EUROPEAN CLUSTER COLLABORATION PLATFORM

Clusters meet Regions' event "European clusters integrating Ukrainian clusters & companies into the EU value chains" in Košice

The ECCP series of events "Clusters meet Regions"

Input paper

An initiative of the European Union

Authors:
Dr. Jan-Philipp Kramer (Prognos)
Marie-Kristin Komendzinski (Prognos)
Lennart Galdiga (Prognos)
Maximilian Welford (Prognos)
Fabian Schmidt (Prognos)
Felix Ginzinger (Prognos)

Brussels, March 2023

Contents

Figures

Tables

Executive Summary

This paper presents observations on the economy, trade flows and the cluster landscape in Slovakia, Ukraine and the wider EU-neighbourhood. By examining (pre-war) trade flows and regional strength key considerations for the (further) integration of Ukrainian cluster organisations and enterprises into EU value chains are outlined. These considerations may pose some open strategic questions that can be addressed in the workshops of the "Clusters meets Regions" event. The following key considerations are summarised below:

Context: Economic profile of Slovakia, Ukraine & the macro-region

- **Slovakia**: From an industry perspective, the importance of the sectors that are related to the industrial ecosystems "Mobility-Transport-Automotive", "Agri-Food", "Retail", "Construction" and "Health" stands out and represents a large part of the Slovak economy. The capital region of Bratislava is a service sector-driven region in Slovakia, with a high concentration of companies and investments. On the other hand, the region of Východné Slovensko, where the city of Košice is located, is characterized by a comparatively large construction and utilities sector and a noticeable manufacturing sector.
- **Ukraine**: As of 2021, the size of the Ukrainian economy amounted to around €169 billion, in nominal terms, which is comparable to the economic size of Hungary (€154 billion). The main sectors of the Ukrainian economy prior to the war were wholesale & retail trade followed by agriculture, forestry and fishing and manufacturing. Moreover, Ukraine has been characterised in previous years by a high employment rate in knowledge-intensive activities which generally indicates a skilled workforce in the country and underlines the potential for future development.
- **Macro-region**: The macro-region includes 11 EU Member States with borders and close geographical proximity to Ukraine: Austria, Bulgaria, Czechia, Estonia, Germany, Hungary, Lithuania, Latvia, Poland, Romania, Slovenia. This region accounts for 37.3% of the GDP of the EU27. As the macro-region encompasses a wide range of different EU27 countries, a variety of different sectoral strengths can be identified. These sectors can be related to the industrial ecosystems "Mobility-Transport-Automotive", "Agri-Food", "Retail", "Construction" and "Health".

Lost supply, lost export markets and EU & Ukraine trade flows

- Looking at the **pre-war trade flows between the EU27 and Russia & Belarus**, it is well known that the imports of raw materials (especially gas & oil but also various metals) stand out. As the EU sanctions target especially the Russian energy sector, the value chains related to the ecosystem "Energy – Renewables" are affected by the war. Other value chains with relevant imports from Russia are related to the ecosystems "Construction" & "Agri-food". In terms of European exports to Russia & Belarus, value chains particularly linked to the industrial ecosystems "Health", "Mobility-Transport-Automotive", "Aerospace & Defence" and "Agri-food" are potentially affected by lost export markets.
- **Pre-war trade between Ukraine and Russia & Belarus** had already decreased significantly over the last decade. Similar to the trade structure between the EU and Russia, raw materials and especially mineral fuels were important elements of Ukraine's imports from Russia before the war. Products that can be linked to industrial ecosystems "Mobility-Transport-Automotive" and "Agri-food" are potentially affected by lost supply. Similarly, goods linked to the ecosystem "Mobility-Transport-Automotive" are potentially affected by lost export markets for Ukrainian firms.
- The **pre-war trade flows between the EU27 & Ukraine** show that Ukraine has been a relevant supplier of raw materials. This showcases the potential for further cooperation in this area. With agricultural products accounting for a significant share of traded goods, value chains linked to the industrial ecosystem "Agri-

Food" played a significant role before the war. In the trade between Ukraine and the EU27 especially value chains linked to the ecosystems "Mobility-Transport-Automotive", "Aerospace & Defence", "Health" and "Electronics" were particularly important before the war and have been affected by it. Additionally, the potential (further) cooperation in value chains linked to the industrial ecosystems "Digital" and "Textiles" is outlined, based on Ukraine's strength in these areas.

- The **trade volume** between the EU27 and Ukraine has grown strongly over the last decade, peaking at more than €53 billion in 2021. Trade between Ukraine and Russia, but also between the EU27 and Russia has fallen sharply following the illegal annexation of Crimea by Russia in 2014. Although the trade volume between the EU27 and Russia remained relatively high with €240 billion in 2021, the impact following of Russia's war against Ukraine and the subsequent sanctions has led to lost supply and export markets of firms in the EU27 & Ukraine.
- The analysis of trade flows has identified several value chains that are particularly affected by the Russian war against Ukraine and/or provide particular potential for further cooperation between European and Ukrainian cluster organisations & enterprises. These value chains can be linked to the following **nine industrial ecosystems, which can be key areas for further cooperation** between the EU and Ukraine:
    - Aerospace & Defence
    - Agri-Food
    - Construction
    - Digital
    - Electronics
    - Energy Renewables
    - Health
    - Mobility-Transport-Automotive
    - Textiles
- Foreign direct investments (FDI) are drivers of (economic) development, as they foster economic growth, productivity and employment. The **Ukrainian foreign direct investment** (FDI) **inflows** have fluctuated over the last decade which can be linked to Russia's illegal annexation of Crimea in 2014. In 2021, the Ukrainian FDI inflows had recovered from the 2020 COVID-19 crisis, but it can be expected that FDI inflows have decreased after the outbreak of the war in February 2022. Nevertheless, several international firms have maintained or even increased their investments in Ukraine despite the war.

Cluster organisations in Slovakia, Ukraine & the macro-region and the role of clusters in rebuilding regional supply chains

- Cluster organisations (can) play a key **role in organising and rebuilding regional supply chains.** Thereby, cluster organisation activities such as the provision of information (e.g., on market opportunities), facilitating connections (e.g., finding new partners/suppliers in other sectors and/or regions) or providing support (e.g., upskilling of suppliers) are particularly relevant in this context.
- In **Slovakia**, 26 cluster organisations are registered on the ECCP. The majority of these cluster organisations are located in the country's capital of Bratislava. These cluster organisations are active in several industrial ecosystems and these industrial ecosystems also cover the previously identified key industrial ecosystems for further cooperation between the EU and Ukraine. Hence, the respective Slovak cluster organisations can be key for rebuilding supply chains and integrating Ukrainian clusters and enterprises into EU value chains.

- Cluster policy in **Ukraine** is a relatively recent development. Within the Ukrainian cluster landscape, the Ukrainian Cluster Alliance (UCA), established shortly after the Russian invasion of Ukraine in February 2022, plays a central role. With more than 40 cluster organisations in Ukraine in different industries, the country offers significant potential for further integration of Ukrainian cluster organisations and enterprises into EU value chains.
- As the **macro-region** covers a number of EU27 Member States, its cluster landscape compromises 450 cluster organisations that are active in various economic sectors and ecosystems. As such, the macro-region provides a number of cluster organisations in the previously identified 9 key industrial ecosystems, indicating a high potential for collaboration.

International cooperation and capacity building of Slovak and Ukrainian clusters through cluster support initiatives

- International cluster cooperation can foster innovation, global competitiveness, and international trade relations. In the 2014-2020 funding period, two cluster organisations from Slovakia participated in three different **European Strategic Cluster Partnerships** (2 participations in ESCP-4i, 1 participation in ESCP-4x). Partners came from Spain, Czechia, Germany, Italy, Denmark, France, Portugal and Ireland.
- **Capacity building of cluster actors and development aid support** through international cluster cooperation between Ukraine and the EU is ongoing. Activities include the EU Cluster Support Ukraine Forum of the European Cluster Collaboration Platform, the Supply Chain Resilience Platform of the Enterprise Europe Network and the EU4Business Initiative.
- Within Ukraine, the Ukraine Cluster Alliance works on the **internationalisation of Ukrainian cluster** organisations and the role of cluster organisations in Ukraine's economic recovery. In this context, around 13 Memoranda of Cooperation have been signed with European partners, including the European Cluster Alliance.
- Within the Danube Transnational Programme, Ukrainian and Slovak actors have worked together on several **cross-regional projects** with 12 other partner countries in the 2014-2020 funding period. In the 2021-2027 funding period, the whole territory of Ukraine is eligible to participate in calls for proposals.

Outlook: Building on the potential for interregional cooperation

- **Smart Specialisation Strategies** (S3) offer a profound foundation for interregional cooperation. The Ukrainian regions have started to develop S3 before the war. These Ukrainian S3 cover a wide range of topics, which are also relevant to the previously identified 9 key industrial ecosystems for further cooperation between the EU and Ukraine. Since the greatest cooperation potential can often be found in priorities that address the same overarching priority areas, several regions in Slovakia and the macro-region are identified that address the same overarching priority areas as their Ukrainian counterparts.
- More than **120 cluster organisations** in Slovakia and the macro-region have been identified that operate in the 9 key industrial ecosystems and that have indicated interest for international collaboration. These cluster organisations provide promising potential for further integration of Ukrainian cluster organisations and enterprises into EU value chains. The list of these cluster organisations can serve as practical orientation for the identification of suitable partners for collaboration.
- All in all, Slovakia, the macro-region and Ukraine provide **substantial potential for further cooperation and economic integration** on different levels. With this potential and through the support of cluster organisations in their important role in industrial ecosystems, the economic impact of the Russian aggression against Ukraine can be alleviated through the reorganisation and building of new value chains between the EU and Ukraine.

01

Context: Economic profile of Slovakia, Ukraine & the macro-region

1. Context: Economic profile of Slovakia, Ukraine & the macro-region

Overview of key findings

- **Slovakia**: From an industry perspective, the importance of the sectors that are related to the industrial ecosystems "Mobility-Transport-Automotive", "Agri-Food", "Retail", "Construction" and "Health" stands out and represents a large part of the Slovak economy. The capital region of Bratislava is a service sector-driven region in Slovakia, with a high concentration of companies and investments. On the other hand, the region of Východné Slovensko, where the city of Košice is located, is characterized by a comparatively large construction and utilities sector and a noticeable manufacturing sector.
- **Ukraine**: As of 2021, the size of the Ukrainian economy amounted to around €169 billion, in nominal terms, which is comparable to the economic size of Hungary (€154 billion). The main sectors of the Ukrainian economy prior to the war were wholesale & retail trade followed by agriculture, forestry and fishing and manufacturing. Moreover, Ukraine has been characterised in previous years by a high employment rate in knowledge-intensive activities which generally indicates a skilled workforce in the country and underlines the potential for future development.
- **Macro-region**: The macro-region includes 11 EU Member States with borders and geographical proximity to Ukraine: Austria, Bulgaria, the Czech Republic, Estonia, Germany, Hungary, Lithuania, Latvia, Poland, Romania and Slovenia. This region accounts for 37.3% of the GDP of the EU27. As the macro-region covers a wide range of different EU27 countries, a variety of different sectoral strengths can be identified. These sectors can be grouped into the industrial ecosystems 'Mobility-Transport-Automotive', 'Agri-food', 'Retail trade', 'Construction' and 'Health'.

This chapter presents an analysis of the economic profile of Slovakia, Ukraine and the surrounding macro-region, based on the most recent economic data such as GDP, growth, employment and GVA. The economic development of each country and the macro-region is described, using World Bank data on GDP and GDP growth. A sectoral analysis of employment and GVA is provided using ECCP data. For Ukraine, the analysis of the country's largest sectors is based on the latest secondary data from the national statistical office. It is important to note that the economic data analysed in this study only cover the period up to 2021, due to the limited information available for some indicators and the focus on describing the economic situation before the war in Ukraine. In addition, the results of the latest European Innovation Scoreboard are presented and contextualised to provide an overview of the innovation landscape in each country and in the macro-region. The macro-region is based on the EU Macro-Regional Strategies, taking into account the countries of the Danube and Baltic Sea regions, including neighbouring countries and countries in close geographical proximity to Slovakia or Ukraine.

Based on these considerations, the following EU Member States are included in the **macro-region**:

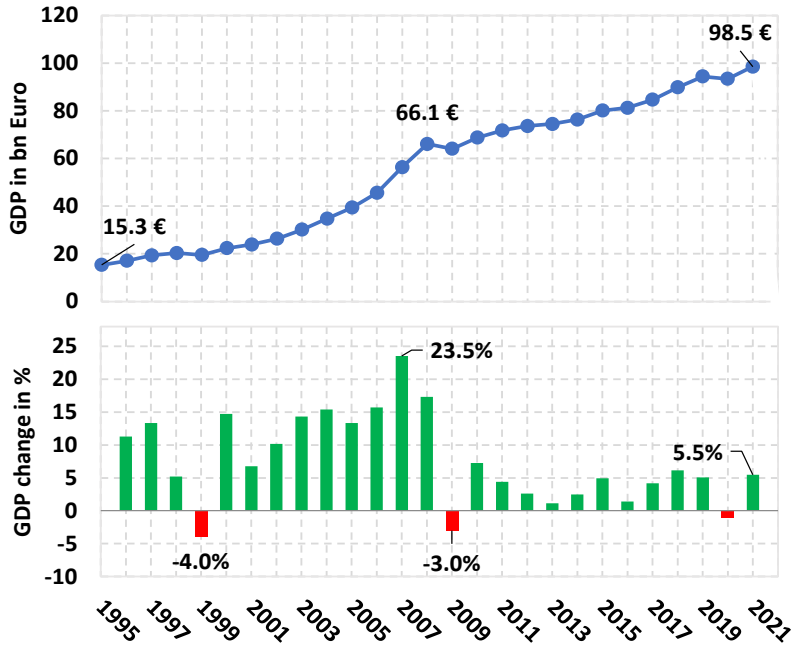
- Danube Region: Austria, Bulgaria, Czechia, Hungary, Romania, Slovenia
- Baltic Sea Region: Estonia, Lithuania, Latvia, Poland
- Baltic Sea & Danube Region: Germany

1.1 Macroeconomic profile of Slovakia, Ukraine and the macro-region

Slovakia

On a general note, Slovakia ranks among the smaller economies in the EU27, in which 2.71 million[1] of 5.46 million[2] inhabitants are economically active. As seen in the Graph below (see Figure 1), Slovakia has enjoyed consistent growth in the past 30 years, with its GDP at current market prices, reaching a peak of €98.5 billion in 2021[3]. Joining the European Union in 2004 opened up Slovakia to EU markets, allowing the country to expand its economy and take advantage of its growing industries and location at the crossroads of Europe. Despite positive GDP growth of 23.5% between 2006 and 2007, Slovakia's growth rates have fluctuated in recent years. The Slovak economy was adversely affected by global financial crises such as the 2009 financial crisis and the COVID-19 pandemic in 2010, resulting in a decline of -3% and -1.1% respectively.

Figure 1: Slovakia GDP in billion Euro and GDP change in % 1993-2021



Source: Eurostat (2023): GDP and main components (output, expenditure and income). Note: GDP in current market prices

Despite these setbacks, one can observe how Slovakia has a resilient economy, with domestic demand appearing to be a significant driver of growth[4]. Increased integration in European markets as well as larger investment from international companies have also helped stimulate growth in Slovakia's national economy, with trade capacities playing an important role in this development. Nevertheless, it is important to note some key challenges in recent years, with regional disparities between Bratislava, Západné Slovensko, Stredné Slovensko and Východné

[1] Eurostat (2023): Active population, aged 15-64 - annual averages. Available under: https://ec.europa.eu/eurostat/web/products-datasets/product?code=tipslm15 (last access 22.02.2023).
[2] Eurostat (2023): Population on 1 January. Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/TPS00001 (last access 22.02.2023).
[3] Eurostat (2023): GDP and main components (output, expenditure and income). Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/NAMA_10_GDP (last access 13.03.2023).
[4] Crédit Agricole Group (2023): Economic and political overview: Slovakia. Available under: https://international.groupecreditagricole.com/en/international-support/slovakia/economic-overview (last access 22.02.2023)

Slovensko standing out. At a national level, the economic output by GDP per capita of 2021 amounted to €21,600, falling below the EU average of €31,200. Bratislava, however, reported a high GDP per capita output of €50,400, surpassing the EU average, due to its strong concentration of companies and investments, with a service sector accounting for about 70% of all employment in the region, while manufacturing comprising 12%.[5]. On the contrary, the region of Východné Slovensko, where Košice is located, has a lower GDP per capita of €15,400 compared to the country average. Compared to the capital region, this region still has a noticeable utilities & construction and manufacturing sector, with employment in these sectors, amounting to 12.9% and 21.5%, respectively.[6]

Slovakia is a landlocked country located in Central Europe, bordered by five other European Member States, as well as Ukraine to the east. Its location at the crossroads of major trade routes between Central and Eastern Europe and its access to the Danube River enables the country to thrive in its advantageous position at the crossroads of major trade routes between Central and Eastern Europe. This has significant implications for its trade capacity, both imports and exports. As of 2021, imports of goods and services amounting to 87.904 billion Euro, and exports of goods and services amounting to €87.868 billion Euro, implying a somewhat balanced trade balance of negative €36.6 million. [7] Slovakia benefits from access to the single market, as evidenced by the fact that 80.5% of exports are intra-EU, while 78.2% of imports come from other EU Member States. The openness of trade is also reflected in the high share of foreign trade in GDP, which amounts to 178% of Slovakia's total GDP.[8]

Ukraine

Ukraine is an Eastern European country located at the crossroads of major transportation routes between Europe and Asia. It shares a border with seven countries, including Hungary, Poland, Romania, and Slovakia, all of which became EU members in 2004 and 2007 respectively. Ukraine's location between the European Union and Russia has significant geopolitical and economic implications, which are reflected in this paper.

With an area of 603,700 square kilometres, it is the second largest country in Europe. Given its diverse geographical characteristics, Ukraine is known for its fertile arable land and natural resources such as coal and iron. In 2021, Ukraine's economy was estimated to have a GDP of €169.2 billion, which, in nominal terms, can be compared with the economic size of Hungary, totalling €153.8 billion.[9] With a population of 41.7 million before the outbreak of the war, Ukraine ranked higher than its neighbours Romania and Poland and is only surpassed by four EU27 Member States in terms of population. When accounting for population, the Ukrainian economy

[5] European Commission (2021): European Innovation Scoreboard 2021: Slovakia. Available under: https://ec.europa.eu/docsroom/documents/45962 (last access 22.02.2023)
[6] European Commission (2021): European Innovation Scoreboard 2021: Slovakia. Available under: https://ec.europa.eu/docsroom/documents/45962 (last access 22.02.2023)
[7] Eurostat (2023): Intra and Extra-EU trade by Member State and by product group. Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/ext_lt_intratrd (last access 10.03.2023).
[8] Own calculations based on Eurostat (2023): Intra and Extra-EU trade by Member State and by product group. Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/ext_lt_intratrd (last access 10.03.2023), and own calculations based on Eurostat (2023): GDP and main components (output, expenditure and income). Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/NAMA_10_GDP (last access 10.03.2023)
[9] Eurostat (2023): GDP and main aggregates- international data cooperation annual data. Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/naida_10_gdp ; Eurostat (2023): GDP and main components (output, expenditure and income). Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/NAMA_10_GDP (last access 10.03.2023)

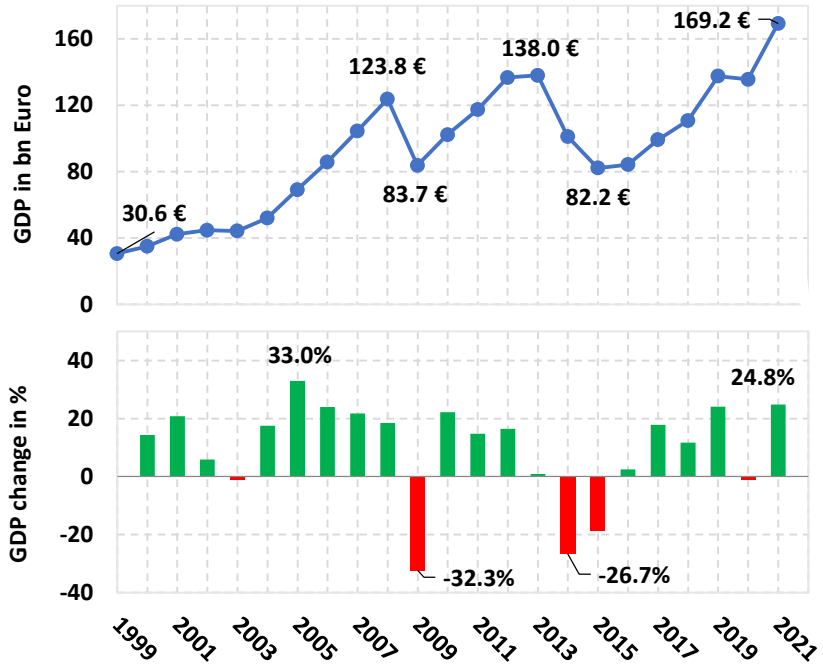
had a GDP per capita of €6,530, compared to the EU27 average of €31,200 and to Ukraine's neighbouring EU27 countries, which range between €22,200 and €23,200.[10]

Despite its relatively low economic performance by European standards, there are two main reasons to believe that the country has high economic potential. First, given its population, Ukraine had a large pre-war labour force, which is expected to reach 17.3 million in 2021. Second, and not least because of its geographic size and strategic location, Ukraine has become a major exporter of agricultural goods and natural resources to trading partners in Europe, Asia and Africa through Ukrainian ports such as Odesa, Mykolaiv and Kherson. Its openness to trade was reflected in Ukraine's trade activity before the Russian aggression, with imports of goods and services amounting to €99.1 billion[11] and exports of goods and services amounting to €96.4 billion.[12]

In the context of economic growth, it is important to note that the Ukrainian economy has fluctuated over the past 30 years, reflecting on and responding to the complex political and social challenges that have characterised the country during this period. Following the collapse of the Soviet Union, Ukraine experienced a sharp economic downturn in the early 1990s and returned to steady growth in the 2000s. However, as shown in the graph below (see Figure 2), 2009 saw a significant decline in nominal GDP (-32.3%), which can be linked to the 2009 financial crisis, which had a negative impact on global markets. 2014 and 2015 saw a further economic downturn (-26.7% and -18.8%, respectively), which can be attributed to Russia's illegal annexation of the Crimean Peninsula in 2014 and the armed conflict with Russian-backed separatists in the Donbass (particularly in the Donetsk and Luhansk regions).

