs may work best through joint ventures or partnerships thanks to Latvia's national programmes focused on facilitating international partnership for the ICT sector (Digital Skills & Jobs Platform 2024) and its low amount of restrictions per "OECD National Treatment for Foreign-Controlled Enterprises" (Appendix 6). Collaborating with local tech firms and infrastructure providers would facilitate access to local expertise. Wholly-owned subsidiaries could also be a viable market entry, as Latvia is ranking 14th amongst 192 countries on the ease of doing business index (Multiplier 2024). The pricing strategy should match the regional market levels and the promotional strategy could be realised through campaigns focused on local technological innovation and secure data management.

DCs focused on reliability and strict security regulations offering secure data management in both the public and private sectors coincides with general governmental priorities. Latvia's focus on e-government initiatives proves its commitment to digital transformation which would create demand for secure data services specialised in support of governmental operations, presenting an opportunity for DCs to market to the public sector (European Commission 2022). Complying with the local regulations and ensuring secure, reliable data handling could be the key selling point of a Latvian DC.

7.7 Lithuania

Lithuania invested significantly in developing its ICT infrastructure including high-speed connectivity, reliable digital networks, cutting-edge technology and is now home to the tech hub ranking first globally (Invest Lithuania 2022). These technological advancements have turned Lithuania into an optimal market for DC operations that would require advanced infrastructure and connectivity. The Lithuanian government actively supports technological initiatives and its proactive attitude in offering incentives, funding, and regulations for tech-related ventures encourages investment and growth in the tech sector, making Lithuania an optimal market for international businesses needing governmental backing (Euro-Start Entreprises 2023).

Entering Lithuania's DC market could involve joint ventures or partnerships with local tech companies as it's currently home to over 150 MNC (Ruzgys 2022). Given Lithuania's well developed ICT infrastructure and its famous Vilnius innovation hub (Vilnius City Innovation Industrial Park 2022), a wholly-owned subsidiary could work best with the local advanced tech environment (Dimoska 2020).

Lithuania's focus on R&D initiatives supports technological advancements and presents a good opportunity for DCs looking to establish a leading position in technological innovation and offer cutting-edge solutions with a focus on education in technology-related fields, training workforce and providing opportunities for tech talents. This skilled network could be advantageous for DCs needing technological expertise and innovation. The pricing models should be flexible and the promotion could be done through events and targeted advertising. (Interreg Europe 2018.)

7.8 Portugal

Portugal is known for its impressive progress with renewable power, particularly wind and solar energy, as it reached the point where 95% of its consumption is covered by sustainable sources (Eurostat 2019). This achievement makes Portugal a leading country in sustainability, opening it to DC construction opportunities that could operate using eco-friendly practices (Euronews Green 2024). Leveraging renewable energy sources allows DCs to reduce their carbon footprints which helps with global sustainability goals. Also, its strategic location at the crossroads between Europe, Africa, and the Americas provides advantageous global connectivity as Portugal is one of the few countries in the world that has direct connections with 5 different continents (White Papers 2022). Portuguese DCs could serve as strategic hubs for global data distribution, targeting global markets and promoting global connectivity.

Expanding the DC industry in Portugal could involve joint ventures to leverage local partnerships or subsidiaries thanks to its established tech infrastructure and strategic connectivity (Goncalves 2021) (Tech Explore 2021) thanks to its low amount of restrictions per "OECD National Treatment for Foreign-Controlled Enterprises" (Appendix 6). Portugal's emphasis on renewable energy and strategic connectivity opens up opportunities for eco-friendly DCs, highlighting sustainable practices, global connectivity, and digital transformation initiatives (López-Dóriga 2022). The recommended pricing models would be value-based and the promotion should be focused on the sustainable infrastructure.

The country's strategic location makes it an attractive destination for MNCs looking to centralize their data operations in a place with efficient global connectivity. Local DCs could capitalize on this advantage to attract international businesses. Portugal is known to actively pursue digital transformation initiatives, digital economy and innovative technological solutions (International Trade Administration 2024) which would allow local DCs to focus their operations on advanced digital infrastructure and digitalization.

7.9 Slovenia

Slovenia's strategic location in central Europe presents an advantage as it could form a bridge with Central and Southeastern European markets (International Trade Administration 2024). This position provides efficient connectivity and proximity to a multitude of customer bases which would allow a DC to serve as a central point for businesses focused on access to these regions. Slovenia’s increasing technological innovation makes it an ideal home for startups, tech initiatives and innovation development (Slovenia Business Development Agency 2022). This type of environment is optimal for technological advancement, making the Slovenian market a favourable place for DCs looking for collaboration opportunities and access to growing tech talent.

Entering Slovenia's DC market might involve partnerships with local tech companies or wholly-owned subsidiaries, given its central European location and growing technological innovation supported by governmental initiatives and its low amount of restrictions per “OECD National Treatment for Foreign-Controlled Enterprises” (Appendix 6). Slovenia’s location and tech drive present market potential for tailored data services for regional access, focusing on innovation (Vekic, Djakovic, Borocki, Sroka, Popp & Olàh 2020). The pricing should take into account regional market demands and implement promotional strategies focused on technological innovation.

Slovenia is known to be focused on R&D initiatives proven by its allocation of over 2% of its GDP to R&D out of which 75 % were provided by the business sector contributing to technological advancements (Slovenia Business 2023). DCs aligning with these government supported initiatives could leverage R&D investments and collaborations and become leaders in technological innovation in the DC industry.

In conclusion, the European markets considered for future DC industry expansion, Croatia, Czechia, Denmark, Finland, Ireland, Latvia, Lithuania, Portugal, and Slovenia, have a different range of strengths and local market opportunities. Leveraging these distinct advantages, including technological innovation or sustainability initiatives, regional connectivity, and government support, would allow a DC to design their approach in order to tap into locally specific market demands and build a strong position within these regions. Understanding each country's unique selling point and aligning the DC operation with it, is key to a successful market expansion.

8 CONCLUSIONS

Expanding a business globally has endless potential, but success depends on careful planning and analysis. The theoretical framework of this thesis focuses on the essential role of market opportunity analysis and market research for international expansion. The DC industry is becoming a foundation of the digital environment and its evolution shows a mix of technological advancement and increasing data demand. Cloud computing and edge computing's rise continue to redefine operational standards, while sustainability and cybersecurity remain important concerns within the industry. The European DC market has been continuously growing and incorporating an increasing amount of sustainable initiatives and data protection regulations, however, the inconsistencies that can be seen amongst its countries call for a need for strategic site selection when considering the future of the European DC industry.