[10] European Commission (2022): European Innovation Scoreboard 2022: Slovakia. Available under: https://ec.europa.eu/assets/rtd/eis/2022/ec_rtd_eis-country-profile-ua.pdf (last access 22.02.2023):
[11] The World Bank (2023): Imports of goods and services (current US$) - Ukraine. Available under: https://data.worldbank.org/indicator/NE.IMP.GNFS.CD?locations=UA (last access 22.02.2023); The World Bank (2023): Exports of goods and services (current US$) - Ukraine. Available under: https://data.worldbank.org/indicator/NE.EXP.GNFS.CD?locations=UA (last access 22.02.2023);
[12] Imports and exports were converted from USD to Euro using the average conversion rate based on Eurostat (2023): Euro/ECU exchange rates – annual data. Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/ert_bil_eur_a (last access 10.03.2023)

Figure 2: Ukraine's GDP in billion Euro and GDP change in % 1993-2021



Source: Eurostat (2023): GDP and main aggregates- international data cooperation annual data Note: GDP is depicted in current market prices

Despite the obstacles it faced after the collapse of the Soviet Union, Ukraine restructured its economy through a combination of policy changes and privatisation in the 1990s and early 2000s. The country has also benefited from the International Monetary Fund's[13] economic reform programme. Particularly in the years since 2014, the EU and Ukraine have stepped up their cooperation, including initiatives[14] to support the Ukrainian economy, Ukraine's green transition and reforms in the country. Another milestone in EU-Ukraine cooperation was the ratification of the EU-Ukraine Association Agreement (Deep and Comprehensive Free Trade Agreement, DCFTA) in 2014, which established further political association, economic integration, and reciprocal free market access.[15] Another important milestone in Ukraine-EU cooperation was reached in 2022, when Ukraine applied for EU membership in February and was granted membership status in June.[16] Finally, it should be noted that the long-term effects of the Russian invasion of Ukraine in February 2022 and the resulting war are still not fully understood as of February 2023.

Macro-region

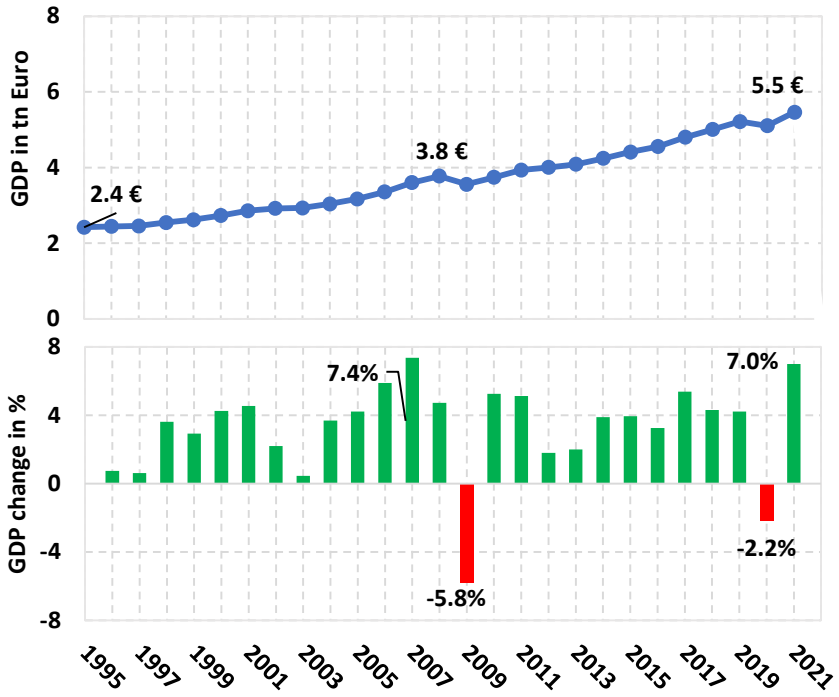
Building on the former sub-sections on the specific countries of Slovakia and Ukraine, this paper makes the case for a wider macro-region that encompasses countries of the Danube and Baltic Sea region. As a myriad of

[13] International Monetary Fund (2014): IMF Survey: Ukraine Unveils Reform Program with IMF Support. Available under: https://www.imf.org/en/News/Articles/2015/09/28/04/53/sonew043014a (last access 22.02.2023).
[14] European Parliament (2022): How the EU has been supporting Ukraine. Available under: https://www.europarl.europa.eu/news/en/headlines/priorities/ukraine/20220127STO22047/how-the-eu-has-been-supporting-ukraine (last access 22.02.2023).
[15] https://www.europarl.europa.eu/news/en/headlines/priorities/ukraine/20140915IPR62504/european-parliament-ratifies-eu-ukraine-association-agreement (last access 09.03.2023).
[16] https://www.consilium.europa.eu/en/policies/enlargement/ukraine/ (last access 09.03.2023)

countries were accessed to the European Union in 2004 and 2007, including Slovakia, plans to bring countries closer together through a collaborative EU-wide project began to emerge. Thereby, EU Macro-Regional Strategies were first initiated in 2011, which should help unite said countries on the basis of principles of sustainability, cooperation and improved mobility.[17] This paper aims to build on the regional classifications of these strategies and cover the economic characteristics of these regions. As mentioned previously, the macro-region of this input paper includes the following EU Member States: Austria, Bulgaria, Czechia, Estonia, Germany, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia.

As the macro-region stretches from Germany to Bulgaria, it represents a set of large economies in the EU which have been subject to significant growth in the past 30 years, reaching a peak of €4.85 trillion in 2019. As seen in Figure 3, the GDP has been subject to consistent increase, albeit global crises like the 2009 Financial crisis and the COVID-19 pandemic (in 2020) disrupting markets and causing a downturn in the macro-region economies as a whole. In 2021, the GDP in the macro-region amounts to €**5.46 trillion**, accounting for more than a third (37.6.%) of the GDP in the EU27.[18]

Figure 3: Macro-region GDP in trillion Euro and GDP change in % 1995-2021



Source: Eurostat (2023): GDP and main components (output, expenditure and income). Note: GDP in current market prices

[17] Danube Civil Society Forum: Participation and civil society in the EU Strategy for Danube Region. Available under: https://danubestrategy.eu/#:~:text=The%20European%20Commission%20has%20prioritised%204%20pillars%20as,Region%3A%20institutional%20capacity%20and%20cooperation%2C%20security%20and%20safety (last access 22.02.2023).

[18] own calculations based on Eurostat (2023): GDP and main components (output, expenditure and income). Available under: https://ec.europa.eu/eurostat/web/products-datasets/-/namq_10_gdp (last access 10.03.2023).

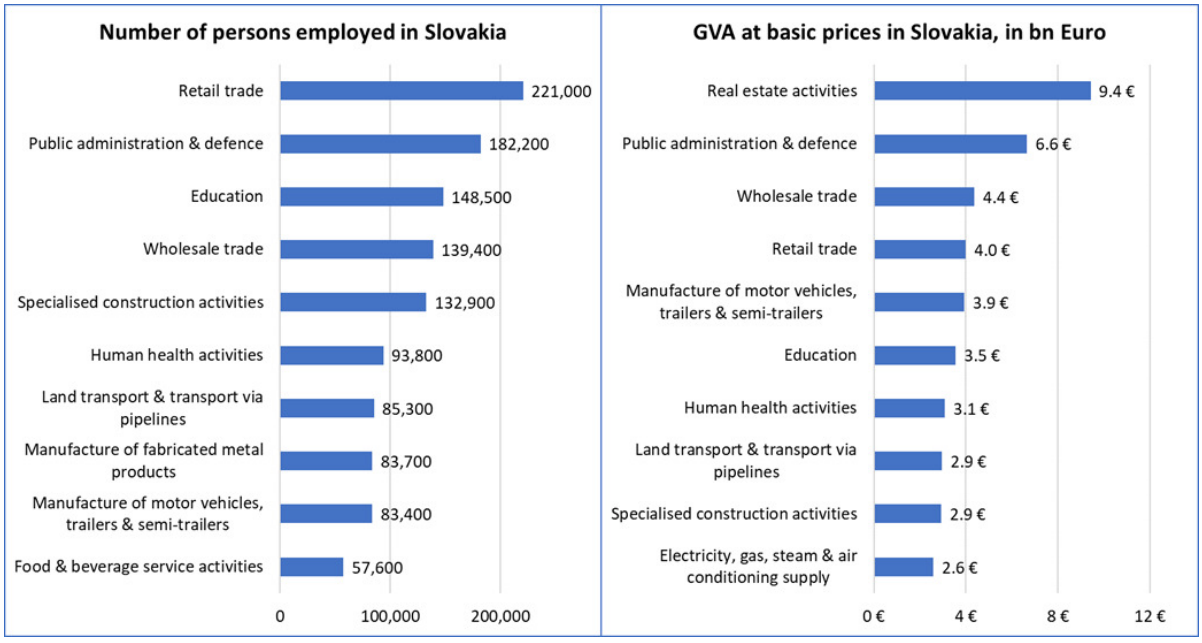
1.2 Sector specialization & employment levels in Slovakia, Ukraine and the Macro-region

To gain a deeper insight into the economic profile of Slovakia, Ukraine and the macro-region, it is necessary to look at the statistical representation of economic sectors and employment levels.

Slovakia

According to World Bank data, most of the employment in Slovakia in 2019 was in the service sector (61%)[19]. This is followed by employment in industry and agriculture, accounting for 36% and 3% of total employment in Slovakia, respectively[20]. Zooming in to the micro-level data, we can see how the dominance of the services sector is further reflected in the top 10 sectors in terms of sectoral employment and gross value added in 2020. An example of this is the number of people employed in trade, with 'Retail trade, except motor vehicles and motorcycles' standing out in the top four most represented sectors, as shown in the left-hand chart in Figure 4. This can be further illustrated by the sectors 'Public administration and defence; compulsory social security', 'Education' and 'Land transport and transport via pipelines', which are all in the top 10 sectors for employment. Meanwhile, sectors pertaining to "Specialised construction activities", "Manufacture of fabricated metal products, except machinery and equipment" and "Manufacture of motor vehicles, trailers and semi-trailers" are also represented in the top 10 in employment, reinforcing the industry-driven economy in Slovakia.

Figure 4: Top 10 sectors for employment (left) and gross value added (right) in Slovakia (in 2020)



Source: ECCP (2023), own elaboration based on Eurostat.

Regarding the right graph in Figure 4, which displays the top 10 sectors regarding their value added at basic prices, one can see how "Real estate activities" emerges as the most valuable sector, accounting for €9.4 billion. On a further note, "Retail and Wholesale trade, except of motor vehicles and motorcycles" and "Retail trade" account for €4.4 billion and €4 billion in value added each, highlighting the significance of trade in the Slovak

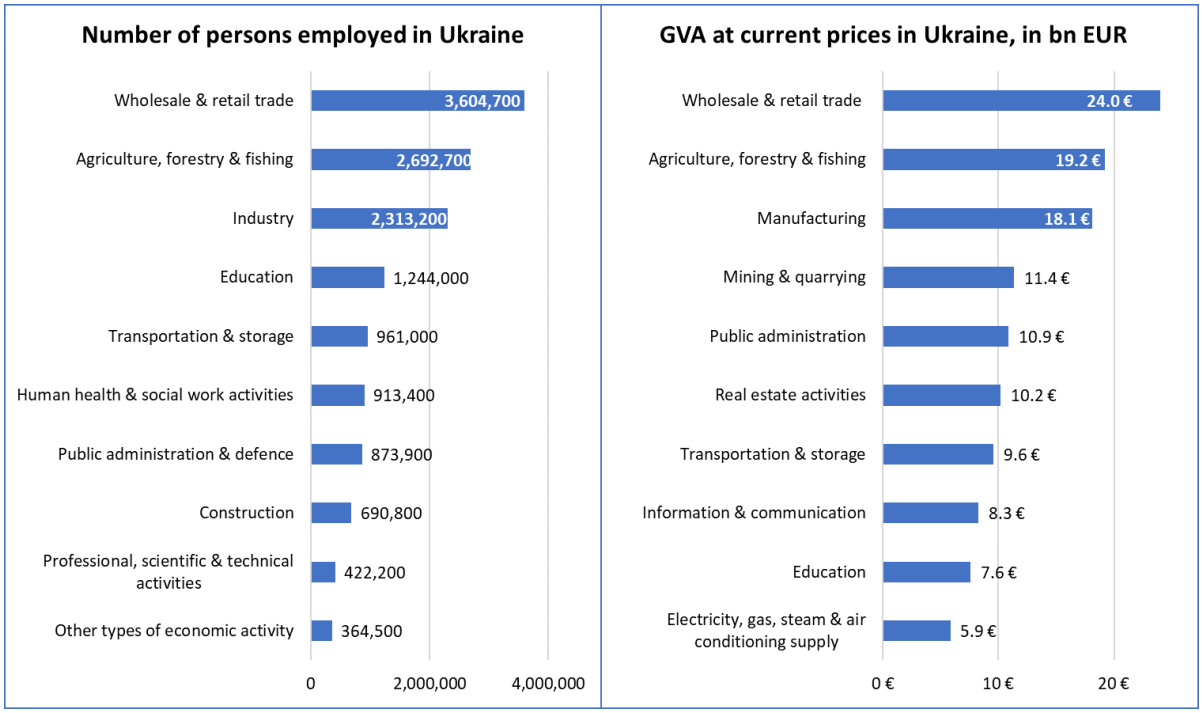
[19] The World Bank (2023): Employment in services (% of total employment)(modelled ILO estimate) – Slovak Republic. Available under: https://data.worldbank.org/indicator/SL.SRV.EMPL.ZS?locations=SK (last access 22.02.2023).
[20] The World Bank (2023): Employment in industry (% of total employment)(modelled ILO estimate) – Slovak Republic. Available under: https://data.worldbank.org/indicator/SL.IND.EMPL.ZS?locations=SK (last access 22.02.2023).

economy. This also aligns with the prior statistics pertaining to said sectors in the context of employment representation, reinforcing its wider importance to the economy of Slovakia as a whole. The significance of industry for the Slovak economy is also highlighted here, as sectors such as "Manufacture of fabricated metal products, except machinery and equipment" and "Specialised construction activities" account for €3.9 billion and €2.9 billion in value added.

Ukraine

Using the most recent collection of data from the State Statistics Service of Ukraine (UKRSTAT)[21] on employment and GVA at current prices for 2021, it is possible to provide information on the most important sectors of the Ukrainian economy at that point in time. In terms of employment, "Wholesale & retail trade" had the highest employment, with approximately 3.6 million people of the total 15.6 million employed population working in the sector, accounting for 23.1% of total employment. Agriculture, forestry & fishing was the second largest sector in terms of employment, with 2.7 million people working in the sector. The industrial sector comes in third place in terms of employment, with 2.3 million people working in the sector, accounting for 14.6% of total employment. Other sectors with high employment include "Education" (8.0%), "Transportation & storage" (6.2%), "Human health & social work activities" (5.9%), "Public administration & defence" (5.6%), and "Construction" (4.4%).

Figure 5: Top 10 sectors for employment (left) and gross value added (right) in Ukraine (in 2021)



Source: UKRSTAT (2023): Employed Population aged 15-70 by economic activities & UKRSTAT (2023): Gross domestic product by production method and gross value added by type of economic activity at current prices. Note: GVA at basic prices were converted to Euro using the average conversion rate for 2020 based on Eurostat.

The figure on the right shows different sectors categorized by their gross value added. In 2021, the total gross value added for Ukraine was **€151.6 billion**. The largest contributor to the total GVA was the wholesale and retail

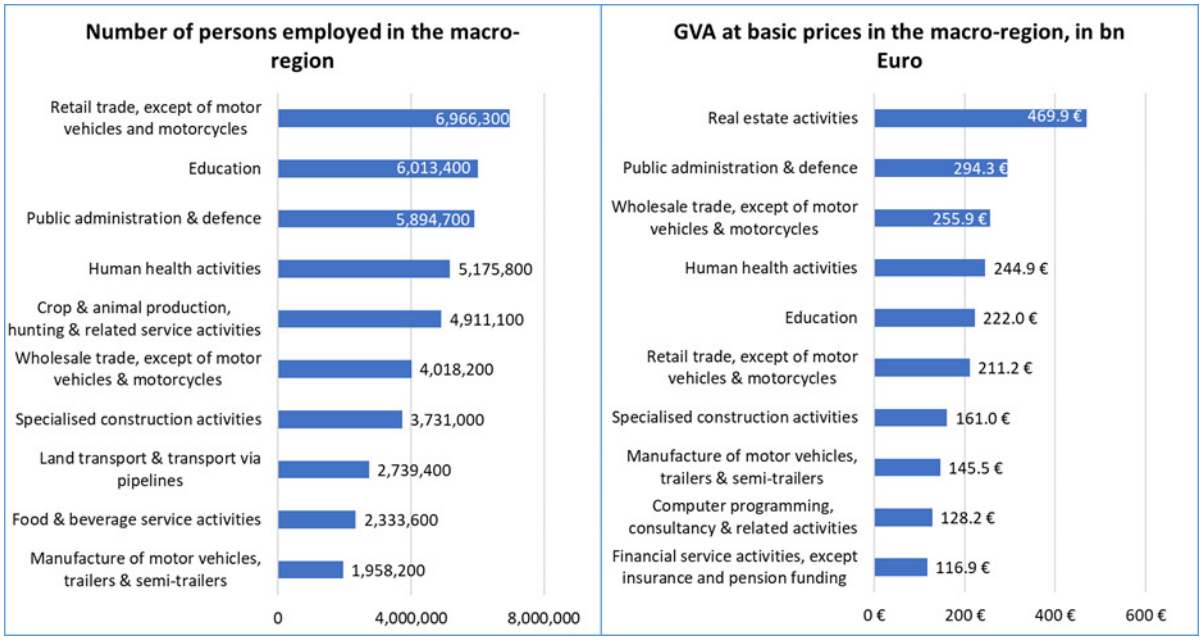
[21] https://ukrstat.gov.ua/ (last access 17.02.2023)

trade sector, making up 15.8% of the GVA. The second-largest contributor was the agriculture, forestry, and fishing sector, generating 12.7% of the total GVA, indicating its relevance to the Ukrainian economy. The manufacturing sector came in third, contributing to approximately 12% of the total GVA.

Macro-region

Analysing the top 10 sectors based on sectoral employment and gross value added in 2020 for all countries within the macro-region, it becomes evident that the service sector holds a significant position in this region. The sector with the highest number of employees is "Retail trade," which accounts for a considerable portion of the total employment in the macro-region. The wholesale trade sector also has a notable presence in the macro-region, contributing to 7.6% of the total employment. Additionally, the top 10 sectors for employment include "Manufacture of motor vehicles, trailers and semi-trailers" and "Specialised construction activities," emphasizing the importance of the industrial ecosystems "Mobility, Transport & Automotive" and "Construction" in the macro-region. Other sectors, including "Public administration and defence; compulsory social security," "Education," and "Land transport and transport via pipelines," also feature among the top 10 sectors for employment. Overall, the dominant sectors demonstrate the crucial role of the service sector in terms of employment in the macro-region, as opposed to other industries such as agriculture and manufacturing.

Figure 6: Top 10 sectors for employment (left) and gross value added (right) in the countries belonging to the macro-region (in 2020)



Source: ECCP (2023), own elaboration based on Eurostat.

The service sector dominates the macro-region, not only in terms of employment but also in its impact on the region's overall gross value added (GVA) at basic prices. Real estate services rank first, followed by other services sectors with smaller employment sizes, such as "Computer programming, consultancy & related activities" and "Financial service activities," which contribute significantly to the region's GVA. Together, these three sectors account for approximately 15% of the GVA. Wholesale trade and Retail trade are both crucial, with respective GVA values of €256 billion and €211 billion. Additionally, "Specialised construction activities" and "Manufacture of motor vehicles, trailers & semi-trailers," both industry-related sectors, contribute significantly to the region's economy, each accounting for 3% of the total GVA.

Overall, these analyses have pointed out the individual strengths of Slovakia, Ukraine, and the macro-region. The Annex provides further and complementary information on the innovation levels in the countries and regions under examination thereby pointing out the respective strengths of the innovation ecosystems. The following Chapter builds upon the previously introduced sector specialisation and provides detailed insights into trade flows between the EU, Ukraine, Belarus, and Russia. Thereby, a focus lies on lost supply and lost export markets due to the Russian war against Ukraine as well as the identification of further integration possibilities of Ukrainian cluster organisations and enterprises into EU value chains.

02

Lost supply, lost export markets and EU & Ukraine trade flows

2. Lost supply, lost export markets and EU & Ukraine trade flows

Overview of key findings

- Looking at the **pre-war trade flows between the EU27 and Russia & Belarus**, it is well known that the imports of raw materials (especially gas & oil but also various metals) stand out. As the EU sanctions target especially the Russian energy sector, the value chains related to the ecosystem "Energy – Renewables" are affected by the war. Other value chains with relevant imports from Russia are related to the ecosystems "Construction" & "Agri-food". In terms of European exports to Russia & Belarus, value chains particularly linked to the industrial ecosystems "Health", "Mobility-Transport-Automotive", "Aerospace & Defence" and "Agri-food" are potentially affected by lost export markets.
- **Pre-war trade between Ukraine and Russia & Belarus** had already decreased significantly over the last decade. Similar to the trade structure between the EU and Russia, raw materials and especially mineral fuels were important elements of Ukraine's imports from Russia before the war. Products that can be linked to industrial ecosystems "Mobility-Transport-Automotive" and "Agri-food" are potentially affected by lost supply. Similarly, goods linked to the ecosystem "Mobility-Transport-Automotive" are potentially affected by lost export markets for Ukrainian firms.
- The **pre-war trade flows between the EU27 & Ukraine** show that Ukraine has been a relevant supplier of raw materials. This showcases the potential for further cooperation in this area. With agricultural products accounting for a significant share of traded goods, value chains linked to the industrial ecosystem "Agri-Food" played a significant role before the war. In the trade between Ukraine and the EU27 especially value chains linked to the ecosystems "Mobility-Transport-Automotive", "Aerospace & Defence", "Health" and "Electronics" were particularly important before the war and have been affected by it. Additionally, the potential (further) cooperation in value chains linked to the industrial ecosystems "Digital" and "Textiles" is outlined, based on Ukraine's strength in these areas.
- The **trade volume between the EU27 and Ukraine has grown strongly over the last decade**, peaking at more than €53 billion in 2021. Trade between Ukraine and Russia, but also between the EU27 and Russia has fallen sharply following the illegal annexation of Crimea by Russia in 2014. Although the trade volume between the EU27 and Russia remained relatively high with €240 billion in 2021, the impact following of Russia's war against Ukraine and the subsequent sanctions has led to lost supply and export markets of firms in the EU27 & Ukraine.
- The analysis of trade flows has identified several value chains that are particularly affected by the Russian war against Ukraine and/or provide particular potential for further cooperation between European and Ukrainian cluster organisations & enterprises. These value chains can be linked to the following **9 industrial ecosystems, which can be key areas for further cooperation** between the EU and Ukraine:
    - Aerospace & Defence
    - Agri-Food
    - Construction
    - Digital
    - Electronics
    - Energy Renewables

- Health
- Mobility-Transport-Automotive
- Textiles

- The **Ukrainian foreign direct investment** (FDI) **inflows** have fluctuated over the last decade which can be linked to Russia's illegal annexation of Crimea in 2014. In 2021, the Ukrainian FDI inflows had recovered from the 2020 COVID-19 crisis, but it can be expected that FDI inflows have decreased after the outbreak of the war in February 2022. Nevertheless, several international firms have maintained or even increased their investments in Ukraine despite the war.

This chapter presents an analysis of the trade relations between the EU27 Member States, Ukraine, Russia and Belarus. The aim is to provide a comprehensive understanding of the trade relations between these countries before the outbreak of the war against Ukraine by outlining lost supplies and export markets, as well as the trade potential between the EU27 and Ukraine in thematic areas. The UN Comtrade database provides a wealth of information on trade flows between these countries. This pre-war information provides insights into structural trends and general characteristics of the respective economies. On this basis, this chapter examines the main trading partners and the types of goods and commodities traded. It also analyses the current situation of foreign investment in Ukraine, including the current activities and commitments of firms. Where possible, additional information is provided on trade developments following the full-scale Russian invasion of Ukraine in February 2022.

2.1 Overview of trade development over the past decade

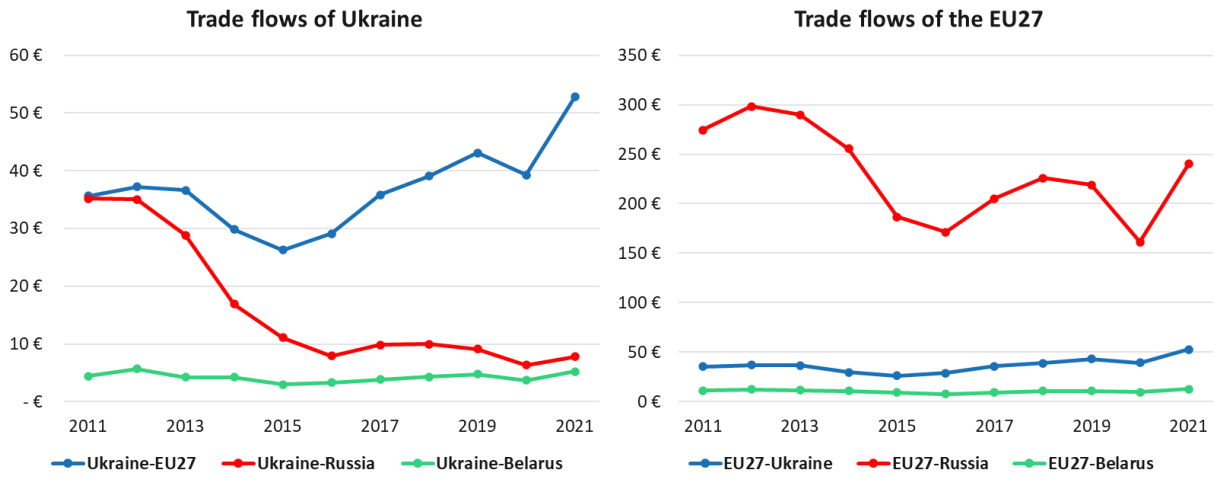
Before going into detail on lost supplies, lost export markets and trade flows between the EU27 and Ukraine, this section provides a brief overview of the evolution of trade between the regions under consideration.

Following the escalation of Russian aggression against Ukraine, trade relations between these two countries and their respective trade relations with the EU have changed over the last decade. Ukraine had previously maintained important trade relations with both the EU and Russia. However, trade relations between Russia and Ukraine have been affected by disputes over natural gas imports, certain trade restrictions, as well as an improving political and closer economic relationship between the EU and Ukraine.

Bilateral trade relations between the two countries have deteriorated significantly due to the escalation of political tensions and military conflicts, exacerbated by Russia's annexation of Crimea in spring 2014 and its subsequent support for separatist movements in eastern Ukraine. The result was an increasingly **rapid decline of Ukraine's trade with Russia**, as evidenced in Figure 7, as well as a **precipitous decline in trade between Russia and the EU**. In response to Ukraine seeking closer ties with the EU, Russia imposed trade restrictions on Ukrainian goods, particularly agricultural products, and imposed a ban on most food imports from Ukraine due to the conflict in eastern Ukraine. Ukraine also imposed restrictions on agricultural products and vehicles. As a result, the total trade capacity between Ukraine and Russia fell by 77.5% from 2012 to 2016 (see Figure 7), and the trade relationship has continued to be strained, with both countries maintaining various trade restrictions and tariffs, and ultimately the suspension of the free trade agreement between Ukraine and Russia, following increasing trade relations with the EU.[22]

[22] https://www.trade.gov/country-commercial-guides/ukraine-trade-agreements (last access 22.02.2023)

Figure 7: Overview of the development of trade volumes for Ukraine (left) and the EU27 (right) with Russia, Belarus as well as EU27&Ukraine



Source: ECCP (2023), own elaboration based on UN Comtrade Database. Note: The figure shows the development of the trade volume (imports & exports) between the regions. The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

As a response to the conflict in Ukraine, the EU has enforced **economic sanctions from 2014 onwards**[23], which included limitations on the import of specific commodities. In turn, Russia banned imports of goods from the EU, particularly agricultural goods, leading to a decline in total trade volume by 42.6% from 2012 to 2016. Despite ongoing tensions, trade between the EU and Russia has not completely broken off, as the EU remained a significant market for Russian oil and gas exports. Hence, the trade volume between the EU27 and Russia increased between 2016 and 2021. Although limited information in the UN Comtrade is currently available for 2022, it can be expected that the trade volume between the EU27, Russia and Belarus experienced a significant decrease not least due to the imposed sanctions[24] and the withdrawal of western firms from the Russian market for reputational and liability risks.[25] Indeed, according to data from the European Commission, the EU trade with Russia has decreased significantly over the course of 2022.[26] Here, it is found that the EU trade with Russia amounted to around €2.5 billion in December 2022 compared to almost €7 billion at the beginning of 2022 before the Russian full-scale invasion of Ukraine (see also Figure 30 in the Annex). In addition, it can be expected that the emigration waves of Russians, following the outbreak of the war in February 2022 and the Russian (partial) mobilisation in September 2022, are further decreasing Russian economic output.[27] Although official emigration

[23] https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/history-restrictive-measures-against-russia-over-ukraine/ (last access 22.02.2023)
[24] https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/sanctions-against-russia-explained/ (last access 17.02.2023); https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729428/EPRS_ATA(2022)729428_EN.pdf (last access 22.02.2023)
[25] OECD (2022): International investment implications of Russia's war against Ukraine. Available online: https://www.oecd-ilibrary.org/finance-and-investment/international-investment-implications-of-russia-s-war-against-ukraine_a24af3d7-en (last access 15.02.2023)
[26] European Commission (2022): Decoupling from Russia – Monitoring supply chains adjustment in the EU. Single Market Economics Papers. Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)
[27] see https://apnews.com/article/russia-ukraine-putin-immigration-kazakhstan-technology-c041eb0b7472668087bb94207de2f71d (last access 01.03.2023)

numbers have not been published, there are indications that more than 1 million Russians have left the country and that especially the IT and tech sectors are subject to brain drain.[28] These are factors leading to **lost supply and lost export markets** especially between Russia and the EU27 as well as Ukraine.

Simultaneously, the EU sought to strengthen **trade ties with Ukraine**, resulting in the signing of the EU-Ukraine Association Agreement and the establishment of the EU-Ukraine Deep and Comprehensive Free Trade Area, which came into effect in January 2016. This agreement eliminated tariffs for European exports and Ukrainian imports, particularly in agricultural and industrial goods, streamlined customs procedures, and established similar trade laws and regulations as in the EU.[29] This led to increased access for Ukrainian products to the EU and vice versa and enabled market access for EU-Ukraine businesses. As shown in Figure 7 above, the total **trade capacity between the EU and Ukraine increased by roughly double (101%) between 2015 to 2021**. Nonetheless, the impact of the Russian invasion of Ukraine in February 2022 are also affecting trade between the EU27 and Ukraine, which will be discussed further in the following section on EU & Ukraine trade flows. As a response of this incursion and the substantial impact on trade between the EU27 and Ukraine, the EU implemented a temporary trade liberalisation regulation, enabling the suspension of trade defence measures for one year to support Ukrainian exports to the EU. These measures were enacted in June 2022 and will remain in effect until June 2023.[30]

Furthermore, it is also important to consider the trade relationships between **Belarus and the EU**. Belarus has an authoritarian political system with strong political and economic ties to Russia. Given the size of Belarus's economy, the trade relationship between the EU27 and Belarus is of comparatively little significance. Even though trade between those two single markets have deteriorated from 2013 until 2016, it has been much more stable than the trade relations between the EU27 and Russia. After the economic repercussions following the Covid-19 pandemic, trade was able to recover. Nevertheless, the involvement of Belarus in the Russian military aggression has led to sanctions of imports, such as wood, cement, iron and steel, and rubber products, and exports, such as technology and machinery, implemented in 2022.[31] Trade between **Ukraine and Belarus** has been relatively stable, and it appears that political and military conflicts between Russia and Ukraine have had little impact on the trade capacity before 2021. Although Belarus is a relatively small market, the trade capacity between Ukraine and Belarus has come closer to that of the trade relationship between Ukraine and Russia as a result of the latter's decline, at least before the outbreak of the war in 2022.

With the ongoing Russian war against Ukraine, the relationships of Ukraine and the EU with Russia have reached a new low, leading to disturbed trade flows with significant economic consequences. Given this context, it is crucial to identify lost supply and export markets and explore ways to compensate for them through trade relations between the EU and Ukraine.

---

[28] see https://www.reuters.com/world/europe/russian-it-workers-head-overseas-despite-call-up-assurances-2022-09-28/ (last access 01.03.2023) and Vorobeva, E. (2022): How Putin's Partial Mobilization Turned into Total Mobilization of Migrants; available online: https://www.research-collection.ethz.ch/bitstream/handle/20.500.11850/582403/RAD288.pdf?sequence=3&isAllowed=y (last access 01.03.2023)

[29] see EU-Ukraine Deep and Comprehensive Free Trade Area: https://www.eeas.europa.eu/sites/default/files/tradoc_150981.pdf#:~:text=The%20Deep%20and%20Comprehensive%20Free%20Trade%20Area%20%28DCFTA%29,sectors%20of%20the%20Ukrainian%20economy%20to%20EU%20standards (last access on 22.02.2023)

[30] see Temporary measures in support of Ukrainian exports to the EU: https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/ukraine_en (last access on 14.03.2023)

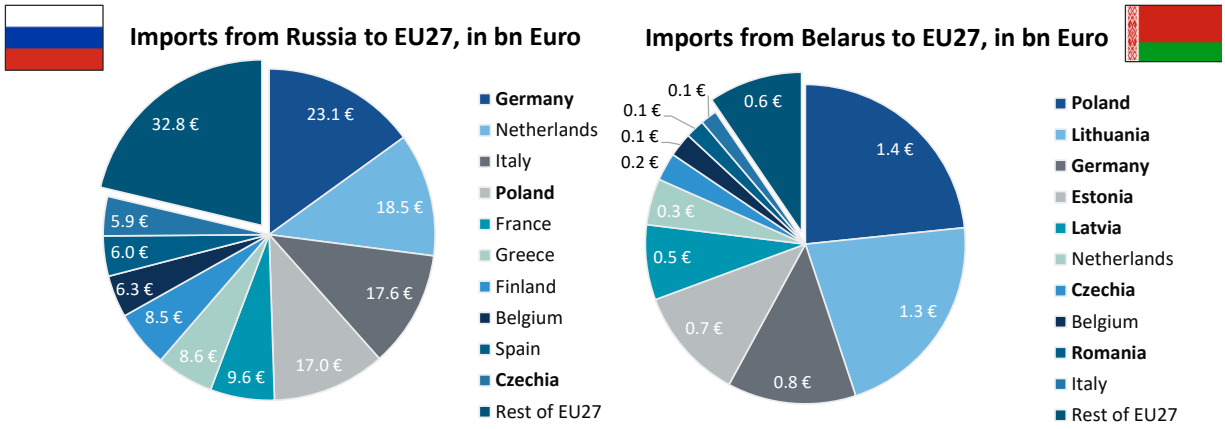
[31] see EU sanctions in response to the involvement of Belarus in the Russian military aggression against Ukraine: https://trade.ec.europa.eu/access-to-markets/en/news/eu-sanctions-response-involvement-belarus-russian-military-aggression-against-ukraine

2.2 EU trade flows with Russia & Belarus

Over the past decade, there have been **fluctuations in the trade flow of imports and exports from the EU27 to Russia** (see Figure 31 in the annex). In 2011, imports from Russia were around €173 billion, while exports to Russia were approximately €102 billion, resulting in a trade deficit of €71 billion in favour of Russia. In the following years, there were changes in the trade flow pattern. Import decreased sharply by 41.9%, which can be attributed to the EU's economic sanctions following the annexation of Crimea. On the other hand, exports to Russia decreased by 39.3%. The trend persisted in 2016, with some recovery observed in 2017 and 2018. In 2019, exports to Russia increased slightly, resulting in a decrease in the trade deficit in favour of Russia. However, in 2020, both imports and exports experienced sharp declines due to the COVID-19 pandemic's economic disruptions of 36% and 11%, respectively. In 2021, the imports of the EU27 from Russia amounted to a total of €154 billion, whereas the EU27 exports to Russia amounted to a total of €86.1 billion for the same year. This results in a trade deficit of €-67.9 billion for EU27, largely due to the import of raw materials.

Trade flows between the **EU27 and Belarus** have been characterized by a lesser significance compared to those with Russia, with the EU27 having a positive trade surplus for the EU27. Exports from the EU27 to Belarus experienced a peak in 2013, with a value of €8.46 billion, before declining steadily by 41.7% until 2016. Imports from Belarus to the EU27 also experienced a decline between 2013 and 2016, but smaller with 10.6%. However, there has been a slight recovery in both imports and exports between the EU27 and Belarus since 2017. The COVID-19 pandemic had a significant impact on trade flows between the EU27 and Belarus. Both imports and exports fell sharply in 2020 by 11.9% and 8.4%, as the pandemic disrupted global supply chains and led to a decline in consumer demand. In 2021, exports to Belarus total €6.8 billion, leading to a trade balance of €700 million.

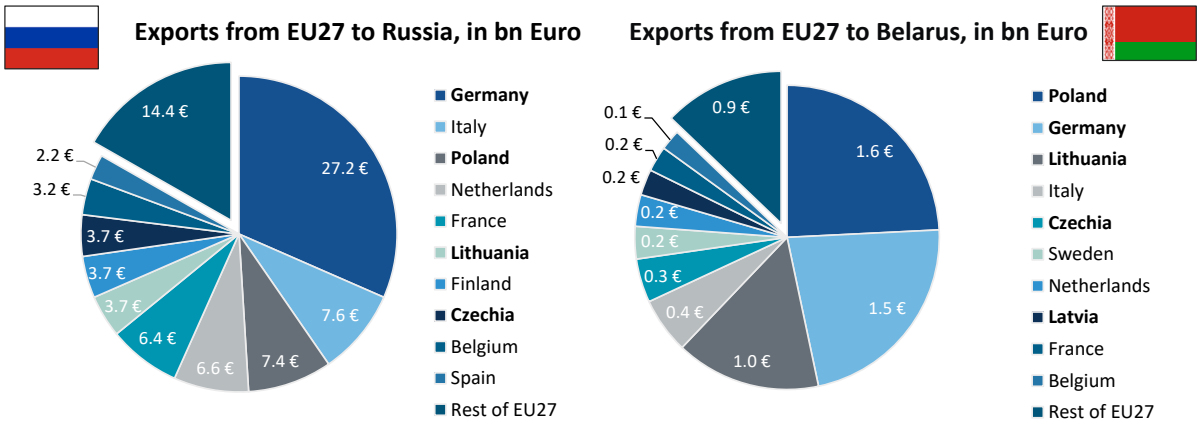
Figure 8: Overview of the 10 most important EU27 trading partners for Russia and Belarus, by import to the EU27 in 2021, values in billion Euro



Source: ECCP (2023), own elaboration based on UN Comtrade Database. Note: Countries in bold highlight the macro-region and Slovakia. The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

As of 2021, 15% of Russian imported goods were going to Germany, making it the largest European trading partner for Russia. The Netherlands and Italy followed closely behind, with 12.0% and 11.4% of EU imports from Russia, respectively. In contrast, Poland, Lithuania, and Latvia are considered the top trading partners for Belarus, accounting for slightly over half of imports from Belarus. Apart from the main contributors, imports from other EU27 countries seem to be of little significance. The importance of geographical proximity in trade with Belarus is highlighted by the fact that countries belonging to the macro-region make up 85% of the EU27 imports.

Figure 9: Overview of the 10 most important EU27 trading partners for Russia and Belarus, by export from the EU27 in 2021, values in billion Euro



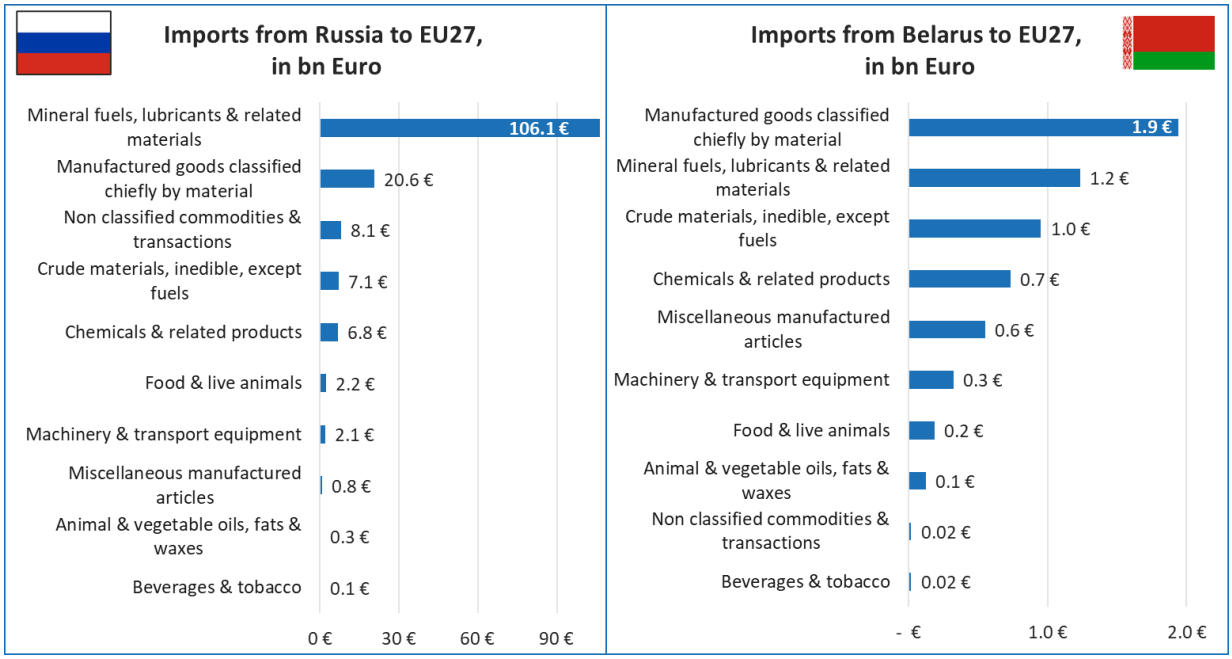
Source: ECCP (2023), own elaboration based on UN Comtrade Database. Note: Countries in bold highlight the macro-region and Slovakia. The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

In terms of exports, Germany is considered the largest European trading partner for Russia, accounting for almost a third (31.6%) of all exports, followed by other big European economies, such as Italy, the Netherlands and France. Slovakia exported €1.3 billion to Russia, ranking 14th behind Austria and Hungary. Exports from the previously defined macro-region contribute a little more to exports, with a share of 58.7% of EU27 exports. In comparison, the macro-region makes up more than three-fourths of the total exports from the EU27 to Belarus. The primary reason for this is that countries such as Poland, Germany, and Lithuania are the main contributors, amounting to around €4.2 billion in total exports.

In 2021, the most imported goods to the EU27 from Russia were mineral fuels, valued at €106.1 billion, accounting for 68.9% of all exports followed by manufactured goods amounting to €20.6 billion worth of imports from Russia to the EU27. This underlines the importance of **raw materials** (especially those related to energy sources) imported from Russia before the war. At the same time, these goods are also a major area of lost supply, since the EU sanctions on Russia target these goods to a large degree with, for instance, an oil ban and other sanctions on coal and other fossil fuels being in place.[32] This also supports the relevance of the industrial ecosystem "**Energy – Renewables**" as a key area of future cooperation between the EU27 and Ukraine. Mineral fuels were mainly exported to large economies like Germany, the Netherlands, and Italy, whereas the macro-region accounted for 41% of all Russian exports of crude materials. Finland was the country that imported the most Russian crude materials, with 27%, followed by Germany with 18%.

[32] https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/sanctions-against-russia-explained/ (last access 17.02.2023)

Figure 10: Overview of the traded goods between EU27, Russia and Belarus, by imports to the EU27 in 2021, values in billion Euro



Source: ECCP (2023), own elaboration based on UN Comtrade Database. Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

Natural resources are also among EU27's **imported goods from Belarus**, with mineral fuels ranked second after manufactured goods, while crude materials were ranked third. This also underlines the importance of raw materials and fuels as areas in which supply was lost because of the Russian invasion of Ukraine. With 47% of all imports to the EU27, Estonia was the country that imported the most mineral fuels in 2021, followed by Lithuania. The macro-region accounted for 94% of EU27 imports of mineral fuels. Poland was the biggest EU27 importer of manufactured goods, with 32%, followed by Lithuania and Germany.

Zooming further in on the **top 10 commodities imported from Russia** (excl. oils, fuels & gas) to the EU27 (see Figure 34 in the Annex) products of iron, platinum, aluminium, and copper stand out. Here, information[33] from the European Commission shows that the imports of such commodities from Russia to the EU has significantly decreased over 2022 and in some cases has nearly come to a complete halt. For instance, the imports from Russia to the EU of precious metals amounted to around €175 million at the beginning of 2022. In December 2022, these imports amounted to below €10 million (see Figure 35 in the Annex). Other commodities like fertilizers with an import value of €0.9 billion are also included in the top 10 commodities imported from Russia to the EU27. This indicates another value chain linked to the industrial ecosystem "**Agri-food**" which is affected by the war. The surge in fertilizer prices observed in the weeks following the Russian invasion of Ukraine in February

[33] European Commission (2022): Decoupling from Russia – Monitoring supply chains adjustment in the EU. Single Market Economics Papers. Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)

2022 is indicative of the same.[34] Moreover, data by the European Commission[35] indicates that the imports of fertilizers from Russia to the EU has halved over the course of 2022 (see Figure 35 in the Annex). Similarly, among the **top 10 commodities imported from Belarus** to the EU27 (see Figure 34 in the Annex) are also several products like fertilizers or products of iron and steel. Moreover, together with the imports from Russia to the EU27 commodities like wood and furniture play a significant role as well as indicating lost value chains linked to the EU industrial ecosystem of "**Construction**".