8.1 Discussion and summarizing conclusion

The main purpose of this thesis was to understand the DC industry in Europe and to explore opportunities for its future expansion. In order to do so, an overview of the industry and how it came to function as it does today was developed by researching the reasons why the DC industry developed unevenly across Europe and uncovering what were the most important expansion deciding factors, which helped provide an industry guideline on the priorities that need to be considered in order for the best possible outcome to be reached. Learning the driving factors of the expansion of this industry by researching factors that ensure suitability for DC development design uncovered the most significant strengths and weaknesses that need to be considered in the decision-making process. (Chapter 5.)

In order to strategically choose a site suitable for building a new DC, there are a wide range of factors that must be evaluated ranging from labour and utilities cost to infrastructure accessibility. One of the main concerns is the energy efficiency which most DC designers are mitigating by implementing innovative designs based on renewable energy and carefully assessing factors that could potentially have a negative impact on the environment. Another concern would be the construction cost and performing a comparative analysis on a certain geographic segment allows the opportunity to make an informed decision when selecting a new market. Power efficiency, natural disaster risks, infrastructure accessibil-

ity, and environmental concerns remain key elements when considering the construction of a cost-effective and sustainable DC. Since multiple factors need to be investigated in the strategic selection process, an integral approach would work best and it would allow the company to make an optimal, informed decision that could be both efficient operationally and sustainable long term. (Chapter 5.)

The political preliminary screening revealed many differences amongst the European countries when it comes to political stability, foreign investment restrictions, corruption risks, security threats, and limitations on foreign-controlled enterprises. Norway, Denmark, Germany, Iceland, Ireland, Luxembourg, Netherlands, and Sweden benefit from higher political stability, fewer restrictions on foreign investments and enterprises, lower corruption risks, and reduced security threats, making them optimal for potential DC investments from a political perspective. Contrarily, Moldova, Kazakhstan, Turkey, Russia, Ukraine, Albania, Belarus, Kosovo, Bosnia and Herzegovina, Azerbaijan, Andorra, Liechtenstein, Luxembourg, Monaco, and San Marino present higher political risks and could pose challenges with political instability, restrictions, corruption, and security threats. (Subchapter 6.1.)

The legal preliminary screening also revealed a wide variety of differences amongst the European countries when it comes to trade freedom, corporate income taxes, investment freedom, fiscal freedom, and legal stability. Spain and Switzerland have the highest legal stability, lowest corporate income taxes, high investment and fiscal freedom, and better trade conditions compared to other countries, making them optimal for potential DC investments from a legal perspective. Contrarily, Andorra, Kosovo, Liechtenstein, Monaco, North Macedonia, San Marino, Belarus, Bosnia and Herzegovina, Moldova, Russia, and Turkey present higher legal potential risks and could pose challenges with trade restrictions, high corporate income taxes, limited investment and fiscal freedom, and potential legal instabilities. (Subchapter 6.2.)

The ecological preliminary screening also revealed a wide range of differences amongst the European countries when it comes to the share of renewable energy and the emissions index. Belgium, Ukraine, Luxembourg, Malta, Russia, Belarus, Moldova, Kazakhstan, San Marino, Turkey, and Monaco have higher potential ecological risks due to lower shares of renewable energy and higher emissions indexes. Contrarily, Iceland, Norway, Switzerland, Sweden, Albania, Finland, Latvia, Montenegro, Bosnia and Herzegovina, Austria, Spain, Kazakhstan, Italy, Poland, Ukraine, France, and the UK benefit from better ecological stability with higher shares of renewable energy and lower emissions indexes, making them optimal for local potential DC development from an ecological perspective. (Subchapter 6.3.)

The technological preliminary screening of the European market showed diverse technological landscapes across its countries as well. Cyprus, Bosnia and Herzegovina, Albania, Turkey, North Macedonia, Greece, Armenia, Iceland, Georgia, Azerbaijan, Kosovo, Lichtenstein, and San Marino, indicate potential risks when it comes to internet speed, bandwidth, and electricity production capacity, suggesting potential limitations for DC efficiency. Contrarily, Monaco, Romania, Switzerland, Denmark, France, Hungary, Spain, Sweden, Luxembourg, Andorra, Luxembourg, Malta, Sweden, Iceland, the UK, and the Netherlands benefit from higher technological readiness across multiple indexes, making them optimal for local potential DC development from an ecological perspective. (Subchapter 6.4.)

The socio-cultural preliminary screening also revealed a wide variety of differences amongst the European countries when it comes to the rule of law, globalisation index, and attitude towards immigrants. Bulgaria, Montenegro, North Macedonia, Serbia, Armenia, Albania, Bosnia and Herzegovina, Moldova, Turkey, Kazakhstan, Azerbaijan, Ukraine, Russia, Belarus, Kosovo, Monaco, and San Marino are the countries indicating the highest potential risks, determined by weak rule of law and limited social globalisation. Contrarily, Finland, Norway, Denmark, Switzerland, Austria, Luxembourg, Iceland, Lichtenstein, the Netherlands, and Sweden are the leading markets benefiting from a strong rule of law, higher social globalization, and positive attitudes towards immigrants, making them optimal for local potential DC development from a socio-cultural perspective. (Subchapter 6.5.)

Finally, the economic preliminary screening revealed that Bulgaria, Romania, the UK, Georgia, North Macedonia, Moldova, Belarus, Azerbaijan, Turkey, Ukraine present higher potential risks dealing with high labour costs. Contrarily, Finland, Italy, Spain, Denmark, France, Belgium, Montenegro, Germany, Sweden, and Luxembourg have optimal labour cost conditions within the region. Transport prices, business freedom, communication costs, and machinery prices revealed France, Ireland, Austria, Finland, Netherlands, Sweden, Switzerland, Denmark, Iceland, Norway to have optimal conditions for local DC expansion. Additionally, Ukraine, Azerbaijan, Belarus, Russia, Moldova have some of the lowest communication and machinery prices which brings potential cost-effective opportunities for DC construction. While Andorra, Kosovo, Lichtenstein, Monaco, San Marino, Norway, Switzerland, Iceland, and Sweden have high economic risks that could potentially impact the DC industry, Belarus and Russia show a lower level of economic risk. (Subchapter 6.6.)

The overall conclusions of the PESTEL based preliminary screening and market opportunity analysis for future expansion of the DC industry in Europe indicated that Croatia, Czechia, Denmark, Finland, Ireland, Latvia, Lithuania, Portugal, and Slovenia are the countries with the biggest strengths

making them optimal potential locations. Each of these countries have specific advantages and selling points that DC operators could leverage for a successful market entry. (Subchapter 6.7.)