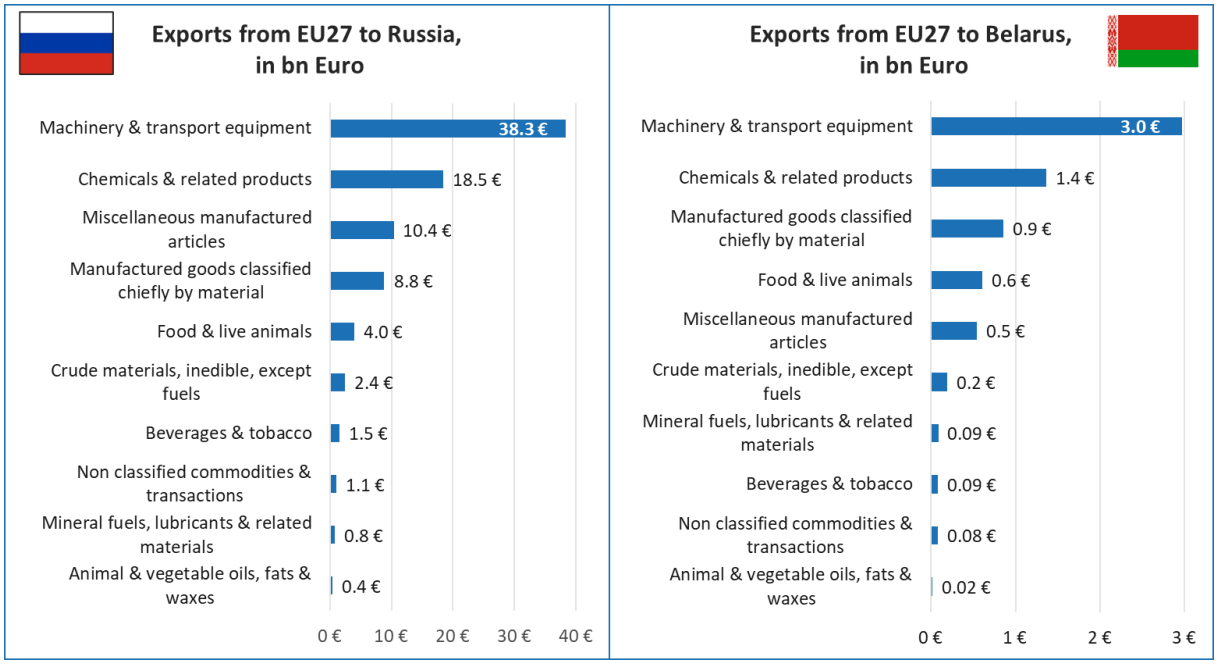
Exported goods from the EU27 to Russia and Belarus are dominated by machinery and transport equipment (see Figure 11). For exports to Russia, this category accounted for a total of €38.3 billion, which is almost half of the total exports. This is a first indication that especially value chains linked to the industrial ecosystems "**Mobility-Transport-Automotive**" and "**Aerospace & Defence**" are facing lost export markets in the wake of the Russian war against Ukraine. Indeed, data from the European Commission[36] shows significant decreases of European vehicle exports to Russia over the course of 2022. The exports of aircrafts came to a complete halt after February 2022 (see also Figure 36 in the Annex). Germany is the biggest contributor of these machinery & transport goods, with 36% of exports. This is followed by chemicals and manufactured goods, amounting to €18.5 billion and €10.4 billion, respectively, with Germany being the biggest contributor. In contrast, mineral fuels and crude materials are less commonly exported to Russia, amounting to only €3.2 billion or 3.7% of total exports to the EU27. Moreover, agricultural goods, such as food & live animals, beverages & tobacco as well as animal and vegetable oils, fats & waxes together accounted for almost €5.9 billion in 2021. This indicates significant lost export markets for value chains linked to the industrial ecosystem "**Agri-food**".

The analysis of the top **10 commodities that were exported in 2021 from the EU27 to Russia** (see Figure 34 in the Annex) further substantiates the impact of the war in Ukraine on the supply chains linked to the industrial ecosystems "**Mobility-Transport-Automotive**" and "**Aerospace & Defence**" as commodities like parts and accessories of motor vehicles followed by motor vehicles for the transport of persons are ranked in the top 3 exported commodities in 2021. Combustion piston engines for propelling vehicles were also in the top 10 most exported commodities from the EU27 to Russia. Aeroplanes and other aircraft with a value of €2.2 billion were exported in 2021 from the EU to Russia. However, the number one commodity that was exported from the EU27 to Russia were medicaments with a value of around €4.8 billion in 2021 which indicates a strong impact and lost export market for the value chains linked to the EU industrial ecosystem "**Health**". In addition, instruments and appliances for medical, surgical and veterinary sciences with a value of €0.85 billion were also exported to Russia from the EU27 in 2021 which adds to the lost exports for this industrial ecosystem. Here, information from the European Commission[37] shows that the EU exports of pharmaceuticals to Russia witnessed increases over the

[34] see https://www.dw.com/en/high-fertilizer-costs-threaten-farmers-amid-sanctions-on-russia/a-61163444 (last access 21.02.2023)
[35] European Commission (2022): Decoupling from Russia – Monitoring supply chains adjustment in the EU. Single Market Economics Papers. Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)
[36] European Commission (2022): Decoupling from Russia – Monitoring supply chains adjustment in the EU. Single Market Economics Papers. Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)
[37] European Commission (2022): Decoupling from Russia – Monitoring supply chains adjustment in the EU. Single Market Economics Papers. Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)

course of 2022, from €200 million in February to almost €400 million in November 2022. In December, however, these exports displayed a strong decline below pre-war levels (see also Figure 36 in the Annex).

Figure 11: Overview of the traded goods between EU27, Russia and Belarus, by exports from the EU27 in 2021, values in billion Euro



Source: ECCP (2023), own elaboration based on UN Comtrade Database. Note: Countries in bold highlight the macro-region and Slovakia. The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

Meanwhile, much like Russia, "Machinery and transport equipment" are the **primary exported goods to Belarus**, totalling €3.0 billion in 2021, which further indicates the lost export markets of the value chains linked to the industrial ecosystems mentioned above. Although Germany is also the largest contributor to these goods, its share is smaller than that of Russia, representing only 27% of EU27 exports. Instead, Lithuania and Poland are other significant trading partners in this sector, accounting for 21% and 14% of exported machinery and transport equipment. Furthermore, most exported goods to Belarus include chemicals and manufactured goods. The top 10 commodities exported from the EU27 to Belarus (see Figure 34 in the Annex) further substantiate the lost export markets of value chains linked to the industrial ecosystems of "Health" and "Mobility-Transport-Automotive", since commodities like medicaments or motor vehicles were also among the top 10 exported commodities from the EU to Belarus in 2021.

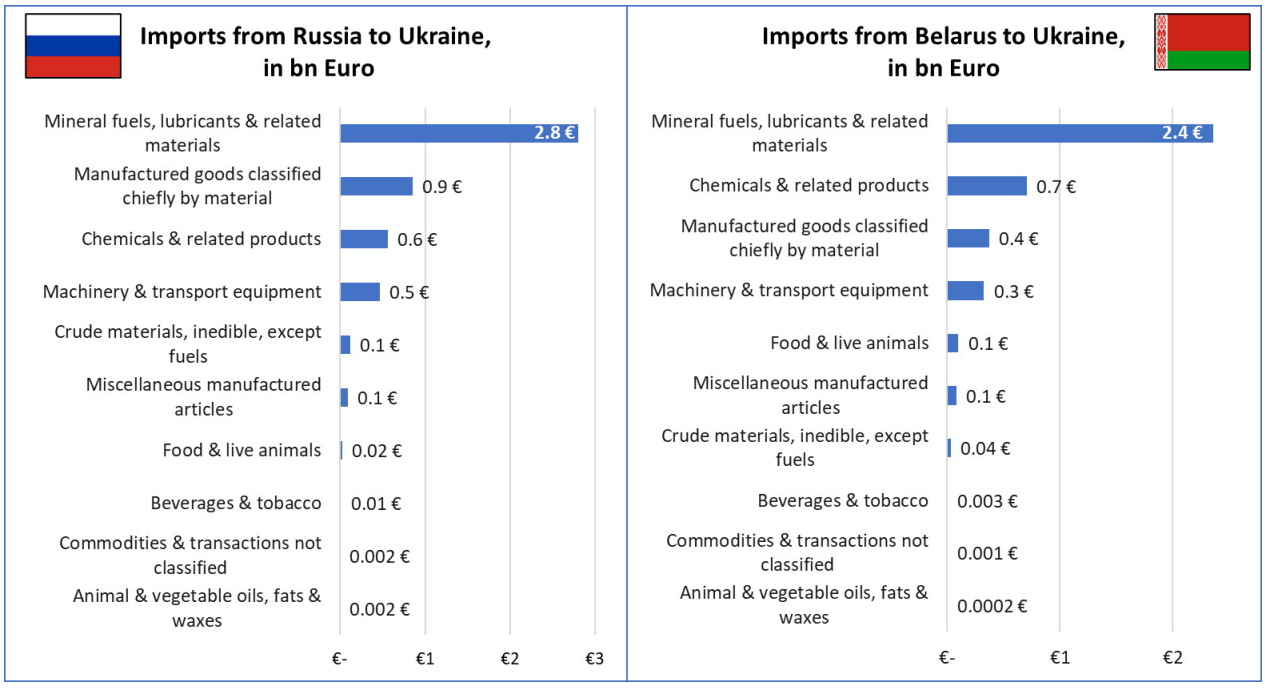
2.3 Ukraine trade flows with Russia & Belarus

The trade relationship between Ukraine and Russia in the past decade has been characterized by **a significant decline in both imports and exports**. Particularly from 2011 to 2016, the import value decreased by 77.8% from €20.9 billion to €4,7 billion, while the export also decreased from €14.2 billion to €3.2 billion by 77.2%. This decline can be attributed to the conflict between the two countries, which led to economic sanctions and a Russian embargo on Ukrainian goods launched in 2013. The military conflict between Ukraine and Russia which started in 2014 continued to have a significant impact on the trade relationship between the two countries. In 2021, imports amounted to €4.9 billion, while exports amounted to €2.8 billion, indicating that the trade relationship remains strained (see Figure 32 in the Annex).

Belarus, with its geographical proximity and historical ties, has been an important trading partner for Ukraine. Despite the challenges posed by the political and military conflict in the region, the trade relationship between Ukraine and Belarus has endured in recent years (see Figure 32 in the Annex). While both imports and exports hit their lowest point in 2015, there was an increase in trade until 2019, although not reaching pre-conflict levels. The COVID-19 pandemic had a negative impact on trade, resulting in a 24.9% decline in exports and a 15.5% decline in imports. However, the trade between the two nations has rebounded, with exports in 2021 valued at €4.0 billion and imports at €1.2 billion.

Like the trade structure between the EU27 and Russia, Ukraine's imports from Russia and Belarus are dominated by mineral fuels, which make up most of the total imports from both countries (see Figure 12). To be more specific, mineral fuels account for €2.8 billion or 57% of Ukraine's total imports from Russia, and account for €2.4 billion or 48% of the country's total imports from Belarus, respectively. This also indicates the relevance of **raw materials and especially mineral fuels** in Ukraine supply from both countries before Russia's invasion in February 2022. Other major imported goods from Russia and Belarus include manufactured goods, chemicals as well as manufactured goods.

Figure 12: Overview of the traded goods between Ukraine, Russia & Belarus, by imports to Ukraine in 2021, values in billion Euro

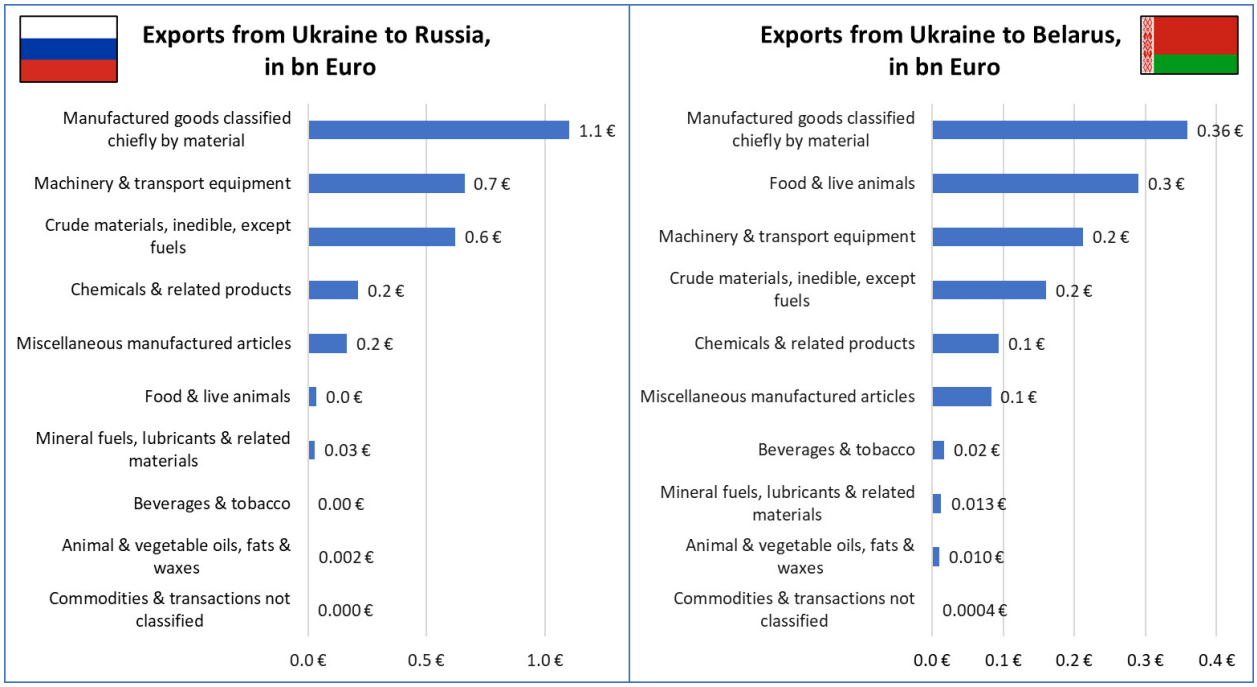


Source: ECCP (2023), own elaboration based on UN Comtrade Database. Note: Countries in bold highlight the macro-region and Slovakia. The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

This is also reflected in the **top 10 commodities** that were imported to Ukraine from Russia and Belarus in 2021 (see Figure 37 in the Annex). The top 10 commodities imported from Russia include products, such as nuclear reactors and parts thereof, aluminium or polymers with relatively low trade values (€0.1 billion). Among the top 10 commodities imported from Belarus products like wheeled tractors, motor vehicles for the transport of goods as well as fertilizers play a role, stressing its relevance of the EU industrial ecosystems "**Mobility-Transport-Automotive**" and "**Agri-food**" in the trade between the two countries.

In 2021, **Ukraine's top exports to Russia** consisted mainly of manufactured goods (€1.1 billion) followed by machinery & transport equipment (€0.7 billion) and crude materials (€0.6 billion), which made up a combined 84.2% of all exports (see Figure 13). Similar to the export from the EU to Russia and Belarus, this points to the relevance of machinery & transport equipment in the trade between Russia and Ukraine and to value chains linked to the ecosystems "**Mobility-Transport-Automotive**", losing export markets due to the Russian war against Ukraine. The top 10 commodities exported from Ukraine to Russia and Belarus in 2021 include a number of **iron and steel products** (see Figure 37 in the Annex). As these were also relevant products in the trade between the EU, Russia, and Belarus (see the previous section), this can be a potential for shifting value chains of these products from Russia to the EU. In addition, the trade of agricultural products has been low, likely due to the overall ban on these goods. On the other hand, Ukraine's top exports to Belarus were manufactured goods and food and live animals, with the latter having a trading volume of €0.3 billion.

Figure 13: Overview of the traded goods between Ukraine, Russia & Belarus, by exports from Ukraine in 2021, values in billion Euro

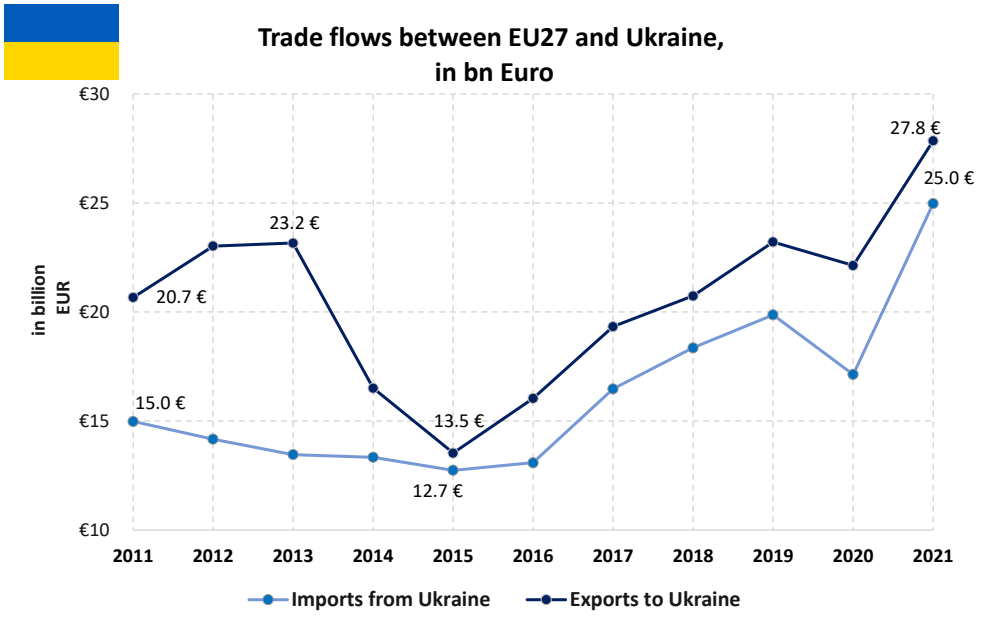


Source: ECCP (2023), own elaboration based on UN Comtrade Database. Note: Countries in bold highlight the macro-region and Slovakia. The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

2.4 EU & Ukraine trade flows

The development of trade flows between the EU and Ukraine over the past decade is shown in Figure 14. Regarding the **imported goods from Ukraine to the EU27 Member States**, the data indicates a fluctuating trend but an **overall strong increase in trade between the EU27 and Ukraine** in the last 5 years. From 2011 to 2013, there has been a growth period in imports, implying an increasing demand for Ukrainian products. This is followed by a decline in trade flows from Ukraine to the EU27 until 2015, most likely traced back to the political instability in Ukraine and its impact on the economy. The lowest value of imports was reached in 2015, with imports between the EU27 and Ukraine totalling €12.7 billion. Subsequently, there was an upward trend with a significant surge in 2017, which continued to increase until 2020 and may be attributed to the partial recovery of the Ukrainian economy and the implementation of a Deep and Comprehensive Free Trade Area (DCFTA) as part of the signing of the EU-Ukraine Association Agreement. This increase mainly stems from the import of agricultural products like "Food and live animals" and "Animal and vegetable oils" as well as "Crude materials" and "Mineral fuels". The decrease in trade by 13.8% after 2020 is potentially due to the economic repercussions following the COVID-19 pandemic, which affected economies all around the globe.

Figure 14: Development of imports & exports between Ukraine-EU27 from 2011 to 2021, values in bn Euro



Source: ECCP (2023), own elaboration based on UN Comtrade (2023). Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

For the **exports from EU27 to Ukraine**, a similar development as for imports is discernible. Between 2011 and 2013, the data reveals a consistent rise from 2011 to 2013, following a decline until 2015. Exports were affected much more following the economic downturn compared to imports. Between 2013 and 2015, the total value of exported goods to Ukraine plunged by 42.3%. With the effect of the trade agreement between both markets, exports to Ukraine rose again, particularly for industrial and manufactured goods. The signing of the free trade agreement and the DCFTA, alongside the increase in the GDP of the Ukrainian economy, induced a **surge in the demand for European goods**. The decrease from 2020 to 2021 was comparatively less than for imports, as exports to Ukraine only fell by 4.7%.

The total value of imports in 2021 was almost 41.6% higher than in 2011, amounting to a total of €25.0 billion according to the latest available data from the UN Comtrade Database. Exports from the EU27 Member States

to Ukraine amounted to a total of **€27.8 billion** for the same year, resulting in a trade balance of €2.9 billion for the EU27. Unfortunately, no more up-to-date information is available. However, it can be expected that following the Russian invasion of Ukraine in February 2022 the Ukrainian economy and trade were deeply affected. For instance, 20% of Ukraine's economic output is lost solely due to the illegal Russian occupation of Ukrainian territories.[38] Other research[39] indicates severe implications of the war on agri-food value chains which is complemented by other information on reductions in arable land (e.g., due to mine fields).[40] However, on a general level latest information for 2022 shows that although a decrease in trade between the EU and Ukraine occurred in the weeks after the Russian full-scale invasion in February throughout 2022 the trade levels remain close to 2021 levels (see Figure 33 in the Annex).

The New Monthly Enterprise Survey conducted by the Ukrainian Institute for Economic Research and Policy is a pertinent source of information for obtaining additional insights into the **current state of Ukrainian businesses**.[41] The results of the most recent survey from January 2023 indicate that since May 2022 many Ukrainian enterprises have resumed their exporting activities (see Figure 15). As of January 2023, 10% of Ukrainian enterprises have stopped and not continued their exporting activities, following the Russian invasion in February 2022. The majority of enterprises that have not resumed their exporting activities are micro-enterprises. The inability to fulfil demand in foreign markets and a lack of demand itself are some of the reasons why Ukrainian enterprises have not resumed their exporting activities. For those who have resumed or continued their exporting activities, logistical challenges such as long queues at the western border of Ukraine, limited export capacities by sea, and a shortage of railway wagons, trucks, and drivers are among the biggest hurdles they face.

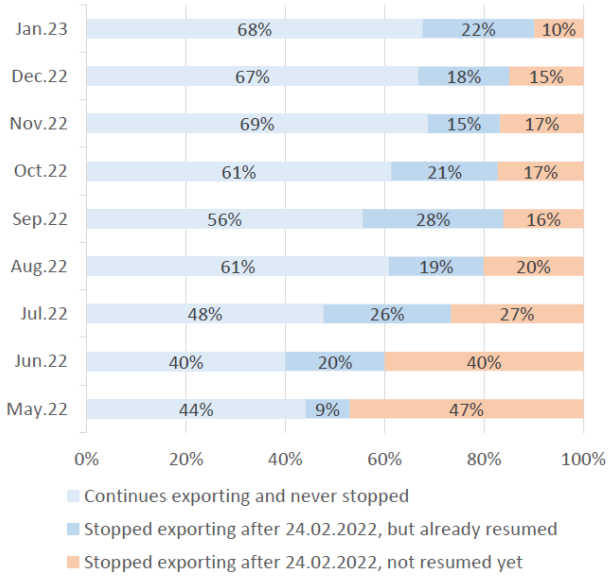
[38] see Wettach, S.: Investors see great opportunities – interview with Oleg Ustenko. In WirtschaftsWoche, p.34, published 24.02.2023 (in German)

[39] Dermastia, M. et al (2022): Impacts and Potentials of the Ukraine Crisis on Supply Chains Development for the Danube Region. Available online: https://www.researchgate.net/profile/Gerd-Meier-Zu-koecker/publication/362175408_Impacts_and_Potentials_of_the_Ukraine_Crisis_on_Supply_Chains_Development_for_the_Danube_Region/links/62da8692f3acdd5dc20e4805/Impacts-and-Potentials-of-the-Ukraine-Crisis-on-Supply-Chains-Development-for-the-Danube-Region.pdf?origin=publication_detail (last access 21.02.2023)

[40] https://www.reuters.com/world/europe/facing-minefields-cash-crunch-ukraine-farmers-sow-smaller-crop-2023-03-08/ (last access 09.03.2023)

[41] see http://www.ier.com.ua/en/publications/reports (last access 09.03.2023);

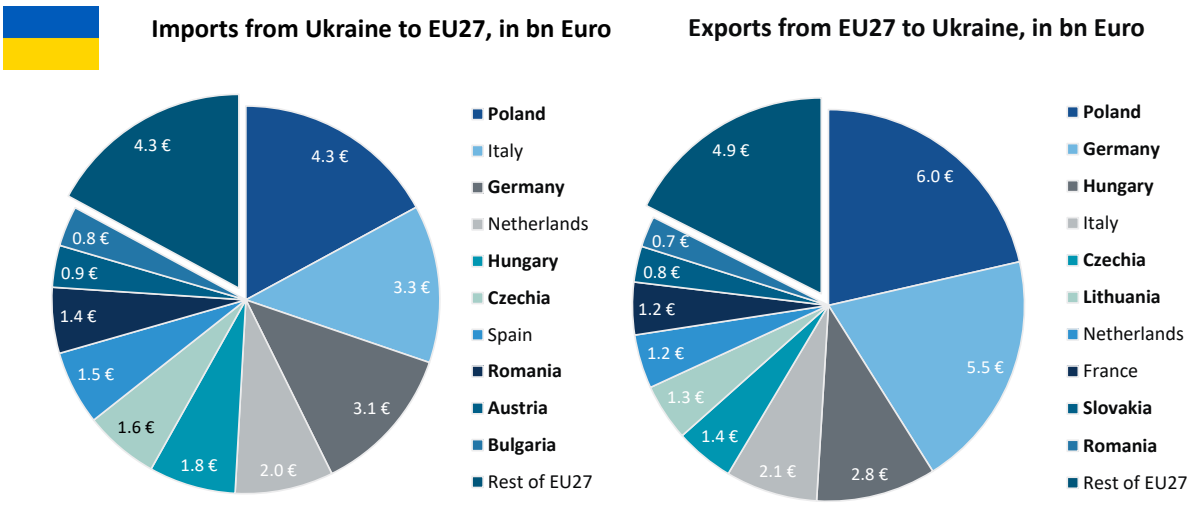
Figure 15: Development of exporting activities of Ukrainian enterprises between May 2022 and January 2023, by shares of respondents



Source: Institute for Economic Research and Policy (2023): Main economic trends in January 2023.

Figure 16 provides an **overview of the 10 most important EU27 trading partners for Ukraine**. With exports totalling €6.0 billion and imports of €4.3 billion, Poland is the trading partner with the highest value of imports and exports. They account for 21% of EU27 exports and 17% of imports of the EU27. Germany also stands out as a key trading partner, ranking third highest in imports and second-highest in exports. Its imports from Ukraine totalled €3.1billion, making up around 13% of EU27 imports, while its exports to Ukraine totalled €5.5 billion, making up 19.7% of EU27 exports.

Figure 16: Overview of the 10 most important EU27 trading partners for Ukraine, by imports to EU27 and export from the EU27 in 2021, values in billion Euro

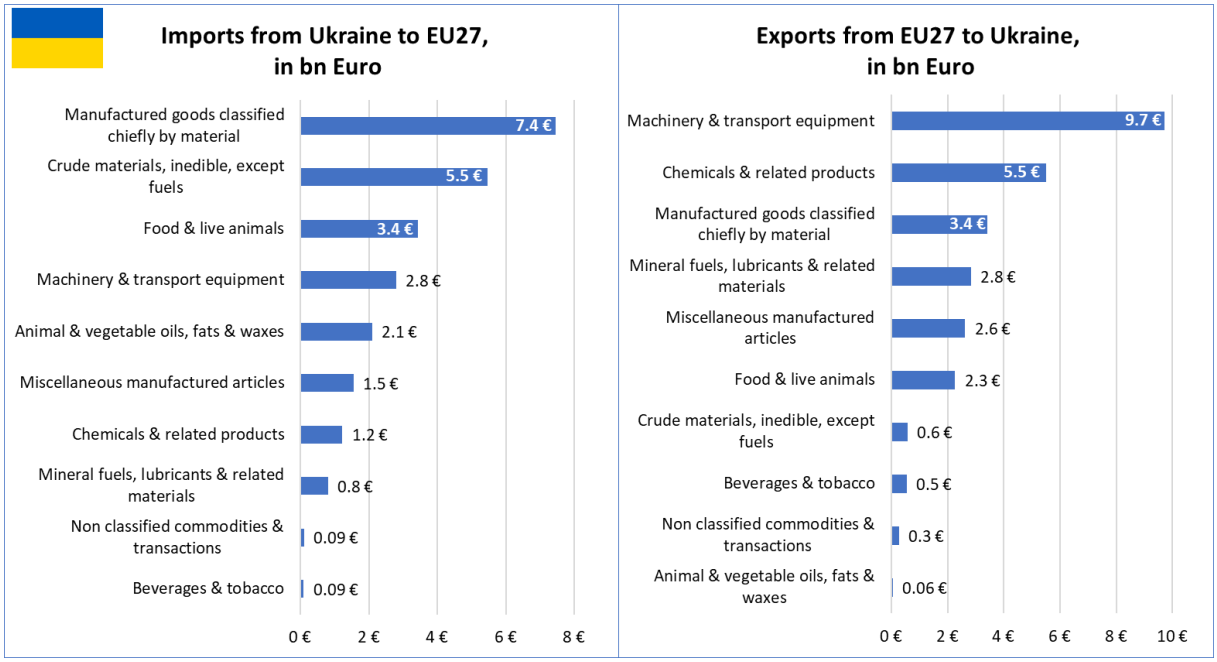


Source: ECCP (2023), own calculation based on UN Comtrade Database. Note: Countries in bold highlight the macro-region including Slovakia. The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

The macro-region includes a majority of the top 10 EU27 trading partners for Ukraine and makes up - approximately 59% of total EU27 imports and 69% of total EU27 exports. Slovakia is ranking 11th in imports and 9th in exports among EU27 Member States. The remaining EU27 countries that are not included in the top 10 make up 17% of exports and 18% of imports. This highlights the importance of the top 10 EU27 trading partners for Ukraine in terms of trade flow and highlights the need for continued cooperation between these countries to strengthen economic ties.

Figure 17 depicts the **imports and exports between the EU 27 Member States and Ukraine by traded goods**. As demonstrated by the chart on the left, in 2021, the EU27 imported the highest volume of goods from Ukraine in the form of manufactured goods, with a trading volume of €7.4 billion. Interestingly, more than half of the trade volume can be traced back to Italy and Poland, which imported manufactured goods from Ukraine at a total value of €2.2 billion and €1.8 billion, respectively.

Figure 17: Overview of traded goods between the EU27 & Ukraine, by import to EU27 and export from EU27 in 2021, values in billion Euro



Source: ECCP (2023), own calculation based on UN Comtrade Database. Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

Crude materials also made up a significant portion of imports, ranking second-highest, which indicates the potential of Ukraine to (partially) substitute the lost supply of **raw materials** from Russia, as outlined in the previous section. Germany, Czechia, and Poland are significant importers of crude materials from Ukraine. However, as mentioned above, regular surveys among Ukrainian enterprises show that although short-term export expectations have recently increased, many enterprises lack the capacity to resume export activities.[42]

[42] Institute for Economic Research & Policy Consulting (2022): New Monthly Enterprises Survey. Ukrainian Business in Wartime. Issue 8 (December 2022). Available online http://www.ier.com.ua/files/Projects/2023/TDF/%D0%B0%D0%BD%D0%B3%D0%BB_%D0%B7%D0%B2%D1%96%D1%82.pdf (last access 22.02.2023)

Meanwhile, agricultural products also make up a notable share of the traded goods. “Food and live animals” ranked among the top three imported goods, with a value of €3.4 billion, while “animal and vegetable oils, fats, and waxes” reached €2.1 billion. This indicates the relevance of value chains between Ukraine and the EU27 linked to the industrial ecosystem “**Agri-Food**”. The leading importers for agricultural products include the Netherlands, Spain, and Poland, making up 51% of all imports of “Food and live animals” and 68% of the import of “Animal and vegetable oils”. A recent study on the impacts of the Russian war against Ukraine for bioeconomy supply chains in the Danube region finds that the most affected products are apples, wood as well as sunflower seeds and oil.[43] Moreover, due to the impacts of the war and difficulties related to exports via sea routes Ukrainian wheat exports have seen a reduction of around 30% in 2022.[44] However, recent data from the European Commission indicates significant increases of cereal imports from Ukraine to the EU in 2022. Whereas these cereal imports totalled around €110 million before the Russian full-scale invasion in February, these imports peaked at more than €180 million at the end of 2022. A potential explanation for this are the EU-Ukraine Solidarity Lanes which aimed at establishing alternative logistical routes to the Black Sea route for Ukrainian grain exports.[45]

Machinery and transport equipment are among the most exported goods to Ukraine, with a trade volume of €9.7 billion. This points to significant value chains related to the industrial ecosystems “**Mobility-Transport-Automotive**“ and “**Aerospace & Defence**”. In connection with the previous elaborations on the lost export markets for EU companies in those ecosystems, there is potential for further cooperation in these industrial ecosystems between the EU and Ukraine. This is followed by chemicals and manufactured goods, amounting to €5.5 billion and €3.4 billion, respectively. Germany and Poland are the leading European exporters of machinery and transport equipment, as well as manufactured goods. When it comes to exports of mineral fuels, lubricants, and associated materials, Hungary stands out as the top exporter, with a value of €831 million and a 29% share of the total. Lithuania is in a close second, with exports valued at €587 million, making up 21% of the total. Greece also contributes to these exports with a value of €477 million, representing 17% of the total.

In addition to the previously shown analysis of traded goods, the following Figure 18 provides a more detailed overview of the **trade between the EU27 and Ukraine broken down by specific commodities**. The high trading volume for agricultural goods and crude materials is reflected when looking at the top ten imported commodities imported from Ukraine to EU27. Agricultural products, such as sunflower seeds and oil (€1.7 billion), maize (€1.6 billion), and rape, colza, and mustard seeds (€1.2 billion) are among the leading imported commodities. This again underlines the relevance of value chains related to the industrial ecosystem “**Agri-Food**” in the trade between the EU and Ukraine. The top trading partners for sunflower seed & sunflower oil include the Netherlands, Spain, and Italy.

The top crude materials imported include semi-finished products of iron and non-alloy steel (€1.7 billion), iron ores and concentrates (€1.4 billion), and flat-rolled products of iron or non-alloy steel (€1.2 billion). It is notable to mention that Italy is a significant contributor to the import of semi-finished products of iron or non-alloy stell,

[43] Dermastia, M. et al (2022): Impacts and Potentials of the Ukraine Crisis on Supply Chains Development for the Danube Region. Available online: https://www.researchgate.net/profile/Gerd-Meier-Zu-Koecker/publication/362175408_Impacts_and_Potentials_of_the_Ukraine_Crisis_on_Supply_Chains_Development_for_the_Danube_Region/links/62da8692f3acdd5dc20e4805/Impacts-and-Potentials-of-the-Ukraine-Crisis-on-Supply-Chains-Development-for-the-Danube-Region.pdf?origin=publication_detail (last access 21.02.2023)

[44] see https://www.reuters.com/markets/commodities/ukraine-grain-exports-down-296-236-mln-t-so-far-202223-2023-01-09/ (last access 27.02.2023)

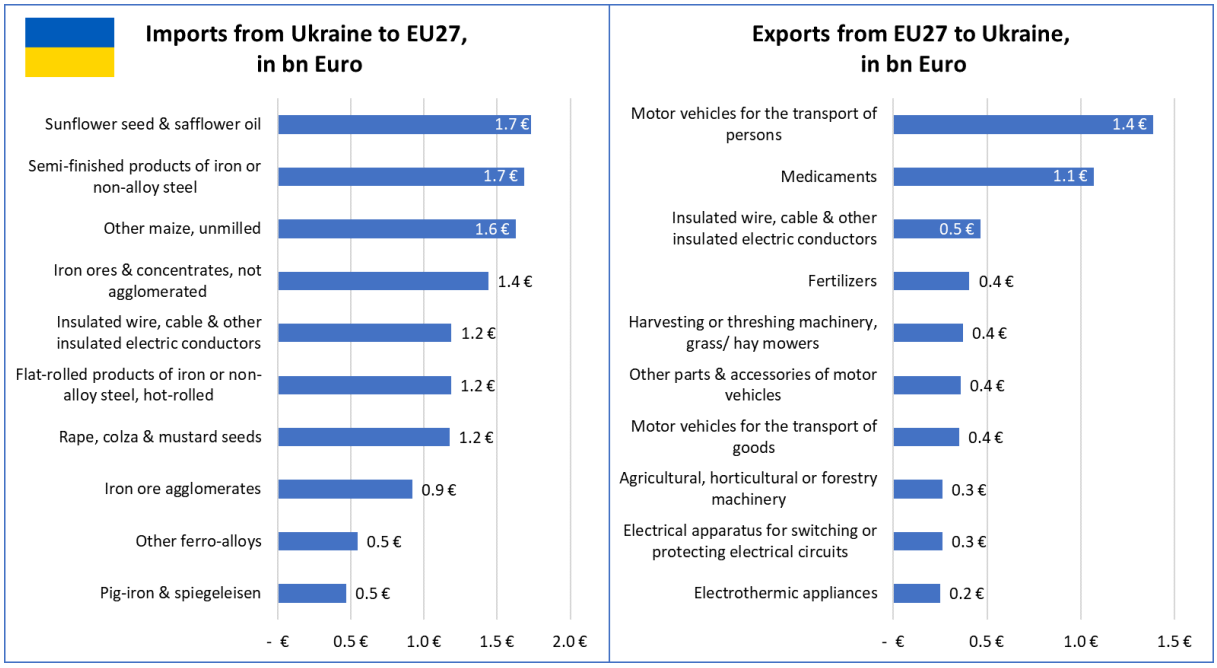
[45] see https://ec.europa.eu/commission/presscorner/api/files/attachment/874450/EU-UA%20Solidarity%20Lanes_Factsheet_EN.pdf.pdf (last access 14.03.2023)

accounting for 73% of all imports to the EU, followed by Bulgaria with 18%. These findings are in line with the analysis of Chapter 1 and are also complemented by other literature that finds that in 2020 one third of Ukraine's exports were non-food raw materials, such as iron and steel products.[46] Other relevant materials included manganese, silicon, and wood. Hence, it can be concluded that Ukraine has been a relevant source of **raw materials** for the EU27 and hence provides potential in substituting lost supply (e.g., with regards to the previously outlined iron and steel imports from Russia to the EU27). Additionally, it can be mentioned that Ukraine has managed to increase its export of raw materials such as titanium ores in 2022, further substantiating the potential of Ukraine in providing supply in raw materials.[47] As these raw materials play a role in a variety of value chains (e.g., steel in cars, silicones in plastics or semiconductors[48], manganese in cermet articles[49]), they also affect various industrial ecosystems such as "**Electronics**" and "**Mobility-Transport -Automotive**". Moreover, the previously mentioned titanium plays a crucial role in building modern aircrafts. Since previously Russia was a major titanium supplier, this constitutes a potential for further integration of Ukrainian cluster organisations and enterprises in the EU value chains related to the industrial ecosystem "**Aerospace & Defence**".[50] However, it needs to be highlighted that on a general level the imports of ores and iron and steel to the EU from Ukraine have decreased throughout 2022 (see Figure 38 in the Annex).

Moreover, insulated wires, cables, and other electric conductors with an import value of around €1.2 billion are as well among the 10 most imported commodities imported from Ukraine to the EU27. This commodity can be linked to value chains that are relevant to the industrial ecosystems "**Electronics**", but also "**Mobility-Transport -Automotive**". This can be exemplified by the supply chain disruptions in the European automotive industry shortly after the start of the war, as missing wires brought production to a halt.[51]

[46] JRC (2022): Ukraine's trade in non-food raw materials – Focus on EU-Ukraine trade relations. Available online: https://rmis.jrc.ec.europa.eu/uploads/Ukraine_trade%20fiche_JRC_D3_FINAL.pdf (last access 21.02.2023)
[47] see https://ukraineinvest.gov.ua/news/13-12-22/ (last access 21.02.2023)
[48] https://oec.world/en/profile/sitc/silicones (last access 21.02.2023)
[49] https://oec.world/en/profile/hs/manganese (last access 21.02.2023)
[50] https://emag.directindustry.com/2022/04/22/russia-ukraine-war-aviation-industry-titanium-aircraft-airbus-boeing/ (last access 21.02.2023)
[51] see https://www.reuters.com/business/autos-transportation/europes-carmakers-scramble-replace-ukrainian-auto-parts-2022-03-14/ (last access 13.03.2023)

Figure 18: Overview of the 10 most important commodities (excl. mineral fuels and unspecified goods) traded between the EU27 & Ukraine, by import to EU27 & export from EU27 in 2021, values in billion Euro



Source: ECCP (2023), own calculation based on UN Comtrade Database. Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

The trade relationship between the EU27 and Ukraine is also characterized by a **diverse range of exported commodities**. In 2021, the most important exported commodity from the EU27 Member States to Ukraine were petroleum oils, amounting to a total of €1.4 billion. 33% of these imports can be traced back to Lithuania, whereas 26% of the total exports from the EU27 came from Greece. In addition to petroleum oils, natural gas exports from the EU27 amounted to €802 million, with Hungary being the main European exporter of this commodity and accounting for 99% of all natural gas exports. Slovakia was the second contributor, albeit with a much lesser share, with a total export volume of roughly €4.0 million. Apart from natural resources, the EU27 also exports a significant number of commodities from the automotive sector to Ukraine. Motor vehicles for the transport of persons were the second-highest exported commodity, totalling €1.4 billion. This further substantiates the importance of the value chains linked to the industrial ecosystem "**Mobility-Transport - Automotive**" in the trade flows between the EU and Ukraine. Here, recent data for 2022 from the European Commission shows that the exports of vehicles from the EU to Ukraine experienced a decline in the weeks after the full-scale Russian invasion in February 2022. However, throughout 2022 these exports have seen strong increases in 2022 and were above pre-war levels for the rest of 2022 (see Figure 39 in the Annex). Moreover, the fact that medicaments were among the top 10 commodities exported from the EU27 to Ukraine, with a trade volume of approximately €1.1 billion in 2021, underscores the significance of value chains linked to the industrial ecosystem "**Health**". In 2022, the exports of pharmaceuticals from the EU to Ukraine have seen a significant decrease in the weeks after February 2022. Throughout 2022, these exports have rebounded but stayed below pre-war levels (see Figure 39 in the Annex).

In conclusion, the overview of the most imported and exported goods between the EU27 and Ukraine shows the diversity of trade between the two regions. On the basis of the previous analysis, the value chains linked to the industrial ecosystems listed below have been identified as being particularly affected by the Russian invasion of

Ukraine in February 2022, on the one hand, and as providing **key areas for further cooperation between the EU and Ukraine**, on the other:

- Aerospace & Defence
- Agri-Food
- Construction
- Electronics
- Energy Renewables
- Health
- Mobility-Transport-Automotive

Since the previous analysis only includes traded goods, the significance of the service sector and thereby especially the IT industry needs to be considered. The IT industry and its value chains are an important factor of the EU industrial ecosystem **"Digital"** and will hence also be in the focus of the following analysis. In this regard, other authors identify the Ukrainian IT sector as a key sector for Ukraine and point out that the sector is less exposed to security threats as well as the success of Ukraine in combatting Russian cyberattacks.[52] Boosted by the aftermaths of the COVID-19 pandemic, the performance of the Ukrainian IT sector is even exceeding the pre-war levels[53] and to function well with the regional start-up ecosystems, especially in regions like Kyiv, Lviv, Kharkiv and Dnipro.[54] Moreover, although the previous analyses do not highlight the role of the textile industry, value chains linked to this industrial ecosystem ("**Textiles**") provide interesting potential for the future (e.g., with regards to European near-sourcing efforts in this context) and will hence be in the focus of the following chapters. Here, it can be highlighted that an EU-Ukraine Textile initiative has been launched with the objective to match supply and demand in this sector.[55] This is also complemented by the analysis of the Ukrainian cluster landscape in the next chapter where the industrial ecosystem "Textiles" plays a relevant role.