Croatia is positioned in a well-developed touristic area as the most visited country in Central and Eastern Europe (CEE) (Statista 2023) and accentuating its reliability when it comes to handling data securing is its main selling point. Czechia's IT sector and technological expertise are one of the best in Europe (Embassy of Czech Republic 2024), making it an ideal location for a DC focused on advanced technology and innovation as its key selling points. Denmark has a focus on sustainability and innovation, constantly ranking first in the environmental performance index (Ministry of Foreign Affairs of Denmark 2022) and the European innovation scoreboard (Ministry of Foreign Affairs of Denmark 2023) and a DC designed for energy efficiency and high-speed connectivity would align well with its environmentally conscious and tech savvy population. (Chapter 7.)

Finland is renowned for its tech industry driven by innovation (World Intellectual Property Organization 2022) and it has a high demand for strong data infrastructure focused on innovation, security and sustainability. Its main selling point would be tailored solutions for the gaming and IoT sectors (Angesleva 2023). Ireland's scalability stands out as a strong selling point in Ireland's tech industry (Deloitte 2021), supporting changing business demands when it comes to data needs, especially for startups and multinational companies. Latvia's strategic geographic location along with its thriving tech industry and e-government initiatives (OECD Library 2021) offers strong regional connectivity and innovation opportunities for potential DC operations (Institute of Economics of the Latvian Academy of Sciences 2023). Lithuania's strong ICT infrastructure, innovation hubs, and government support (Ruzgys 2022), as well as its position make it an optimal location for a DC focused on an environment driven by tech development and innovation. (Chapter 7.)

Portugal focuses on renewable energy (Euronews Green 2024), global connectivity (AICEP Portugal Global 2023), and digital transformation initiatives (Portugal Digital 2020) which makes it a sustainable and globally connected location for data operations. Slovenia's central European positioning along with its growing tech innovation and governmental initiatives (Slovenia Business Development Agency 2022) offer strategic advantages for DCs focused on regional connectivity and innovation hubs. (Chapter 7.)

A complex range of influential factors need to be investigated when researching potential market opportunities for the future of the European DC industry expansion. Since most countries present a certain set of advantages as well as disadvantages, it is important to first learn which factors are the most relevant for the industry in question, and how they need to be prioritised in order to be able to best interpret the research discoveries. Factors such as cost effectiveness, technological development, sustainable infrastructure, political stability, supportive legal framework or high social globalization become more relevant when assessed as an overall regional performance rather than on their own and this type of balance is crucial for optimal construction and operation of a DC.

8.2 Ethics and reliability of the thesis

Ensuring ethical integrity within academic research is essential conduct amongst the research community and this master's thesis complies with all the established recommendations and guidelines as advised by the Finnish National Board on Research Integrity (TENK) to hold ethical standards. Throughout the author's research process, ethical considerations such as ascertaining of conflicts of interest, acquainting with the thesis topic, ascertaining of resources (Nareaho, Kettunen, Karki, Paallysaho 2020) were prioritized to ensure adherence to the community's responsible conduct.

Given that all the data utilized for this research was secondary, there was no requirement for individual data usage consent. However, ethical principles were sustained through careful examination of the sources that were used, their quality and compliance to the principles of data privacy and confidentiality. The selection and use of secondary data were conducted conforming with the relevant regulations and guidelines to ensure the integrity and reliability of the research findings. Moreover, efforts were made to critically assess the ethical implications of utilizing secondary data, including considerations of data ownership, copyright, and potential biases within the sources (Nareaho, Kettunen, Karki, Paallysaho 2020). The reliability of this thesis is guaranteed by the quality of the secondary data that was used which was only selected from organizations that are generally considered reliable (e.g. World Bank, Statista, Eurostat). The reliability is also enhanced by the level of depth into which the analysis was performed. In conclusion, this thesis was written with commitment to the ethical research practices, ensuring that all the aspects of the study comply with the recognized ethical recommendations and guidelines.