[52] Movchan, V. & Rogoff, K. (2022): International trade and foreign direct investment. In Rebuilding Ukraine: Principles & Policies. Available online: https://scholar.harvard.edu/files/rogoff/files/movchan_and_rogoff_international_trade_and_foreign_direct_investment_with_book_cover.pdf (last access 21.02.2023) and https://cepr.org/voxeu/columns/reconstructing-ukraine-trade-and-foreign-direct-investment (last access 21.02.2023)

[53] see https://www.forbes.com/sites/forbestechcouncil/2022/10/12/the-ukrainian-it-industry-is-alive-and-healthy/?sh=5a05aadd7f2c (last access 21.02.2023); https://itukraine.org.ua/en/t-%D1%96ndustr%D1%96ya-zrosta%D1%94-nav%D1%96t-cherez-v%D1%96s%D1%96m-m%D1%96syacz%D1%96v-v%D1%96jni.html (last access 21.02.2023); Institute for Economic Research & Policy Consulting (2023): Monthly Economic Monitoring of Ukraine (February 2023). Available online http://www.ier.com.ua/files/Projects/2023/%D0%9C%D0%95%D0%9C%D0%A3/MEMU%20Feb%202023%20En.pdf (last access 22.02.2023)

[54] see also https://www.bbc.com/storyworks/future/ukraine-innovating-for-the-future/ukraines-dynamic-it-sector (last access 21.02.2023)

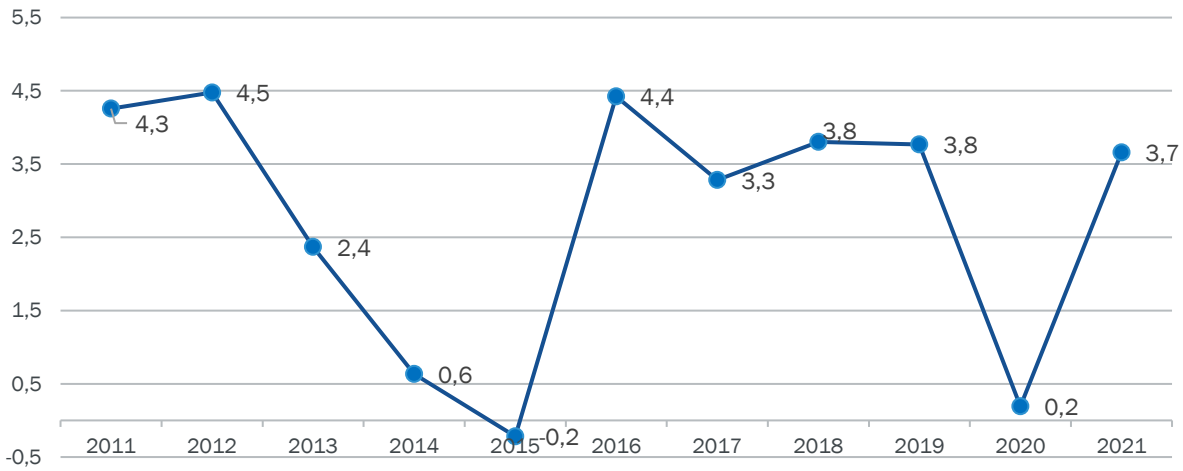
[55] see https://euratex.eu/eu-ukraine-textile-initiative-euti/ and https://euratex.eu/news/euratex-is-reaching-out-to-the-ukrainian-textile-industry/ (last access 22.02.2023)

2.5 Foreign investment structure in Ukraine

This section will provide a brief outline of the foreign investment structure in Ukraine and thereby focus on foreign direct investments (FDI). FDI is relevant in this context since it indicates the long-term interest of an investor in an enterprise in another economy.[56] In this regard, FDI can act as a driver of economic growth, productivity, wages and employment and can hence be considered as an accelerator of socio-economic development.[57]

The figure below shows the **development of Ukrainian FDI net inflows between 2011-2021**. As displayed in the figure, FDI net inflows reached a peak in 2012 with a share of 4.5% of GDP. In the years after this share dropped and ultimately reached a negative value of -0.5 in 2015 which indicates that in 2015 the outflow of investments exceeded the inflows. This development can be linked to the Euromaidan, the Russian occupation of Crimea as well as the military conflict in the Donbas (Donetsk and Luhansk regions) since studies find a negative link between political risks and FDI.[58] After 2015, the Ukrainian FDI net inflows have increased and settled between 3.3 and 4.4%. The economic impact of the COVID-19 pandemic is also visible with the drop in FDI net inflows in 2020. In 2021 the Ukrainian FDI net inflows totalled 3.7% of GDP, but it can be expected that there is a strong decrease in FDI inflows in Ukraine in 2022.[59] The main sources of the FDI inflows to Ukraine between 2019 and 2021 were Cyprus, the Netherlands and Switzerland.[60]

Figure 19: Overview of the development of Ukrainian FDI net inflows between 2011-2021 (in % of GDP)



Source: ECCP (2023), own elaboration based on data from Worldbank.

[56] see also https://ec.europa.eu/eurostat/web/economic-globalisation/globalisation-in-business-statistics/foreign-direct-investments (last access 15.02.2023)
[57] see https://www.ecb.europa.eu/pub/economic-bulletin/articles/2018/html/ecb.ebart201804_01.en.html (last access 15.03.2023); OECD (2002): Foreign Direct Investment for Development. Available online: https://www.oecd.org/investment/investmentfordevelopment/1959815.pdf (last access 15.03.2023)
[58] Khan, M. and Akbar, M. (2013): The Impact of Political Risk on Foreign Direct Investment. Available online: https://mpra.ub.uni-muenchen.de/47283/ (last access 15.02.2023)
[59] OECD (2022): International investment implications of Russia's war against Ukraine. Available online: https://www.oecd-ilibrary.org/finance-and-investment/international-investment-implications-of-russia-s-war-against-ukraine_a24af3d7-en (last access 15.02.2023)
[60] https://bank.gov.ua/en/statistic/sector-external#5 (last access 08.03.2023)

From a regional perspective, foreign direct investments in Ukraine are concentrated in larger cities such as Kyiv, Odessa and Lviv. The majority of FDI in Ukraine can be linked to the software and IT service sector followed by renewable and alternative power and logistics.[61] For the future, it can be outlined that FDI (especially from the EU) will be crucial for the reconstruction and further integration of Ukraine into European value chains.[62] In this regard, it can be highlighted that whereas a multitude of companies from different sectors have divested their operations in Russia for various reasons (including reputational risks) several international firms from various industries have **maintained or even increased their investments in Ukraine**. This includes, for instance, the automotive[63] or the steel[64] industry as well as the agriculture[65] and construction[66] sector. Moreover, representatives of large investment banks have already been in contact with Ukraine officials to discuss the rebuilding of Ukraine and mitigations of the financial impacts of the war on Ukraine.[67] As a concluding remark it can be outlined that in 2021 Ukraine has issued a new law that aims at incentivising larger investments (the so called "investment nannies"). Investors who invest more than €20 million are eligible for state support including tax benefits. The Ukraine investment agency has prepared information and a guide for receiving this support. [68] Despite the war, it was recently announced that Ukraine has been able to attract around $1.2 billion (around €1.1 billion) under the "investment nanny" programme.[69]

[61] https://www.investmentmonitor.ai/special-focus/ukraine-crisis/ukraine-fdi-snapshot-foreign-investment/ (last access 15.02.2023)
[62] https://cepr.org/voxeu/columns/reconstructing-ukraine-trade-and-foreign-direct-investment and OECD (2022): International investment implications of Russia's war against Ukraine. Available online: https://www.oecd-ilibrary.org/finance-and-investment/international-investment-implications-of-russia-s-war-against-ukraine_a24af3d7-en (last access 15.02.2023)
[63] see https://www.gtai.de/de/trade/ukraine/branchen/ukrainischer-automarkt-legt-vorsichtig-den-vorwaertsgang-ein-886734 (last access 15.02.2023)
[64] https://en.interfax.com.ua/news/investments/890995.html (last access 15.02.2023)
[65] https://ukraineinvest.gov.ua/news/15-02-2023/ (last access 16.02.2023)
[66] https://ukraineinvest.gov.ua/news/09-02-2023-2/ (last access 15.02.2023)
[67] see https://www.president.gov.ua/en/news/volodimir-zelenskij-zustrivsya-z-top-menedzherami-jp-morgan-80933 (last access 01.03.2023) and https://www.reuters.com/world/europe/ukraines-zelenskiy-met-jpmorgan-bankers-over-rebuilding-efforts-2023-02-13/ (last access 01.03.2023)
[68] see https://ukraineinvest.gov.ua/analytics-research-2/explanatory-guide/ (last access 01.03.2023)
[69] https://ukraineinvest.gov.ua/news/30-01-2023-2/ (last access 01.03.2023)

03

Cluster organisations in Slovakia, Ukraine & the macro-region and the role of clusters in rebuilding regional supply chains

EUROPEAN CLUSTER COLLABORATION PLATFORM

Strengthening the European economy through collaboration

3. Cluster organisations in Slovakia, Ukraine & the macro-region and the role of clusters in rebuilding regional supply chains

Overview of key findings

- Cluster organisations (can) play a key **role in organising and rebuilding regional supply chains.** Thereby, cluster organisation activities such as the provision of information (e.g., on market opportunities), facilitating connections (e.g., finding new partners/suppliers in other sectors and/or regions) or providing support (e.g., upskilling of suppliers) are particularly relevant in this context.
- In **Slovakia**, 26 cluster organisations are registered on the ECCP. The majority of these cluster organisations are located in the country's capital of Bratislava. These cluster organisations are active in several industrial ecosystems and these industrial ecosystems also cover the previously identified key industrial ecosystems for further cooperation between the EU and Ukraine. Hence, the respective Slovak cluster organisations can be key for rebuilding supply chains and integrating Ukrainian clusters and enterprises into EU value chains.
- Cluster policy in **Ukraine** is a relatively recent development. Within the Ukrainian cluster landscape, the Ukrainian Cluster Alliance (UCA), established shortly after the Russian invasion of Ukraine in February 2022, plays a central role. With more than 40 cluster organisations in Ukraine in different industries, the country offers significant potential for further integration of Ukrainian cluster organisations and enterprises into EU value chains.
- As the **macro-region** covers several EU27 Member States, its cluster landscape compromises 450 cluster organisations that are active in various economic sectors and ecosystems. As such, the macro-region provides a number of cluster organisations in the previously identified 9 key industrial ecosystems, indicating a high potential for collaboration.

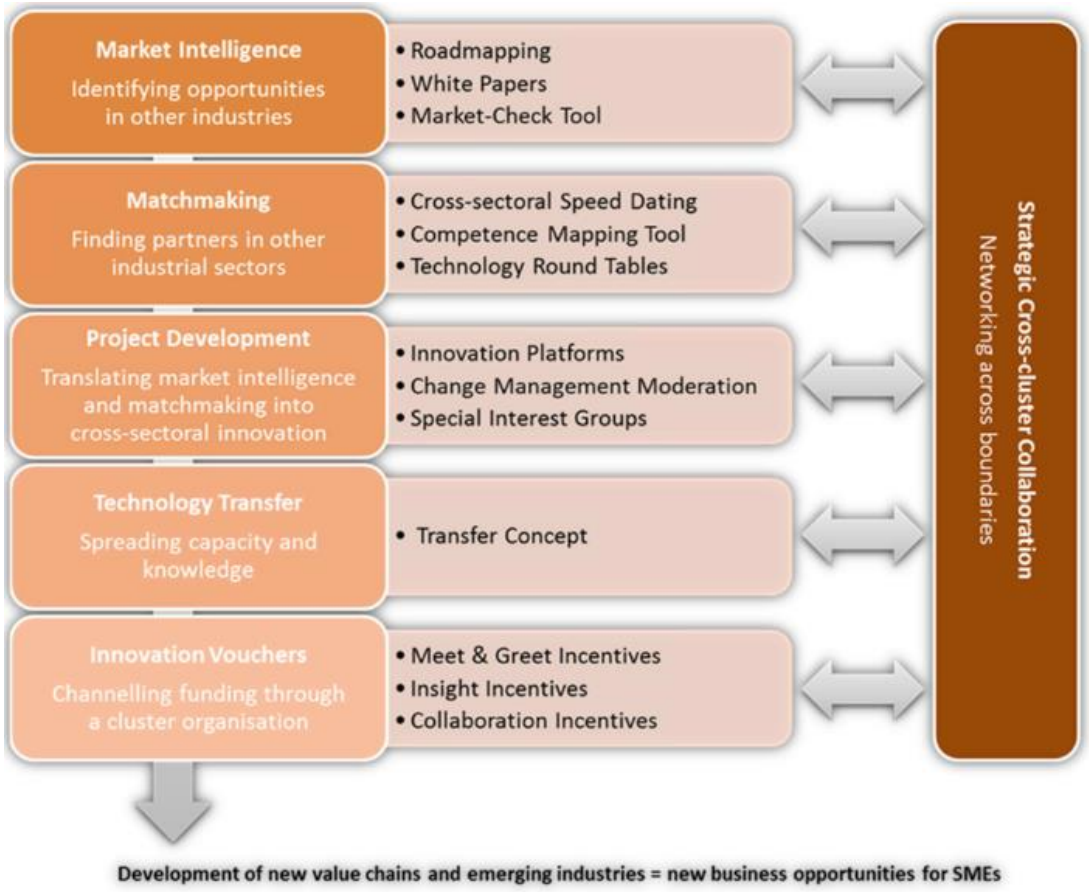
This chapter will start by elaborating on the relevance of cluster organisations in organising and rebuilding regional supply chains. This is followed by an overview of the cluster landscapes in Slovakia and Ukraine as well as the larger macro-region. To do so, the respective sections will map out the locations of cluster organisations, inform about their addressed industrial ecosystems (thereby focusing especially on the nine industrial ecosystems that were outlined in the previous chapter), and sketch out the respective policy frameworks under which cluster organisations are operating.

3.1 Relevance of cluster organisations in organising & rebuilding regional supply chains

This section provides a short elaboration on the relevance of cluster organisations in organising and rebuilding regional supply chains. As a starting point for this one can refer to the fundamental activities and the role of cluster organisations in promoting collaboration. The following figure presents central activities of cluster organisations which are pivotal for strategic cross-cluster collaboration and can foster the development of new value chains as well as new business opportunities for SMEs.[70]

[70] European Cluster Observatory (2014): Cluster Collaboration and Business Support Tools to Facilitate Entrepreneurship, Cross-sectoral Collaboration and Growth. Available under: https://clustercollaboration.eu/sites/default/files/eu_initiatives/cluster-collaboration-and-business-support-tools-to-facilitate-entrepreneurship-cross-sectoral-collaboration-and-growth_en_0.pdf (last access 21.02.2023)

Figure 20: Role of cluster organisations in promoting collaboration



Source: European Cluster Observatory (2014): Cluster Collaboration and Business Support Tools to Facilitate Entrepreneurship, Cross-sectoral Collaboration and Growth.

With these activities in mind, the **results of an EU-wide survey on supply chain disruptions** by the ECCP from April 2022 identify supply chain disruption in the inbound logistic of enterprises as one of the most impacted state of their supply chain.[71] Other areas where relevant supply chain disruptions were reported are operations, outbound logistics and procurement. This report also finds that participants from the industrial ecosystems of "Agri-food", "Construction" and "Mobility-Transport-Automotive" showcased the highest impact in terms of input and market losses. A follow-up report[72] from October 2022 illustrates that the diversification as well as the regionalisation of the supplier base are central measures to improve supply chain resilience. Moreover, the report detects that organisation across the EU are struggling with the identification of new suppliers and the insufficient competitiveness of (regional) suppliers. The fundamental activities of cluster organisations that were outlined above can potentially also serve to organise and rebuild supply chains. For instance, by providing market intelligence or organising matchmakings, cluster organisations can support in the identification of (new) suppliers or increase the capacity and knowledge of regional suppliers to increase their competitiveness (e.g., through the

[71] ECCP (2022): Report on the survey Identification of disruptions in value and supply chains. Available online: https://clustercollaboration.eu/sites/default/files/news_attachment/Report%20on%20the%20survey%20Identification%20of%20disruptions%20in%20value%20and%20supply%20chains.pdf (last access 21.02.2023)

[72] ECCP (2022): Report on the survey "Solutions to Supply Chain Disruptions in the EU". Available online: https://clustercollaboration.eu/sites/default/files/document-store/ECCP_SC_Disruptions_Report_final.pdf (last access 21.02.2023)

design of supplier development programmes[73]). The "EU COVID-19 vaccines upscale production matchmaking event"[74] can be highlighted as an example of cluster-based matchmakings for new value chains. Moreover, it can be underlined that since cluster organisations are built around supply chains, they are also well suited for supporting new connections in rebuilding supply chains.[75]

In addition, the efforts and considerations of the Ukrainian Cluster Alliance (UCA) as the national Ukrainian cluster association can be highlighted. As a relatively young organisation UCA has established six key directions[76] for 2023 among which inter-cluster cooperation as well as internationalisation play a central role. Moreover, UCA has elaborated on the role of cluster organisations in times of crisis and for the economic recovery of Ukraine thereby outlining the role of clusters as a tool for countering crisis phenomena (e.g., through internationalisation support), in supporting critical infrastructures and industries as well as the role of cluster organisations as relevant organisations for initiatives in recovery programmes.[77]

3.2 Cluster organisations in Slovakia and Ukraine

Cluster organisations in Slovakia

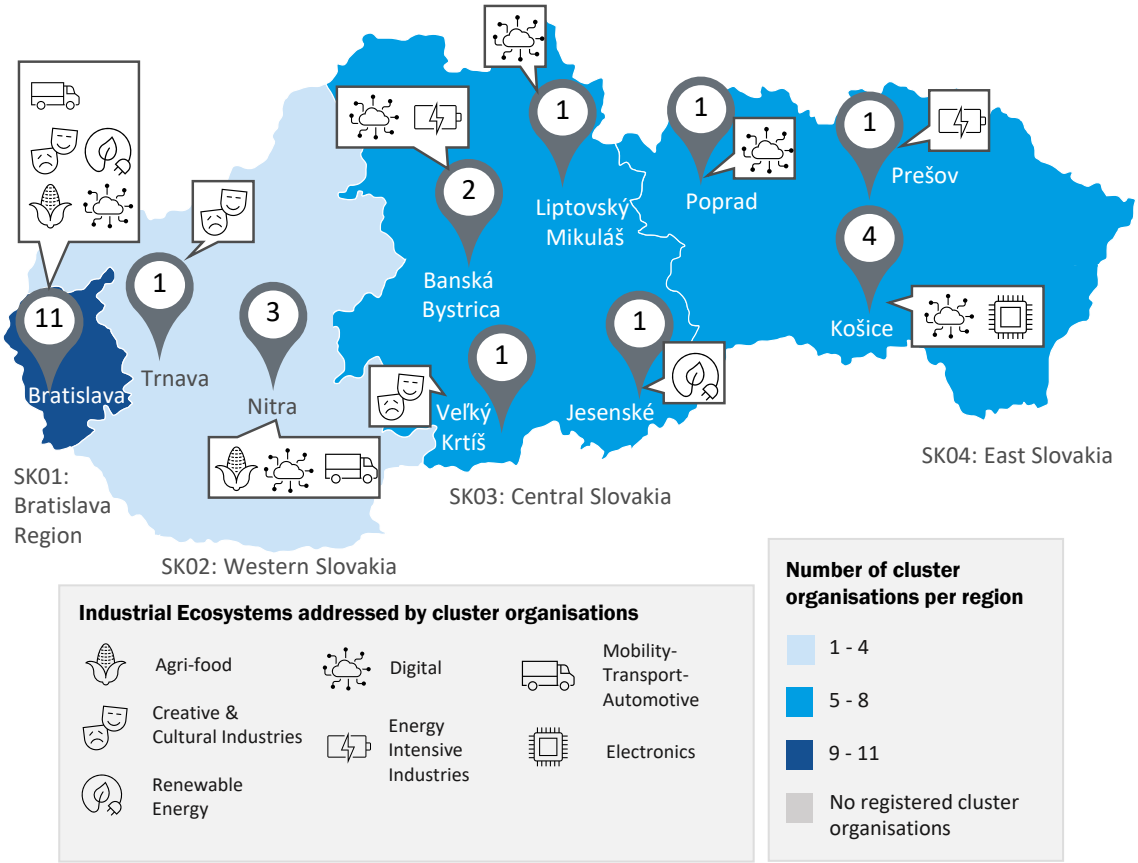
Before an introduction to Slovakia's cluster landscape, here is a **brief overview of the country's cluster policy**. From a cluster policy perspective, there are two relevant policies for clusters that need to be mentioned. First, the Research and Innovation Strategy of the Slovak Republic 2021-2027[78] which is focused on priority areas and transformation goals of defined domains. This strategy and its domains will also be presented in more detail in Chapter 5. Second, the Programme Slovakia is focused on five policy objectives: More competitive and smarter Europe; Greener, low-carbon transitioning towards a net zero carbon economy; More connected Europe by enhancing mobility; More social and inclusive Europe; Europe closer to citizens.

The European Cluster Collaboration Platform serves as a one-stop-shop for cluster organisations at the European level. Therefore, the number of registered cluster organisations in Slovakia on the ECCP gives the first impression of the intensity of organised industrial collaboration. Out of the total 1,094 registered EU-27 cluster organisations on the ECCP[79], there are **26 cluster organisations from Slovakia**. Compared to the Slovak share of GDP in the EU27 (0.7%), the share of Slovak cluster organisation in EU27 cluster organisations on the ECCP (2%) is above average. The following Figure 21 displays the **geographical distribution** and addressed industrial ecosystems of the cluster organisations in the country with a profile on the ECCP. While there is a certain concentration in the capital region of Bratislava (11 cluster organisations), more than half of Slovakia's cluster organisations are distributed rather equally across its regions with four cluster organisations in Western, five cluster organisations in Central and six cluster organisations in East Slovakia. In comparison with its larger neighbours, Slovakia – with

[73] ECCP (2020): Responding to COVID19: The role of clusters in supply chain adjustments. Available online: https://clustercollaboration.eu/sites/default/files/WYSIWYG_uploads/dp2_supply_chains_final.pdf (last access 21.02.2023)
[74] see https://clustercollaboration.eu/content/covid-19-vaccines-upscale-production-matchmaking-event (last access 21.02.2023)
[75] ECCP (2020): Responding to COVID19: The role of clusters in supply chain adjustments. Available online: https://clustercollaboration.eu/sites/default/files/WYSIWYG_uploads/dp2_supply_chains_final.pdf (last access 21.02.2023)
[76] https://www.clusters.org.ua/en/about-alliance/uca-roadmap-for-2022-23/ (last access 21.02.2023)
[77] UCA (2022): 5 roles of clusters in times of crisis & in the country's economic recovery. Available online: https://mautic.appau.org.ua/asset/259:white-book---5-roles-of-clusters-enpdf (last access 21.02.2023)
[78] Ministry of Investment, Regional Development and Informatization of the Slovak Republic (2021): Research and Innovation Strategy of the Slovak Republic 2021-2027 (Draft). Available online: https://www.mirri.gov.sk/wp-content/uploads/2018/10/Research-and-innovation-strategy-for-smart-specialisation-of-the-Slovak-Republic-2021-2027.pdf (last access 17.02.2023)
[79] see the ECCP mapping tool. Available under: https://reporting.clustercollaboration.eu/all (last access 21.02.2023).

only about half the population – has more registered cluster organisations than Czechia (22 cluster organisations) and only slightly less than Hungary (28 cluster organisations).
Similar to the majority of European cluster organisations registered on the ECCP, cluster organisations in Slovakia are rather small since 24 of the Slovak cluster organisations have between 1-5 employees. Likewise, 24 of the Slovak cluster organisations have between 1-100 members. SMEs account for the majority of Slovak cluster organisation members (77%), followed by large enterprises (14%) and research organisations (9%). Compared to the EU average, SMEs (EU:71%) and large enterprises (EU10%) are more often represented in the Slovak cluster organisations.