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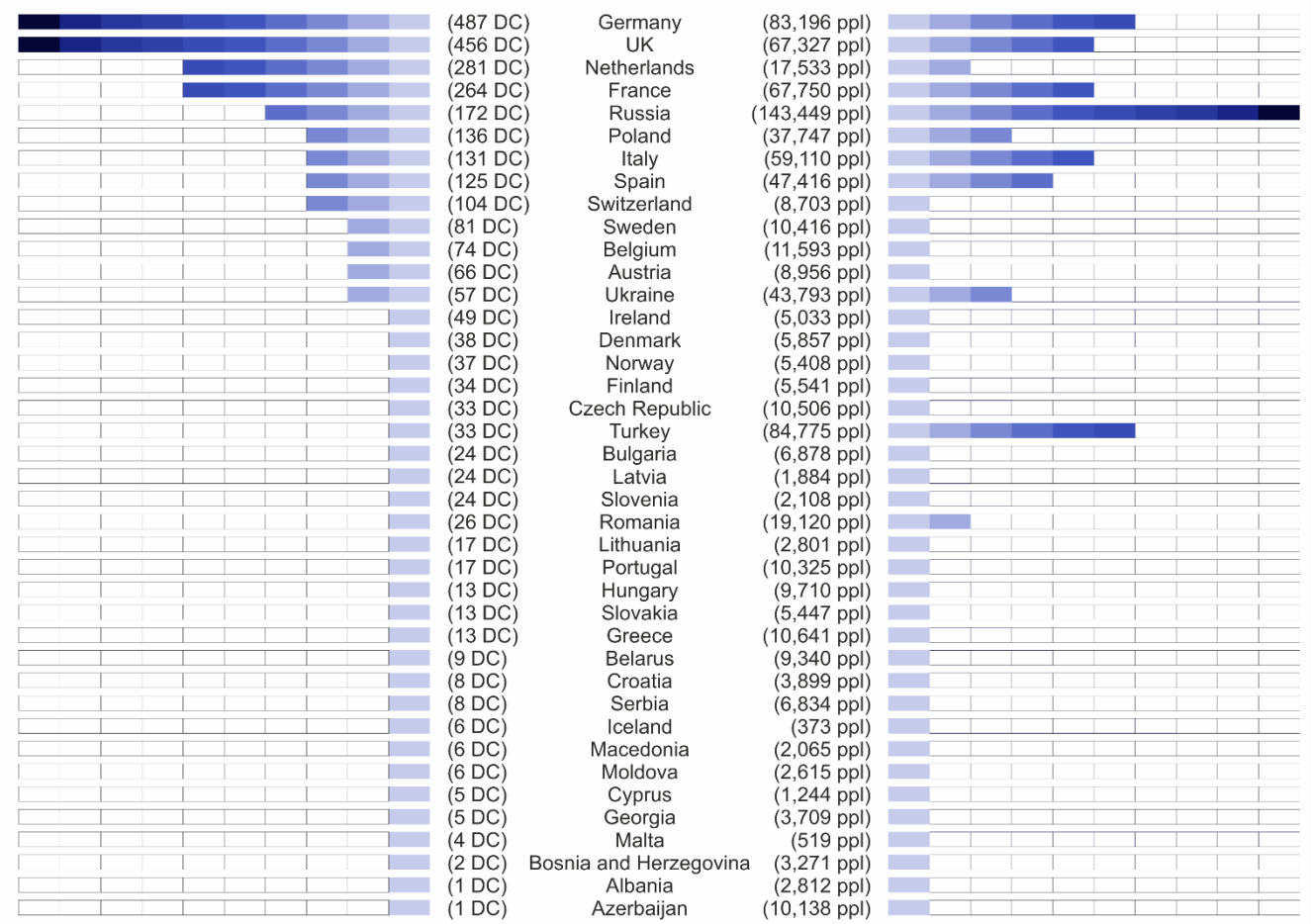
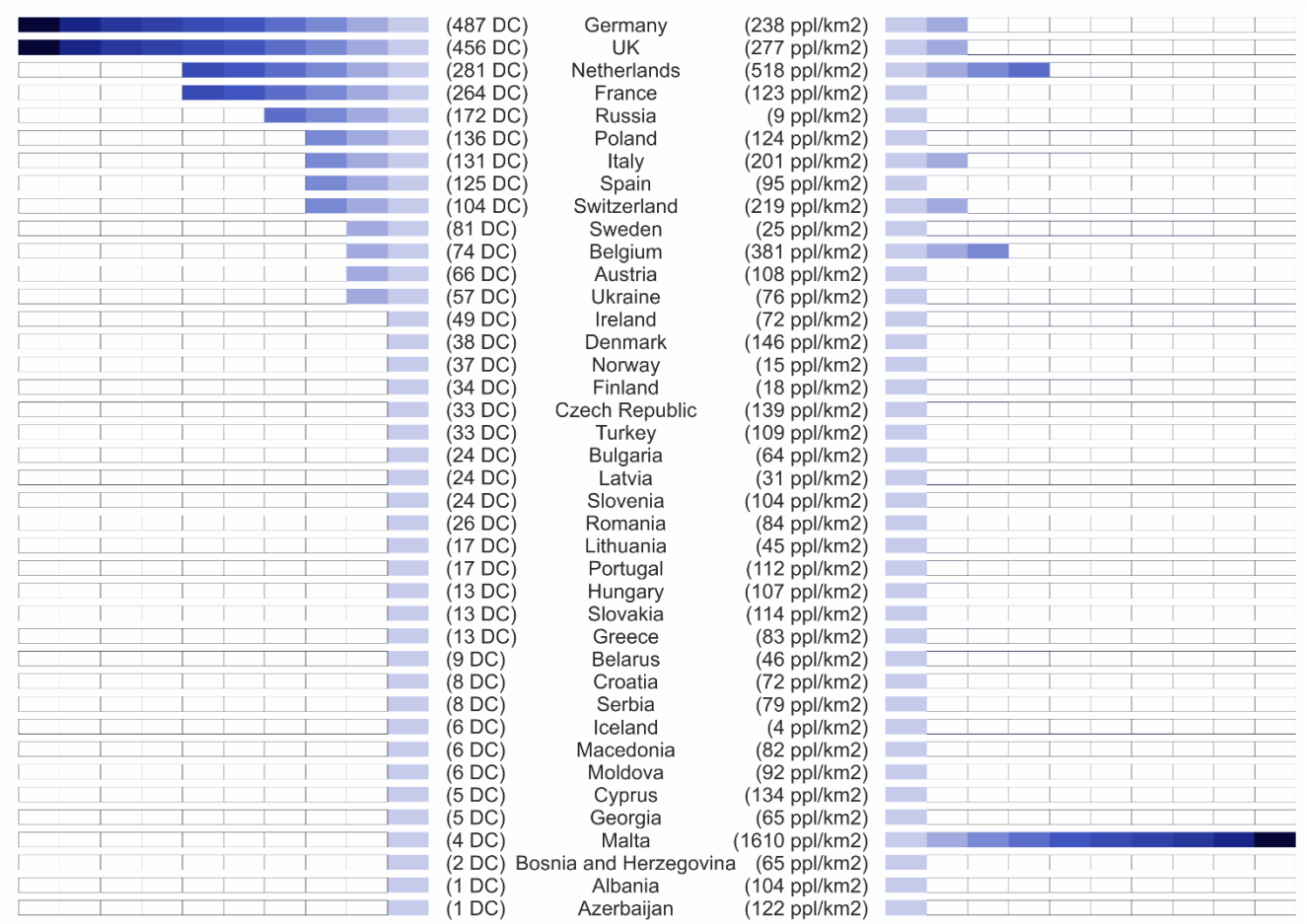
APPENDIX 1



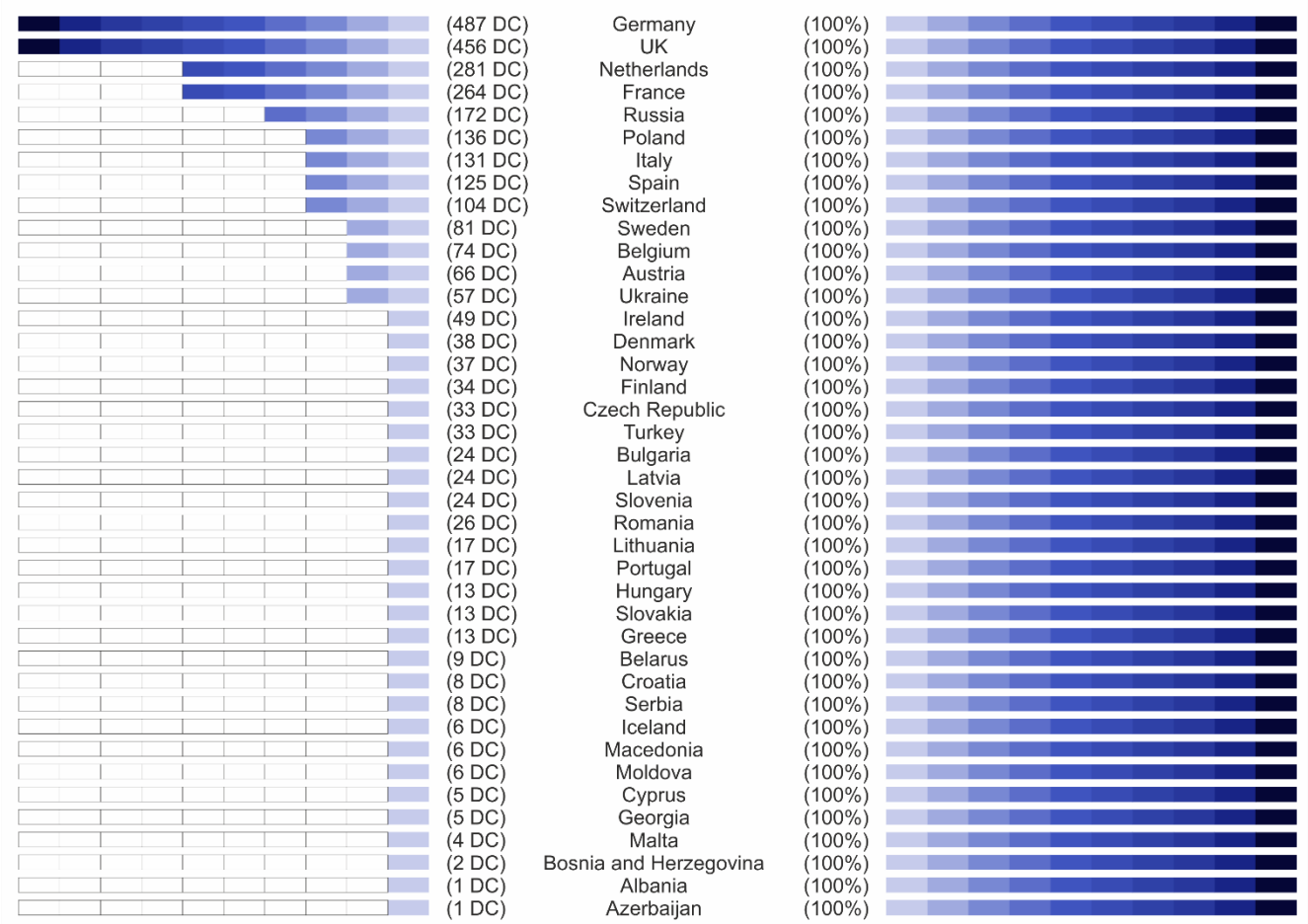
Number of data centers in Europe by country 2021 compared to total population (2021 value in thousands) (adapted from Statista 2021 & The World Bank 2021)

APPENDIX 2



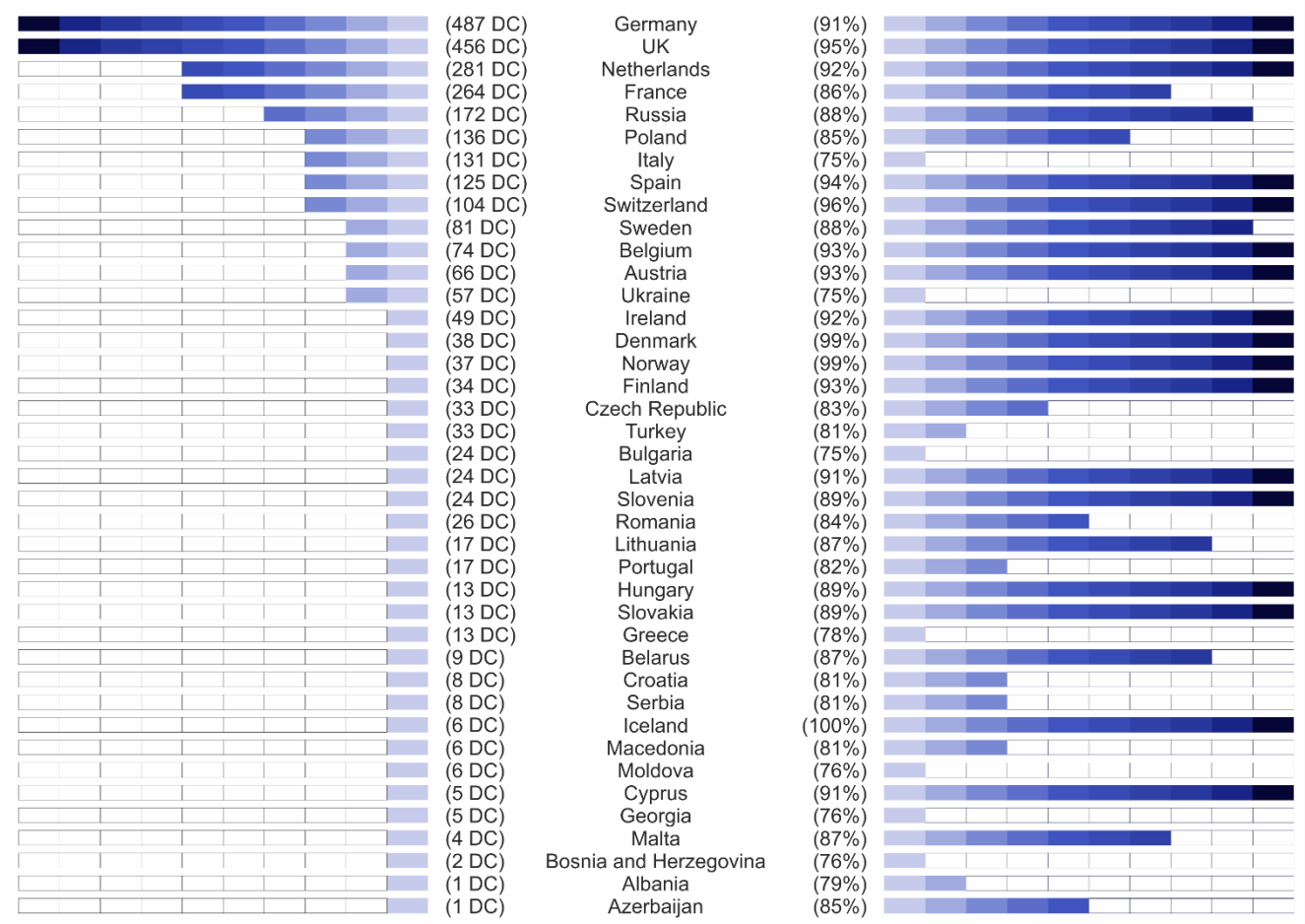
Number of data centers in Europe by country 2021 compared to population density (2022 number of people/km2) (adapted from Statista 2021 & The World Bank 2020)

APPENDIX 3



Number of data centers in Europe by country 2021 compared to percentage of population with access to electricity (2020) (adapted from Statista 2021 & The World Bank 2020)

APPENDIX 4



Number of data centers in Europe by country 2021 compared to percentage of population using internet (2020) (adapted from Statista 2021 & The World Bank 2020)