Figure 21: Overview of the regional and sectoral distribution of registered cluster organisations in Slovakia with profiles on the ECCP



Source: ECCP (2023), own elaboration based on https://reporting.clustercollaboration.eu/all (last access 07.02.2023). A full overview of clusters in Slovakia is provided in Table 1 in the Annex.

The cluster organisations in Slovakia can be related to **seven out of 14 different EU industrial ecosystems**[80]. Cluster organisations are particularly prevalent in the "Digital" industrial ecosystem (10 cluster organisations), followed by "Renewable Energy" and "Creative and Cultural Industries" (4 cluster organisations each), "Agri-food" (3 cluster organisations), "Mobility-Transport-Automotive" and "Energy Intensive Industries" (2 cluster organisations both) and "Electronics" (1 cluster organisation). Hence, the Slovak cluster organisations operate in the majority of in Chapter 2 identified industrial ecosystems which can be key areas for further cooperation between the EU and Ukraine.

[80] see the European Industrial Strategy. Available under: https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-industrial-strategy_en (last access 31.01.2023)

Cluster organisations from Slovakia seek **collaboration** primarily in the areas of partnering for projects (16 cluster organisations), internationalisation (10 cluster organisations) and digitalisation (7 cluster organisations). Therefore, it can be concluded that there is a great interest on the part of Slovak cluster organisations in establishing new international collaborations and that there is potential for constructing new or reinforced relations with Ukrainian partners. This is especially relevant for ecosystems like "**Digital**" where both countries have strengths and demonstrate interest to collaborate.

Cluster organisations in Ukraine

Before illustrating the cluster landscape of Ukraine, it is important to emphasise that **cluster policy in Ukraine** is relatively young and that clusters are increasingly targeted in policies developed in recent years. The following policies can be highlighted in this regard.

The "**National Economic Strategy 2030**"[81], the "**Innovation Development Strategy 2030**"[82] and "**National Strategy for Regional Development 2021-2027**"[83] of Ukraine form the framework on the national level relevant for cluster policy. Although they do not represent a dedicated and detailed national cluster policy, they confirm the policy support for cluster development in Ukraine and provide some general guidelines. In this respect, they are complementary. One of the main goals mentioned in the National Strategy for Regional Development is "ensuring comprehensive assistance to the reindustrialisation of agglomerations and large cities on the basis of innovations (techniques and technologies) of higher technological structures, the formation of urban and regional economic clusters". Furthermore, it aims for the creation of cross-border clusters, the development of regional Smart Specialisation Strategies and the strengthening of existing cluster organisations as well as research on best practices in cluster management. The National Economic Strategy and the Innovation Development Strategy highlight the importance of internal cluster development support as well as international – in particular European – networking.

Moreover, a draft for a "**National Cluster Development Programme 2027**"[84] has been developed which represents the most advanced document available on the path to a dedicated Ukrainian cluster development policy. It has been drafted by cluster managers and experts under the auspices of the Ukrainian Cluster Alliance (UCA) and is currently in consultation with government bodies. Its primary goal is the professionalisation of cluster management at and across all levels of governance from the national to the regional and local level. More specifically, the draft for a "National Cluster Development Programme 2027" aims for the institutionalisation of cluster development at the national level, the introduction of a monitoring and evaluation system, a cluster coordination centre, internationalisation and integration into European networks, the diversification of clusters into different economic priority sectors.

[81] Cabinet of Ministers of Ukraine (2021): National Economic Strategy 2030. https://www.kmu.gov.ua/npas/pro-zatverdzhennya-nacionalnoyi-eko-a179 (in Ukrainian; last access 22.02.2022)
[82] Cabinet of Ministers of Ukraine (2019): Strategy for the development of the sphere of innovation activity until 2030 ("Innovation Development Strategy 2030"). https://zakon.rada.gov.ua/laws/show/en/526-2019-%D1%80?lang=uk#Text (in Ukrainian, last access 13.03.2023)
[83] Cabinet of Ministers of Ukraine (2021): National Strategy for Regional Development 2021-2027. https://zakon.rada.gov.ua/laws/show/695-2020-%D0%BF#Text (in Ukrainian, last access 23.02.2023)
[84] Ukrainian Cluster Alliance (2022): Draft National Cluster Development Programme 2027. https://www.clusters.org.ua/blog-single/proyekt-naczionalnoyi-programy-klasternogo-rozvytku-do-2027/ (in Ukrainian; last access 22.02.2023)

Finally, in the context of the cluster ecosystem in Ukraine the role of the **Ukrainian Cluster Alliances**[85] needs to be highlighted. In March 2022, right after the Russian invasion, the Ukrainian Cluster Alliance (UCA) was formed and is now listing more than 40 cluster organisations, business associations and similar actors as its members. Currently, it is working to support the Ukrainian economy to both handle the challenges posed by the Russian invasion and to develop the Ukrainian cluster landscape and policy including its international relations.

Key strategic documents and actions of the UCA include[86]:

- The **UCA Roadmap for 2022-23**[87] lays out an ambitious plan across the three axes of, first, institutionalisation, i.e., the adoption of its **Draft National Cluster Development Programme 2027**[88] in government policy, second, organisational development of Ukrainian cluster organisations and their inter-regional networking and, finally, the internationalisation of the Ukrainian cluster network and the strengthening of its European supply chain integration.
- The latter point of **internationalisation** was pushed early on through the **Ambassadors of Industry4Ukraine**[89] as of April 2022 and developed into a series of incipient and increasingly formalised **collaborations between the Ukrainian and European cluster networks** as well as business missions like, for example, in October 2022 to Czechia.[90]
- On a **sectoral level**, the UCA is working to develop specific policy proposals, e.g., in its Top 10 UCA proposals in the field of **Advanced Manufacturing**[91].
- To focus capacities, the UCA established **Common Resource Centres (CRC)** that are currently working on policy proposals in the sectors of Agri-food, Medical, Engineering-Machinery, Utilities, Industry 4.0, and Dual-use technology.
- Early in the war**, Rapid Response Centres (RRC)** were launched by the UCA to, first, support the restoration of value chains, the substitution of products previously sourced from Russia and Belarus, and the connection to European value chains. Second, they support the relocation of firms and clusters from the war zone into more secure regions. Finally, they help to sustain firms and clusters operating in industries that are critical for the supply of both the population (food, textile, medicine, utilities) and of the military to sustain the war efforts.[92]

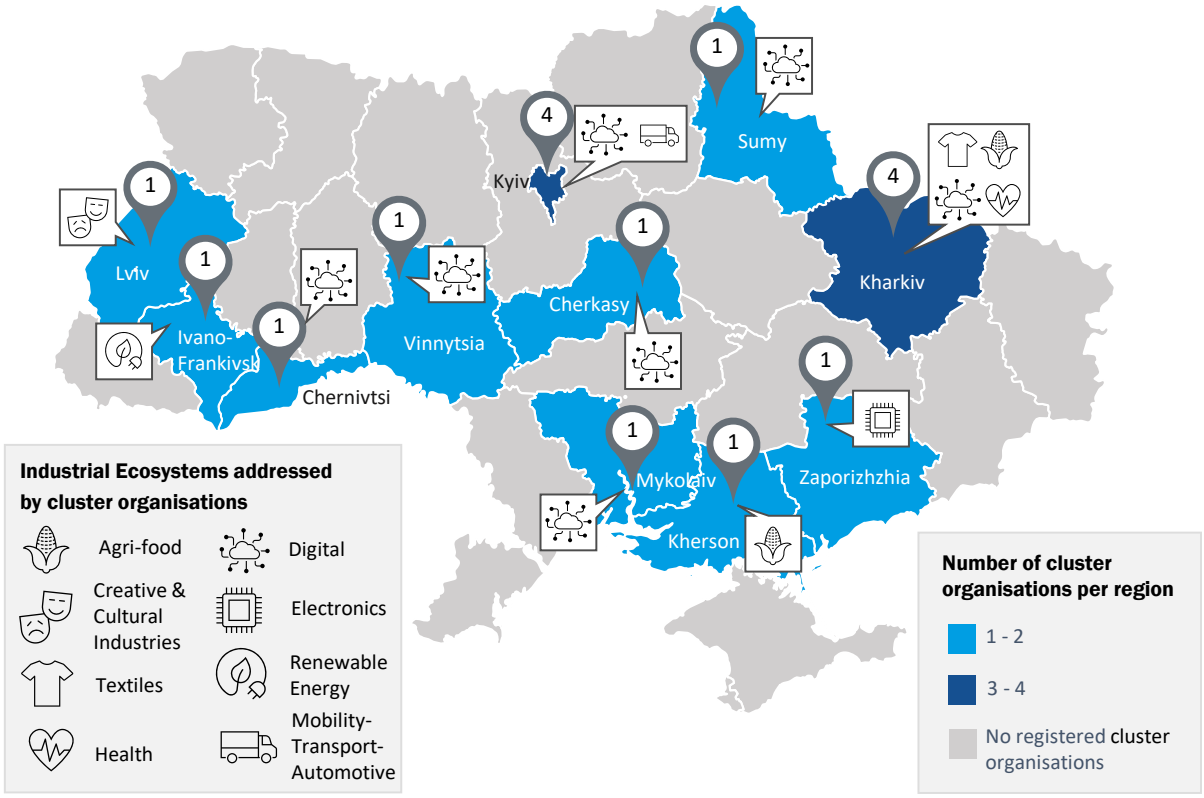
With regards to cluster organisations, there are **16 Ukrainian cluster organisations** registered on the ECCP. Figure 22 shows a rather homogenous geographical distribution of cluster organisations across the country with five cluster organisations in the (north-)eastern regions of Kharkiv (4 cluster organisations) and Sumy (1 cluster organisations), three cluster organisations in the south in the regions of Zaporizhzhia, Kherson and Mykolaiv (1 cluster organisation each), three cluster organisations in the West in the regions of Lviv, Ivano-Frankivsk, and

[85] https://www.clusters.org.ua/ (last access 22.02.2023)
[86] For the UCA's annual report 2022, see https://www.clusters.org.ua/en/annual-report-2022/ (last access 22.02.2023)
[87] See https://www.clusters.org.ua/en/about-alliance/uca-roadmap-for-2022-23/ (last access 22.02.2023)
[88] See https://www.clusters.org.ua/blog-single/proyekt-naczionalnoyi-programy-klasternogo-rozvytku-do-2027/ (last access 22.02.2023)
[89] See https://www.industry4ukraine.net/publications/ambasadory-industry4ukraine/ (last access 28.02.2023)
[90] See https://www.clusters.org.ua/en/digest-en/ambassadors-i4u-digest-1/ (last access 28.02.2023)
[91] See https://www.clusters.org.ua/en/blog-about-clusters/top-10-uca-proposals-in-the-field-of-advanced-manufacturing/ (last access 22.02.2023)
[92] See https://www.industry4ukraine.net/publications/czentry-shvydkogo-reaguvannya-v-ramkah-ukrayinskogo-klasternogo-alyansu-oglyad-konczepcziyi/ (last access 22.02.2023)

Chernivtsi (1 cluster organisation each) and six cluster organisations in central Ukraine including the capital of Kyiv (4 cluster organisations), and the regions of Vinnytsia and Cherkasy (1 cluster organisation each).

In international comparison, Ukraine appears to have significantly fewer cluster organisations registered on the ECCP than its neighbours Poland (79 cluster organisations) and Romania (63 cluster organisations). However, it should be noted that the UCA, as the national cluster association of Ukraine, lists more than 40 members on its website, indicating that there are more Ukrainian cluster organisations than those registered with the ECCP.[93]

Figure 22: Overview of the regional and sectoral distribution of registered cluster organisations in Ukraine



Source: ECCP (2023), own elaboration based on https://reporting.clustercollaboration.eu/all (last access 22.02.2023). A full overview of clusters in Ukraine is provided in Table 2 in the Annex.

The Ukrainian cluster organisations that are registered on the ECCP can be related to **eight out of 14 EU industrial ecosystems**. The **most strongly represented one is the industrial ecosystem "Digital"** (8 cluster organisations) followed by "Mobility-Transport-Automotive" and "Agri-food" (each two cluster organisations). Finally, "Renewable Energy", "Creative and Cultural Industries", "Textiles", "Health" and "Electronics" are represented by one cluster organisation each on the ECCP. The strong presence of cluster organisations in the industrial ecosystem "Digital" was also outlined previously with regards to the Slovak cluster landscape and emphasised in Chapter 2, thereby outlining the importance of the IT sector in Ukraine. Moreover, Ukrainian cluster organisations that are registered on the ECCP seek collaboration primarily in the areas of partnering for projects and internationalisation (5 cluster organisations each), followed by digitalisation, and participating in training (four cluster organisations each).

[93] See https://www.clusters.org.ua/en/members/ (last access 22.02.2023)

However, this information of Ukrainian cluster organisation on the ECCP can be complemented by information of the UCA. Building on the information provided on the website of UCA[94] there are nine cluster organisations that can be linked to the industrial ecosystem "**Mobility-Transport-Automotive**" and "**Aerospace & Defence**" and nine cluster organisations that can be linked to the ecosystem "**Agri-food**". Moreover, there are seven Ukrainian cluster organisations that are linked to the industrial ecosystem "**Textiles**". This high number of cluster organisations in this industrial ecosystem further substantiates the potential of this ecosystem in the further integration of Ukrainian cluster organisations and enterprises in EU value chains. Moreover, as of February 2023 the UCA lists two cluster organisations that can be linked to the industrial ecosystem "**Construction**" which is potentially relevant for rebuilding supply chains in this ecosystem. Similarly, two of the cluster organisations that are members of UCA can be linked to medical sectors which underlines their potential contribution to EU value chains in the industrial ecosystem "**Health**".

The **Common Resource Centres (CRC)** established by the UCA (see above), are currently working on **six sectoral areas** that overlap in large parts with the already highly clustered industrial ecosystems that are organised within the UCA and that show a high potential for stronger integration with European supply chains: Agri-food, Medical, Engineering-Machinery, Utilities, Industry 4.0, and Dual-use technology.

In conclusion, the Ukrainian cluster landscape provides significant potential for further integration of Ukrainian cluster organisations and enterprises into EU value chains through its various cluster organisations in different industrial ecosystems.

3.3 Cluster organisations in the macro-region

As the macro-region includes various EU countries that together account for almost 40% of the EU27 GDP (see Chapter 1) the cluster landscape of this region encompasses a variety of cluster organisations. Overall, there are **450 cluster organisations** in the macro-region that are registered on the ECCP. The majority of those cluster organisations are located in Germany (123 cluster organisation), Poland (79 cluster organisations) and Romania (63 cluster organisations). These cluster organisations are active in a variety of economic sectors and industrial ecosystems.

In the following, the cluster organisations in the macro-region that are active in the nine industrial ecosystems identified in Chapter 2, which can be key areas for further cooperation between the EU and Ukraine, are examined in more detail. In the macro-region there are 168 cluster organisations active in these nine identified industrial ecosystems. Below is an overview of the number of cluster organisations in the macro-region that are active in each of the nine industrial ecosystems identified:

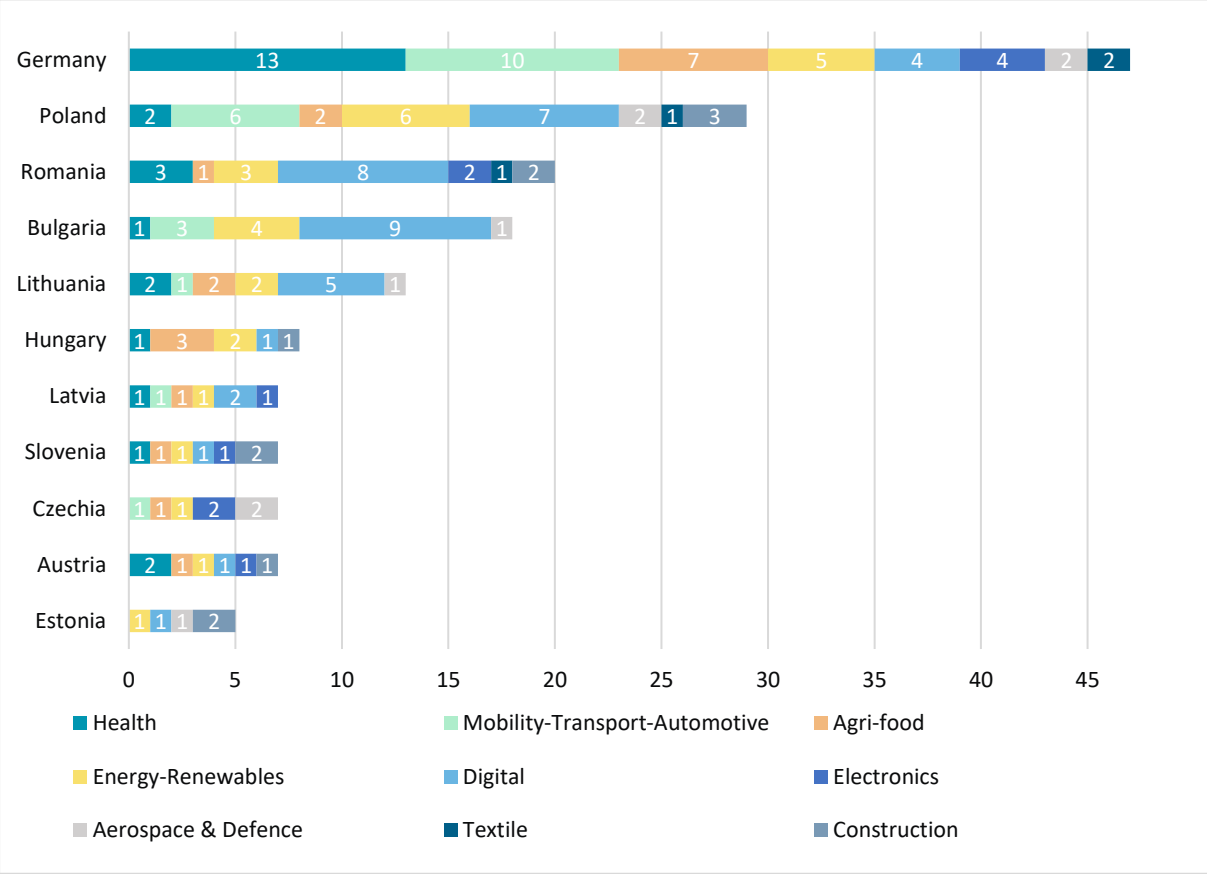
- **Digital**: 39 cluster organisations
- **Energy** - **Renewables**: 27 cluster organisations
- **Health**: 26 cluster organisations
- **Mobility**-**Transport**-**Automotive**: 22 cluster organisations
- **Agri**-**food**: 19 cluster organisations
- **Construction**: 11 cluster organisations
- **Electronics**: 11 cluster organisations
- **Aerospace** & **Defence**: 9 cluster organisations
- **Textile**: 4 cluster organisations

[94] https://www.clusters.org.ua/en/members/ (last access 22.02.2023)

Figure 23 provides a more detailed overview of the number of cluster organisations in the macro-region that are active in the nine identified key industrial ecosystems by country. Here, the number of relevant cluster organisations is a reflection the general distribution of cluster organisation in the macro-region as outlined above with the majority of cluster organisations from Germany, Poland and Romania. However, there is a greater variety in the number of cluster organisation in the identified key industrial ecosystems between the countries of the macro-region. Overall, Germany is home to many cluster organisations in the macro-region that active in the industrial ecosystems "Health", "Mobility-Transport-Automotive" and "Agri-food". Poland on the other hand is the location for the majority of cluster organisations that are active in the industrial ecosystem "Energy-Renewables" and Bulgaria for cluster organisations in the industrial ecosystem "Digital". Overall, the macro-region provides at least two cluster organisations for all the identified ecosystems.

In conclusion, Slovakia, Ukraine, and the macro-region offer a variety of different cluster organisations active in the previously identified 9 industrial ecosystems, which can be key areas for further cooperation between the EU and Ukraine. This overview of cluster organisations will be built upon in chapter 5, where the potential for cluster cooperation based on cluster organisation in the 9 identified industrial ecosystems will be further elaborated. The role of cluster organisation in organising and rebuilding regional supply chains is discussed in the following section.

Figure 23: Number of cluster organisations in the 9 identified industrial ecosystems for further cooperation, by country of macro-region



Source: ECCP (2023), own elaboration based on ECCP profile information extracted 05/01/2023.

04

International cooperation & capacity building of Slovak and Ukrainian clusters through cluster support initiatives

EUROPEAN CLUSTER COLLABORATION PLATFORM

Strengthening the European economy through collaboration

4. International cooperation and capacity building of Slovak and Ukrainian clusters through cluster support initiatives

Overview of key findings

- International cluster cooperation can foster innovation, global competitiveness, and international trade relations. In the 2014-2020 funding period, two cluster organisations from Slovakia participated in three different **European Strategic Cluster Partnerships** (2 participations in ESCP-4i, 1 participation in ESCP-4x). Partners came from Spain, Czechia, Germany, Italy, Denmark, France, Portugal, and Ireland.
- **Capacity building of cluster actors and development aid support** through international cluster cooperation between Ukraine and the EU is ongoing. Activities include the EU Cluster Support Ukraine Forum of the European Cluster Collaboration Platform, the Supply Chain Resilience Platform of the Enterprise Europe Network and the EU4Business Initiative.
- Within Ukraine, the Ukraine Cluster Alliance works on the **internationalisation of Ukrainian cluster** organisations and the role of cluster organisations in Ukraine's economic recovery. In this context, around 13 Memoranda of Cooperation have been signed with European partners, including the European Cluster Alliance.
- Within the Danube Transnational Programme, Ukrainian and Slovak actors have worked together on several **cross-regional projects** with 12 other partner countries in the 2014-2020 funding period. In the 2021-2027 funding period, the whole territory of Ukraine is eligible to participate in calls for proposals.

The following chapter aims at giving an overview of cluster support initiatives strengthening the internationalisation and capacity building of Slovak and Ukrainian organisations. Due to different support programmes being available for cluster organisations in Slovakia and Ukraine, the chapter will be divided into three sub-chapters. In the first part of this chapter, the involvement of Slovak cluster organisations in EU cluster support programmes, such as the European Strategic Cluster Partnerships and the Eurocluster, is given. The second part of this chapter will assess the internationalisation and capacity-building activities of the Ukrainian cluster organisation through activities of the Ukraine Cluster Alliance and in the context of international development aid such as cooperation and support from the EU Clusters Support Ukraine initiative of the ECCP and the EU4Business Initiative. In the third part of the chapter, a closer look will be put at cross-regional cluster activities in the macro-region through the Interreg Danube Transnational Programme of which Slovakia and Ukraine are part.