APPENDIX 5

Ranking of European countries by restrictions on foreign investments in 2002 (OECD 2002, 5)

Restrictions on Foreign Investments (from least to most)								
1	United Kingdom	0,06	18	Poland	0,21	35	Latvia	no data
2	Ireland	0,07	19	Austria	0,27	36	Liechtenstein	no data
3	Netherlands	0,08	20	Turkiye	0,34	37	Lithuania	no data
4	Germany	0,08	21	Iceland	0,39	38	Luxembourg	no data
5	Denmark	0,085	22	Albania	no data	39	Malta	no data
6	Belgium	0,09	23	Andorra	no data	40	Moldova	no data
7	Italy	0,10	24	Armenia	no data	41	Monaco	no data
8	France	0,11	25	Azerbaijan	no data	42	Montenegro	no data
9	Greece	0,13	26	Belarus	no data	43	North Macedonia	no data
10	Sweden	0,14	27	Bosnia and Herzegovina	no data	44	Romania	no data
11	Portugal	0,15	28	Bulgaria	no data	45	Russian Federation	no data
12	Hungary	0,16	29	Croatia	no data	46	San Marino	no data
13	Spain	0,165	30	Cyprus	no data	47	Serbia	no data
14	Czechia	0,17	31	Estonia	no data	48	Slovak Republic	no data
15	Switzerland	0,17	32	Georgia	no data	49	Slovenia	no data
16	Finland	0,18	33	Kazakhstan	no data	50	Ukraine	no data
17	Norway	0,185	34	Kosovo	no data			

APPENDIX 6/1

No #	Country (ranked by ascending difficulty level for foreign controlled eneterprises to invest locally)	Member of National Treatment for Foreign-Controlled Enterprises	Exceptions (at national level or by territorial subdivisions)	Conclusions
1	Czechia	Yes	None/ Not relevant to DC Industry	Lack of restrictions makes it easy for foreign controlled companies to invest in this location
2	Portugal	Yes	None/ Not relevant to DC Industry	Lack of restrictions makes it easy for foreign controlled companies to invest in this location
3	Romania	Yes	None/ Not relevant to DC Industry	Lack of restrictions makes it easy for foreign controlled companies to invest in this location
4	Slovak Republic	Yes	None/ Not relevant to DC Industry	Lack of restrictions makes it easy for foreign controlled companies to invest in this location
5	Poland	Yes	-Foreign-controlled enterprises require authorisation for the acquisition of real estate (35)	Possible impact on: -schedule -operation
6	Latvia	Yes	-Purchase of land in some locations is restricted (25)	Impact on: -limits site location selection
7	Ireland	Yes	-Air transport limited to EU carriers (22)	Possible impact on: -schedule -cost
8	Italy	Yes	-Air transport limited to EU carriers (23)	Possible impact on: -schedule -cost
9	Belgium	Yes	-Transport of goods on inland waterway is limited to EU carriers (3)	Possible impact on: -schedule -cost
10	Slovenia	Yes	-Maritime transport limited to EU carriers (36)	Possible impact on: -schedule -cost
11	Hungary	Yes	-Air transport limited to EU carriers (17) -Inland waterways transport limited to EU carriers (18)	Possible impact on: -schedule -cost
12	Netherlands	Yes	-Air transport limited to EU carriers (30) -Maritime transport limited to EU carriers (31) -Inland waterways transport limited to EU carriers (32)	Possible impact on: -schedule -cost
13	Luxembourg	Yes	-Restrictions on air and land transport schedule (29)	Possible impact on: -schedule -cost -operation
14	Norway	Yes	-Maritime transport limited to EEA carriers (33) -Road transport limited to Norwegian carriers (34)	Possible impact on: -schedule -cost -operation
15	United Kingdom	Yes	-Maritime transport limited to British carriers (49) -Inland waterways transport limited to EU carriers (50)	Possible impact on: -schedule -cost
16	Denmark	Yes	-Air transport limited to Danish carriers (4)	Possible impact on: -schedule -cost
17	Finland	Yes	-Air transport limited to Finnish carriers (7)	Possible impact on: -schedule -cost
18	Spain	Yes	-Air transport limited to Spanish carriers (37)	Possible impact on: -schedule -cost
19	Turkiye	Yes	-Maritime transport is limited to Turkish carriers (45)	Possible impact on: -schedule -cost
20	Greece	Yes	-Purchase of land is limited to EU members (15) -Maritime transport is limited to Greek carriers (16)	Possible impact on: -schedule -cost -operation
21	Austria	Yes	-Air transport limited to Austrian carriers (1) -Real estate acquisition requires authorization (2)	Possible impact on: -schedule -cost -operation
22	Sweden	Yes	-Air transport limited to Swedish carriers (38) -Air routes restrictions for foreign enterprises (39) -Maritime transport limited to Swedish carriers (40)	Possible impact on: -schedule -cost
23	France	Yes	-Transport of goods on inland waterway limited to EU carriers (8) -Foreign participation in newly privatised companies is limited (9)	Impact on: -access to the local market opportunitites Possible impact on: -schedule -cost
24	Lithuania	Yes	-Restrictions on land acquisition (26) -Maritime and inland waterway transport is limited to Lithuanian carriers (27) -Restrictions for foreign legal persons receiving state subsidies (28)	Impact on: -limits site location selection Possible impact on: -schedule -cost -operation
25	Estonia	Yes	-Purchase of real estate in some locations is restricted to EEA nationals with minimum 3 years residence (5) -Maritime transport limited to EU carriers (6)	Possible impact on: -schedule -cost -operation

APPENDIX 6/2

No #	Country (ranked by ascending difficulty level for foreign controlled eneterprises to invest locally)	Member of National Treatment for Foreign-Controlled Enterprises	Exceptions (at national level or by territorial subdivisions)	Conclusions
26	Switzerland	Yes	-Air transport is limited to Swiss carriers (41) -Inland waterways transport is limited to Swiss carriers (42) -Maritime transport is limited to Swiss carriers (43) -Real estate acquisition requires authorization (44)	Possible impact on: -schedule -cost -operation
27	Ukraine	Yes	-Restrictions on purchases of state-owned land by foreign legal entities (46) -Maritime transport limited to Ukrainian carriers (47) -Foreign firms participation to procurment biddings is forbidden (48)	Possible impact on: -schedule -cost -operation -future expansion and development
28	Germany	Yes	-Air transport limited to EEA carriers (10) -Maritime transport limited to EU carriers (11) -Inland waterways transport limited to EU carriers (12) -Rail transport limited to German carriers (13) -Disadvantages for enterprises not established as legally independent (14)	Possible impact on: -schedule -cost -operation
29	Iceland	Yes	-Restrictions on foreign investments. (19) -Restrictions and prohibitions on investments by foreign states or state-owned enterprises without authorization (20) -Foreign investment in real estate is limited to EEA nationals (21)	Highest number of restrictions on foreign investments amongst member states. Possible impact on: -schedule -cost -operation
30	Kazakhstan	Yes	-Governmental approval needed for owning and using Telecommunications services (24)	Hiighest level of impact to project cost, schedule and operation.
31	Albania	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
32	Andorra	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
33	Armenia	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
34	Azerbaijan	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
35	Belarus	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
36	Bosnia and Herzegovina	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
37	Bulgaria	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
38	Croatia	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
39	Cyprus	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
40	Georgia	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
41	Kosovo	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
42	Liechtenstein	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
43	Malta	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
44	Moldova	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
45	Monaco	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
46	Montenegro	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
47	North Macedonia	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
48	Russian Federation	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
49	San Marino	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location
50	Serbia	No	N/A	Lack of membership makes it more difficult for foreign controlled companies to invest in this location

APPENDIX 6/3

Notes:
1. "Air transport: Cabotage reserved to national airlines." (OECD, 14)
2. "Real estate: Authorisation requirement for acquisition of real estate." (OECD, 14)
3. "Inland waterways: The right to carry out transport of goods and persons between two points on the inland waterways covered by the Revised Convention for the navigation on the Rhine is reserved to vessels owned by either nationals of Contracting States of that Convention or Member States of the EU, or companies based on the territory of any of these States, which are owned in majority and controlled by nationals of these States." (OECD, 16)
4. "Air transport: Cabotage reserved to national carriers." (OECD, 32)
5. "Real-estate: On smaller islands (except for the 4 biggest islands) and 18 local government units bordering Russia – acquisition of land and real estate is forbidden for foreigners, foreign legal persons and foreign states. Nationals of EEA states, who have been legally resident and active in farming in Estonia for at least three years continuously, are not subject to any restrictions." (OECD, 35)
6. "Maritime transport and related services: Cabotage is reserved to sea-going vessels flying the national flag of the Republic of Estonia or of an EU member State. The right to fly the national flag of the Republic of Estonia is granted to sea-going vessels owned by Estonian citizens; sea-going vessels in common ownership if the greater share of the vessel is owned by Estonian co-owners; sea-going vessels that are the object of shared succession, if the greater share of the succession is owned by Estonian citizens or Estonian legal persons which have inherited the sea-going vessel in common." (OECD, 35)
7. "Air transport: Air cabotage reserved to national carriers." (OECD, 37)
"Inland waterways:
8. "1. The right to transport goods and persons between two points on the inland waterways covered by the Revised Convention for the Navigation of the Rhine is reserved to vessels owned and operated by either nationals of Contracting States of that Convention or Member States of the EU, or companies based in any of these States, which are majority-owned and controlled by nationals of these States.
2. The right to transport goods or passengers by inland waterway within an EU country (in which the enterprise is not established), between EU countries and in transit through them, is reserved to vessels owned by either nationals of EU countries or companies based in any of the EU countries, which are majority-owned by nationals of these EU countries. " (OECD, 38)
9. "Privatisation: Foreign participation in newly privatised companies may be limited to a variable amount, determined by the government on a case-by-case basis, of the equity offered to the public." (OECD, 39)
10. "Air transport: Cabotage reserved, in principle, to airlines from EEA-countries." (OECD, 40)
11. "Maritime transport: Registration in the German Ship Register is reserved to ships owned by EU-nationals or companies controlled by EU-nationals, domiciled in the EU. Flag is required to engage in marine cabotage and fishing within territorial waters." (OECD, 40)
12. "Inland waterways: The right to carry out transport of goods and persons between two points on the inland waterways covered by the Revised Convention for the navigation on the Rhine is reserved to vessels owned by either nationals of Contracting States of that Convention or Member States of the EU, or companies based on the territory of any of these States, which are owned in majority and controlled by nationals of these States. " (OECD, 40)
13. "Rail transport: Access to public rail infrastructure is reserved to:
Railway undertakings established in Germany;
International groupings of railway undertakings; and
Railway undertakings providing international combined freight transport.
Access is also possible on the basis of reciprocity or governmental agreement" (OECD, 40)
14. "Trans-sectoral: Branches of enterprises that are not established as legally independent companies are excluded from the provision of financial assistance or guarantees in some sectors." (OECD, 40)
15. "Real estate: Non-EU controlled enterprises are not allowed to acquire land rights in border areas. The prohibition applied to border land acquisition by non-EU enterprises may be waived by means of a decision by the Minister of National Defence." (OECD, 42)
16. "Maritime transport and fishing: Non-EU ownership of Greek flag vessels is limited to 49 percent. Cabotage is reserved to national and EU flag vessels, including also voyages with legs in foreign ports. " (OECD, 42)
17. "Air transport: Licences for domestic transport of persons or goods are reserved to undertakings majority-owned and effectively controlled by EU states or nationals." (OECD, 43)
18. "International waterways: Shipping licences are reserved to EU nationals or enterprises with majority EU ownership. " (OECD, 43)
19. "Trans-sectoral: Foreign investment is accepted under reciprocity conditions. Transactions may be blocked if foreign investment is deemed to ""seriously reduce competition"" or to have an ""undesirable effect on the Icelandic Economy"" (OECD, 44)
20. "Trans-sectoral: Investment by foreign states or state-owned enterprises is prohibited unless an authorisation is granted." (OECD, 44)
21. "Real estate: Foreign investment by nationals from non-EEA countries - other than for direct business use - is restricted, with the exception of acquisitions by limited liability companies in which non-residents do not own more than 20 per cent of the capital and do not hold a majority of the total voting power." (OECD, 44)
22. "Air transport: Cabotage is generally reserved to airlines licensed in the state, and direct majority investment in air transport by non-EU states or nationals of non-EU states may be restricted. " (OECD, 46)
23. "Air transport: Cabotage is reserved to national companies unless international conventions on air transport services state otherwise. Companies from EU countries are authorised to undertake cabotage that represents an extension of an international service." (OECD, 49)
24. "Telecommunications services: In order to directly or indirectly own, use, dispose of or manage an aggregate of more than 49% of the voting shares in a legal entity supplying longdistance and international telecommunications services and owning terrestrial communications lines (cable, including optical fibre and radio relay), foreign investors must obtain a special approval from the Government. This approval is based on recommendations from the Ministry of Information and Communication and the National Security Committee. " (OECD, 55)
25. "Real estate: Land may be acquired by all natural and legal persons, except in the territories in Latvia's border area, dune areas of the Baltic Sea and the Riga gulf and protected areas of other public waters, land of state reserves, land usable for agriculture and forestry, and land of deposits of mineral resources of State importance" (OECD, 59)
26. "Land: Acquisition into ownership of land, internal waters and forests is permitted to foreigncontrolled enterprises meeting the criteria of European and transatlantic integration embarked on by Lithuania." (OECD, 61)
27. "Maritime and inland waterway transport: Only ships and vessels with Lithuanian state flag and registered in Lithuania or any European Union member state flag are allowed to provide maritime waterway cabotage and inland cabotage service" (OECD, 61)
28. "State Subsidies: Foreign legal persons in any sector of the economy may be limited to receive state subsidies. Producers and exporters of some goods and services of Lithuanian origin are supported by legal acts or onetime decisions by the Government." (OECD, 62)
29. "Air transport/Land transport: Some restrictions may apply to regular scheduled air transport and public transport." (OECD, 63)
30. "Air transport: Cabotage reserved to airlines from EU-countries." (OECD, 70)
31. "Maritime transport: National flag is reserved for ships owned by nationals of an EU country, Efta or Switzerland or by companies incorporated under the law of an EU country, one of the countries, islands or territories indicated in article 299, paragraph 2, 5 and 6 under c of the ECTreaty, Efta or Switzerland, and having their actual place of business in the Netherlands." (OECD, 70)
32. "Inland waterways: The right to carry out transport of goods and persons between two points on the inland waterways covered by the Revised Convention for the navigation on the Rhine is reserved to vessels owned by either nationals of Contracting States of that Convention or Member States of the EU, or companies based on the territory of any of these States, which are owned in majority and controlled by nationals of these States." (OECD, 70)
33. "Maritime transport: Ships in the Norwegian Ordinary Ship Register (NOR) have to be owned by EEA citizens or by an EEA company where EEA citizens own at least 60 per cent of the capital. Exemptions from the 60 per cent rule may be granted. There is no such limitation for ships registered in the Norwegian International Ship Register (NIS)." (OECD, 73)
34. "Road transport: In general, cabotage reserved to national hauliers." (OECD, 73)
35. "Real estate: Foreign-controlled enterprises require authorisation for the acquisition of real estate for other purposes than direct investment and of land reserved for agriculture or forests, or water areas." (OECD, 77)
36. "Maritime transport: majority ownership by non-EU residents of a Slovenian flag maritime vessel, unless the operator is a Slovenian or other EU national." (OECD, 81)
37. "Air transport: Cabotage reserved to national airlines." (OECD, 82)
38. "Air transport: Cabotage reserved to national airlines." (OECD, 83)
39. "Air transport: Foreign enterprises may be restricted from access to international air routes unless bilateral intergovernmental agreements provide otherwise." (OECD, 83)
40. "Maritime transport: Cabotage is reserved to vessels flying the national flag." (OECD, 83)
41. "Air transport: The commercial transport of persons and goods by foreign-controlled enterprises is regulated by international agreements. In the absence of these, it is possible to permit foreign enterprises to exploit certain routes for commercial transport and to authorise commercial flights by foreigners outside these routes depending on the compatibility of the service offered with essential Swiss interests and on the granting of reciprocity.
Air transport: The business transport of people or goods between two points in Switzerland is reserved to Swiss companies, in the absence of international agreements providing otherwise." (OECD, 84)
42. Inland waterways: To be registered in Switzerland and to transport persons and goods between two points on the Rhine, a vessel must be owned by a company which is substantially controlled (by at least 66 per cent of capital and vote) by persons domiciled in Switzerland or in a country, according to the Revised Convention for the Navigation on the Rhine of 17th October 1868 or Member States of the EU in which, for the purposes of flying the flag of their state on the Rhine, regulations apply that are equivalent to those applicable to the contracting states to the Revised Act on Rhine shipping." (OECD, 84)
43. "Maritime transport: An enterprise may register a vessel for the commercial transport of persons or goods or for commercial maritime activities if its head office and real centre of activities is located in Switzerland and if at least the majority of its capital and two thirds of its voting rights are owned by Swiss nationals domiciled in Switzerland and/or by substantially Swiss-owned and Swiss-controlled enterprises with registered office in Switzerland." (OECD, 84)
44. "Tran-sectoral: Acquisition of real estate is subject to authorisation by the relevant cantonal authority when the acquirer does not use the property to operate a permanent establishment." (OECD, 85)
45. "Maritime transport: Cabotage is reserved to Turkish citizens and/or ships flying the national flag. Ships belonging to legal persons set up in accordance with Turkish laws, with the majority of managerial staff and representatives of Turkish nationality and with the voting majority held by partners of Turkish nationality are accepted as Turkish and have the right to fly the Turkish flag." (OECD, 89)
46. "Purchase of state-owned land: The purchase of state and municipal land by foreign legal entities or by joint ventures with participation of foreigners and foreign legal entities is subject to a specific screening procedure. Foreign legal entities must have a representation office in Ukraine. The purchase requires the approval of the Cabinet of Ministers. In the case of state-owned land, the approval of the Ukrainian Parliament (Verkhovna Rada) is also required." (OECD, 91)
47. "Maritime transport: Cabotage (i.e. transport of cargo between Ukrainian ports, including as part of international transportation) is reserved to vessels under Ukrainian flags, unless a special permit is issued by the State Inspectorate for Maritime and Inland Water Transport Safety. According to Article 32 of the Merchant Marine code, only vessels owned by Ukrainian citizens or by a Ukrainian legal entity whose shareholders are all Ukrainian citizens can fly the Ukrainian flag. Foreign vessels hired by Ukrainian citizens under a bareboat charter arrangement can fly the Ukrainian flag for the duration of the arrangement. " (OECD, 92)
48. "Participation by firms registered offshore (as defined by Ordinance N°143-p of the Cabinet of Ministers dated 23 February 2011) into public procurement biddings is forbidden." (OECD, 92)
49. "Maritime transport: In order to obtain the national flag, fishing vessels must be at least 75 per cent owned by British individuals and/or by companies which are at least 75 per cent owned by British citizens in all cases resident and domiciled in the U.K.; vessels must be managed, directed and controlled from within the U.K. Without the national flag, vessels may not fish against the U.K. quotas under the Common Fisheries Policy." (OECD, 93)
50. "Inland waterways: The right to carry out transport of goods and persons between two points on the inland waterways covered by the Revised Convention for the navigation on the Rhine is reserved to vessels owned by either nationals of Contracting States of that Convention or Member States of the EU, or companies based on the territory of any of these States, which are owned in majority and controlled by nationals of these States." (OECD, 93)