4.1 Slovak clusters in European network and support initiatives

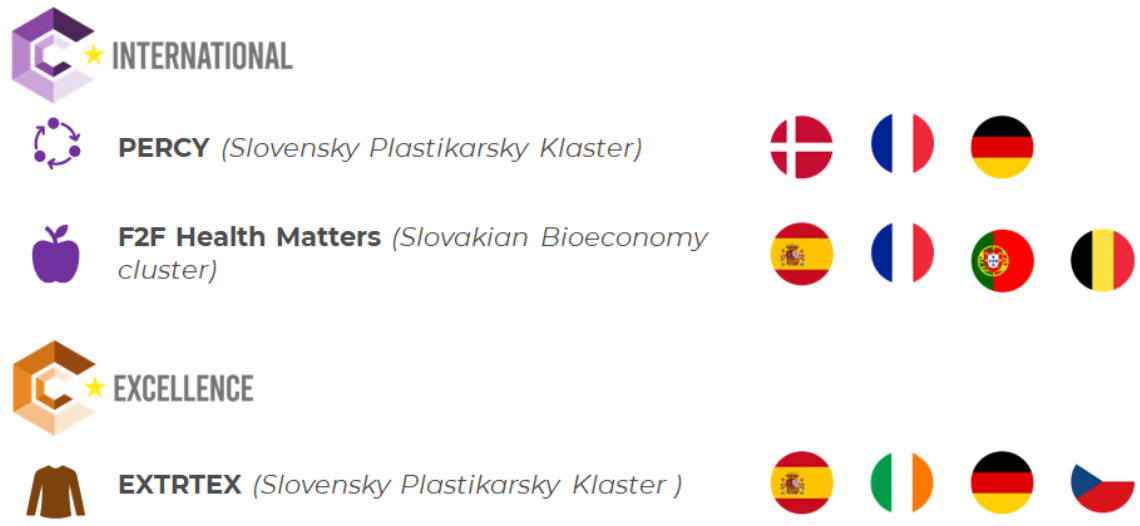
In the 2014-2020 funding period, one relevant EU support initiative to increase cross-border cooperation of EU cluster organisations and other intermediary organisations was the **European Strategic Cluster Partnership (ESCP) initiative** funded under the EU Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME). The ESCP initiative established partnerships between European clusters and intermediary organisations from the different EU Member States or associated countries. Those partnerships

focused on three different thematic areas which were internationalisation (ESCP for Going International), cluster excellence (ESCP for Excellence) and smart specialisation (ESCP for Smart Specialisation).[95]

In total, two cluster organisations from Slovakia participated in three different European Strategic Cluster Partnerships. The S*lovensky Plastikarsky Klaster* was involved in the ESCP-4x *EXTRATEX* with five partners coming from Spain, Czechia, Germany, and Italy. The project focused on the enhancement of the excellence of clusters by bringing together partners from different industrial sectors such as textile, transport, and sustainable materials.[96] The requested grant for the Slovak cluster within the project was €45,700.

Besides the participation in the EXTRATEX partnership, the S*lovensky Plastikarsky Klaster* was part of the ESCP-4i partnership *PERCY*. Together with partners from France, Germany and Denmark, the Slovak cluster organisation worked on an internationalisation strategy for recycling polymers. The targeted third countries of the partnership were India, Canada, the USA, and Israel. The requested grant of the Slovak cluster organisation was around €31,800.[97] Another ESCP-4i with Slovak cluster participation was the partnership *F2F Health Matters* in which the Slovak Bioeconomy Cluster was involved together with four partners from Spain, France, Portugal, and Belgium. The partnership focused on the topics such as healthy food, sustainable bio-based techno-functional ingredients and bio-solutions. Targeted third countries were Japan, South Korea, Vietnam, Canada and the United Arab Emirates. The requested grant of the Slovak Bioeconomy cluster was around €92,300.[98]

Figure 24: European Cluster Partnerships with the participation of Slovak clusters with the origin of cluster partners and thematic focus



Source: ECCP (2023) based on COSME data hub (data extracted in January 2023).

For the period 2021-2027, the European Commission has launched the implementation of the EU Industrial Strategy. In this context, so-called **Euroclusters** are funded under the Single Market Programme. The Eurocluster

[95] For more information on the European Cluster Partnerships see: https://clustercollaboration.eu/eu-cluster-partnerships (last access 31.01.2023).
[96] For more information on the ESCP EXTRATEX see: https://extratex.eu-vri.eu/home.aspx?lan=230&tab=3165&itm=3165&pag=3165#Objectives (last access on 31.01.2023).
[97] For more information on the ESCP-4i *PERCY* see: https://percy.spklaster.sk/ (last access on 31.01.2023).
[98] For more information on the ESCP-4i *F2F Health Matters* see: https://f2f-project.eu/ (last access on 31.01.2023).

initiative aims to support multi-sectoral, multi-regional European industrial clusters that cooperate with other economic actors such as enterprises or business organisations. In the current funding period, no Slovak cluster organisation is involved in a Eurocluster (as of January 2023).

4.2 Internationalisation and capacity building of Ukrainian clusters through cluster organisations

Since the start of the Russian aggression against Ukraine in February 2022, Ukraine has faced massive destruction of infrastructure, loss of life and displacement of Ukrainians. The European Union, together with other international partners, has stepped up its support to Ukraine through various emergency assistance measures (e.g. electricity, medicines, and shelter). In addition to the emergency response, the European Union has been working with Ukraine since before the war through existing cluster-based assistance programmes such as the EU4 Business Initiative. In order to provide an overview of existing and new cluster-related assistance and cooperation activities, the following sub-section presents a selection of ongoing cluster-related development assistance activities.

Immediate cluster-related support activities for Ukraine through the European Cluster Collaboration Platform

The EU Cluster Support Ukraine Forum is an online forum initiated by the European Commission and established by the European Cluster Cooperation Platform. Its objective is to improve the coordination of European industry to contribute to the delivery of humanitarian aid as well as to enhance support for refugees in Member States. Through the forum, European cluster organisations are enabled to share relevant information, offer assistance, find collaboration partners and assist procurement and delivery of urgently needed humanitarian requirements.[99] Moreover, the Enterprise Europe Network (EEN) supports humanitarian relief to Ukraine e.g. by widening its services to other target groups such as NGOs or humanitarian organisations. To tackle supply chain disruptions, the EEN has also set up an online platform called Supply Chain Resilience platform for better identification of supply chain disruptions and increased support to find subsidiary partners for SMEs having lost import or export markets in Ukraine, Russia or Belarus.[100]

Cluster-related support activities for Ukraine through the EU4Business project on SME competitiveness and internationalisation with cluster involvement

In the context of other existing cluster-related support activities for Ukraine, the EU has already started to support business development through the EU4Business Initiative before the beginning of the war. As one project of the activities of the EU4Business initiative in Ukraine, the German Federal company *Gesellschaft für Internationale Zusammenarbeit* (GIZ) has started to implement a project on the utilisation and implementation of the Association Agreement between the EU and Ukraine in the field of trade / EU4Business: SME Competitiveness and Internationalisation since June 2020.[101] The overall objective of the project is to improve support to SMEs by third parties, including clusters and chambers of commerce. Prior to the start of the war, the main focus of the project was to improve the conditions for Ukrainian companies to enter the EU market and increase their export capacity through training courses for SMEs and clusters and dialogue forums. Cluster

[99] For more information on the EU Clusters Support Ukraine Forum see: https://clustercollaboration.eu/content/eu-clusters-supporting-ukraine (last access on 08.02.2023)
[100] For more information on the Enterprise Europe Network support for Ukraine see: https://een.ec.europa.eu/eu-and-enterprise-europe-network-support-ukraine#_The_EU%E2%80%99s_wider (last access on 08.02.2023).
[101] For more information on the EU4Business projects in Ukraine see: https://eu4business.org.ua/en/ (last access on 10.02.2023).

organisations involved are/were the Publishing and Printing Cluster (Lviv), the West Ukrainian Fashion Industry Cluster (Lviv), the Kharkiv Light Industry and Design Cluster, the Kharkiv EAM Cluster, the Printing, Publishing and Digital Technologies Cluster (Dnipro) and the Zaprizhzhia EAM Cluster.

Due to the outbreak of war in Ukraine, the project's activities are now focused on emergency measures to save jobs, stabilise the Ukrainian economy and integrate displaced Ukrainians into local value chains and networks. In addition, the emergency response continues to provide support to SMEs, with a greater attempt to help enterprises diversify their business models.[102]

Upcoming EU funding calls for support to Ukrainian companies and clusters to integrate into the Single Market

To support Ukrainian clusters and companies to further develop their capacities, the European Commission has launched two calls for proposals under the collective name "ReadyForEU" with a budget of €7.5 million.[103] The first call “Support to Ukrainian companies to integrate into the Single Market” also referred to as “Business Bridge” and the second call “Erasmus for Young Entrepreneurs - Ukraine”. The purpose of these calls is to assist Ukrainian entrepreneurs and businesses in accessing the Single Market. Both calls are funded under the Single Market Programme.[104]

Support to Ukrainian companies to integrate into the Single Market

By restricting the action for Ukrainian SMEs based in Ukraine and Ukrainian-registered companies currently operating from EU, the objective of this call for proposal is to help Ukrainian SMEs to integrate into the single market.[105] Besides the named target group, EU businesses seeking alternative suppliers in Ukraine due to the loss of market opportunities in Russia and Belarus are eligible to apply.

The budget of the action is €4.5 million including €750.000 going towards a selected consortium and a minimum of €3.75 million dedicated to providing direct third-party support to Ukrainian SMEs.[106] A selected consortium (main beneficiary) will identify up to 1,500 Ukrainian companies that can benefit from direct support to integrate into the single market. It will establish a common secretariat to manage the implementation of this action, including calls for SMEs from a dedicated website, selection of SMEs, disbursement of third-party support, and publication of success stories.

Selected Ukrainian SMEs will receive a grant of up to €2,500 to cover expenses related to administrative costs, translation, legal advice, and joint venture set-up. As part of the call for proposal, it is aimed that the selected consortium will work with existing networks, such as the Enterprise Europe Network, ECCP, Ukrainian Cluster Alliance, and EYE Intermediary Organizations, to complement their successful initiatives. The overall objective is to modernize EU and Ukrainian industry by promoting a green, digital, and resilient economy. It is not intended

[102] For further information on involved Ukrainian cluster actors, please see Figure 40 in the Annex. Please be aware that the map shows the status before the start of the Russian aggression against Ukraine.
[103] For more information on the “ReadyForEU” calls see:
https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1224 (last access on 02.03.2023).
[104] Calls are launched in Q1 of 2023 after Ukraine joined the Programme on 2 February 2023
[105] The reason for launching a restricted call is to provide support to European and Ukrainian companies affected by the Russian military aggression in Ukraine.
[106] Co-financing rates of up to 100% are available for financial support to third parties and up to 90% for other costs. The call is expected to launch in Q1 of 2023, and its evaluation and grant signature are anticipated in Q2 of 2023. The action will then start in Q3 of 2023 and the expected duration of the action is 18 to 24 months.

to contribute to the brain drain from Ukraine to the EU, but instead to provide experience with the single market, support Ukrainian companies to return home, and create new opportunities for those with the capacity to go international. Additionally, closer integration with the EU is expected to improve access for European businesses to Ukrainian markets and alternative supplies.

Erasmus for Young Entrepreneurs

The "Erasmus for Young Entrepreneurs - Ukraine" is the second call under "ReadyForEU" with a budget of three million Euro. It will allow new Ukrainian entrepreneurs to gain experience in other European countries as part of the Erasmus for Young Entrepreneurs programme. This call aims to recruit 430 new Ukrainian entrepreneurs to be matched with host entrepreneurs in the EU. It will offer financial support to these entrepreneurs, as well as contributing to their living and travel expenses. Financial support to third parties, specifically new entrepreneurs, may receive a co-financing rate of up to 100% of eligible costs, while other cost categories may receive up to 90% of eligible costs. The financial assistance provided to new entrepreneurs, also known as Financial Support to Third Parties, will be in the form of a unit cost per month of exchange for a maximum duration of six months. It is planned to fund approximately five projects which have a maximum duration of 36 months.

Capacity building and internationalisation through activities of the Ukraine Cluster Alliance

Apart from the cooperation and capacity-building activities of the European counterpart, the Ukraine Cluster Alliance constantly works on broadening international networks and initiating cooperation with European and other international partners.

To strengthen international cooperation in times of crisis, the Ukrainian Cluster Alliance published a White Paper on “The Roles of clusters in times of crisis and in the country’s economic recovery” in January 2023.[107] To deepen international cooperation, UCA has signed around 13 Memorandum of Cooperation with European clusters and associations and joined relevant cluster networks such as the European Cluster Alliance, the TCI global cluster organisation, the International Business Council and the EIT Manufacturing innovation programme. According to the White Paper, these agreements help to further develop relationships with EU and US cluster partners. With some partners, e.g. Czechia and Poland, dedicated action plans are under development. Together with partners from Czechia, UCA developed e.g. a Ukraine-Czech bilateral agenda on Industry 4.0.

Other activities to foster international cooperation of the Ukrainian Cluster Alliance with international cluster partners consists also of the Ambassador of Industry4Ukraine platform. The initiative targets, besides others, representatives of cluster organisations temporarily abroad which are interested in supporting Ukrainian SMEs, research and universities during wartime. The main objectives of the initiative are to lobby for joint initiatives at the EU and EU Member State level, to promote the integration of Ukrainian SMEs and researchers into existing EU projects and to promote ongoing Ukrainian industry-related activities.

4.3 Capacity building and cross-regional activities in the Danube macro-region

Within the EU, different INTERREG programmes are providing funding to cross-territorial cooperation projects to strengthen the European Territorial Cooperation. In this context, Ukraine and Slovakia are both part of the Danube Transnational Programme (DTP) with 12 other partner countries. Other involved countries are Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Hungary, Moldova, Montenegro, Romania, Serbia, Slovenia

[107] Ukrainian Cluster Alliance (2023): Roles of clusters in times of crisis and in the country’s economic recovery. Available under: https://www.clusters.org.ua/en/blog-about-clusters/uca-white-book-5-roles-of-clusters/ (last access on 15.02.2023)

and Germany.[108] In the case of Ukraine and Germany, only some regions are involved in the INTERREG programme.[109] In the 2014-2020 funding period, 1,597 project participations from different beneficiaries types such as public authorities, NGOs and regional development agencies coming from the 14 participating countries can be counted in the following four priority areas:

- Innovative and socially responsible Danube Region
- Environnent and culture responsable Danube Region
- Better connected and energy-responsible Danube Region
- Well-governed Danube Region

In the 2014-2020 funding period, **20 Ukrainian organisations from four Ukrainian regions** (Kyiv City, Kirovograd, Odesa, Transcarpathia and Ivano-Frankisvs'k) and **110 Slovak organisations** participated in projects of the Danube Transnational Programme. While five projects with Ukrainian project participation were on increasing competencies for business and social innovation, three projects with Ukrainian project participation focused on the improvement of framework conditions for innovation. Other project participation of Ukrainian and Slovak organisations were in the field of the environmental heritage of the Danube region, the better connection and energy responsibility as well as improvement of governance in the Danube region. **Participants from Ukraine** were mostly public (local) authorities like the Ministry of Education and Science or the City of Ivano-Frankivsk, non-governmental organisations like the NGO Youth Space, research institutes like the Institute of Market Problems and Economic-Ecological Research of NAS Ukraine or network organisations like the agency for sustainable development of Carpathian region.

The "Danube S3 Cluster" - Transnational Cluster Cooperation active on Agri-food, based on Smart Specialization Approach in the Danube region (July 2018 – December 2021)[110]

Under the priority "Innovative and socially responsible Danube region", the project focused on the development of cluster cooperation policies based on the smart specialisation concept to boost the innovation ecosystem in the Danube region. The main objective of the 16 involved project partner led by the South Muntenia Regional Development Agency (RO) was the development and coordination of cluster policies by initiating cluster cooperation in the agro-food sector. Involved organisations from Slovakia and Ukraine were the Bioeconomy cluster (SK), the Institute of Market Problems and Economic-Ecological Researches of National Academy of Science of Ukraine (UA) and National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (UA). The main output of the project was the Danube S3 Cluster Strategy.[111]

Source: ECCP (2023) based on Danube S3 Cluster – project website.

[108] For more information on the Danube Transnational Programme (DTP) see: https://interreg.eu/programme/interreg-danube-transnational-programme/ (last access on 15.02.2023)
[109] In the case of Ukraine, involved regions are Chernivetska Oblast, Ivano-Frankiviska Oblast, Zakarpatska Oblast and Odessa Oblast. German regions participating in the INTERREG programme are Baden-Württemberg and Bavaria.
[110] For more information on the Danube S3 Cluster see project website: https://www.interreg-danube.eu/approved-projects/danube-s3-cluster/partners (last access on 15.02.2023).
[111] The Danube S3 Cluster Strategy is available under: https://www.interreg-danube.eu/uploads/media/approved_project_output/0001/40/d62523fcac96bbf51646906e2fc7c55726a9ca76.pdf (last access on 15.02.2023).

In the 2021-2027 funding period, the **Danube Transnational Programme** continue its activities. While all participating countries remain the same, the entire territory of Ukraine can in the current funding period participate in the call for proposals. The new thematic priorities are:

- A smarter Danube Region
- A greener low-carbon Danube Region
- A more social Danube Region
- A better cooperation governance Danube Region

The first call for projects has taken place in November 2022 and was in February 2023 in the evaluation and project selection process. The average budget is expected to range between €1.5 to €2.5 million.[112]

[112] For more information see: https://www.interreg-danube.eu/about-dtp (last access on 15.02.2023).

05

Outlook: Building on the potential for interregional cooperation

5. Outlook: Building on the potential for interregional cooperation

Overview of key findings

- **Smart Specialisation Strategies** (S3) offer a profound foundation for interregional cooperation. The Ukrainian regions have started to develop S3 before the war. These Ukrainian S3 cover a wide range of topics, which are also relevant to the previously identified 9 key industrial ecosystems for further cooperation between the EU and Ukraine. Since the greatest cooperation potential can often be found in priorities that address the same overarching priority areas, several regions in Slovakia and the macro-region are identified that address the same overarching priority areas as their Ukrainian counterparts.
- More than **120 cluster organisations** in Slovakia and the macro-region have been identified that operate in the 9 key industrial ecosystems and that have indicated interest for international collaboration. These cluster organisations provide promising potential for further integration of Ukrainian cluster organisations and enterprises into EU value chains. The list of these cluster organisations can serve as practical orientation for the identification of suitable partners for collaboration.
- All in all, Slovakia, the macro-region and Ukraine provide **substantial potential for further cooperation and economic integration** on different levels. With this potential and through the support of cluster organisations in their important role in industrial ecosystems, the economic impact of the Russian aggression against Ukraine can be alleviated through the reorganisation and building of new value chains between the EU and Ukraine.

The previous sections have provided information on thematic areas where there is potential for interregional cooperation and the integration of Ukrainian clusters and companies into the EU value chains. This chapter complements these assessments with an assessment of regions and specific actors (i.e. cluster organisations) that provide potential for interregional cooperation. To pursue this objective, the first step is to examine the potential for interregional cooperation through Smart Specialisation Strategies (S3), as S3 is a place-based approach that builds on the assets and capabilities of regions. Based on this consideration, regions with similar innovation priorities in Slovakia, the macro-region and Ukraine are identified. This is followed by an examination of cluster organisations in Slovakia, the macro-region and Ukraine that operate in similar industrial ecosystems and thus offer potential for interregional cooperation.

5.1 Interregional cooperation through Smart Specialisation Strategies (S3)

There are strong links between the concepts of clusters and Smart Specialisation Strategies (S3), as both concepts share the facilitation of economic growth and competitiveness through regional proximity as key elements.[113] In this process, cluster organisations play for instance central role in the Entrepreneurial

[113] European Commission (2013): The role of clusters in smart specialisation strategies. Available under: https://op.europa.eu/en/publication-detail/-/publication/2fe44194-e5a8-42b7-ac14-9c9b8e157de3 (last access on 02.02.2023); OECD (2016): OECD Science, Technology and Innovation Outlook 2016 – Cluster Policy and Smart Specialisation. Available under: https://www.oecd-ilibrary.org/docserver/sti_in_outlook-2016-28-en.pdf?expires=1628167848&id=id&accname=guest&checksum=54667669BA762145CD40965A391C05BE (last access on 02.02.2023)

Discovery Process (EDP)[114] and act as an effective mechanism in establishing a continuous involvement of the private sector in the EDP.[115] The model of Strategic Research and Innovation Partnerships (SRIPs) in Slovenia can be highlighted as a good practice of cluster involvement in S3. There, priority areas are implemented through one SRIP per priority area and constitute long-term partnerships between different actors such as the business communities, research organisations and the state.

Interregional cooperation is highly relevant to the S3 concept since exchanges and spill-overs are important prerequisites for innovation.[116] A recent study by Prognos/CSIL (2022) concludes that the Smart Specialisation Strategies in the EU provide a rich basis for interregional cooperation and that the priority areas of the S3 correspond to complementary knowledge assets.[117] Based on these considerations, the following sections will first present the S3 priority areas of Ukrainian regions and outline the potential for interregional cooperation based on priority areas addressed by S3 in Slovakia and the macro-region. A key element for this analysis of the priority areas of Slovakia and the macro-region in 2014-2020 is the data collected in the "Study on prioritisation in Smart Specialisation Strategies in the EU".[118]

S3 priority areas of Slovakia

In Slovakia, the innovation strategy, which defines strategic priorities, is prepared at the national level. It identifies **five priority** areas of the Slovak Smart Specialisation Strategy for the 2014-2020 funding period. These priority areas are shown in Figure 25 and range from priorities related to digitalisation to health and automotive. Although these priority areas have been identified for the 2014-2020 funding period, they are also relevant for the 2021-2027 funding period, as some consistency in regional strengths can be expected. This is also the case for Slovakia, as the draft "Research and Innovation Strategy of the Slovak Republic 2021-2027"[119] also includes five priority areas, which thematically correspond to the priorities of the 2014-2020 funding period.

[114] The entrepreneurial discovery is an interactive and inclusive process in which the relevant actors identify new and potential activities and inform the government. The government assess this information and empowers those actors most capable of realising the potential. See https://s3platform.jrc.ec.europa.eu/edp (last access on 13.01.2023)

[115] Prognos /CSIL (2021): Study on prioritisation in Smart Specialisation Strategies in the EU. Study on behalf of the European Commission. Available under: https://ec.europa.eu/regional_policy/en/information/publications/studies/2021/study-on-prioritisation-in-smart-specialisation-strategies-in-the-eu (last access on 13.01.2023)

[116] JRC (2021): Interregional Cooperation and Smart Specialisation: a Lagging Regions Perspective. Available online: https://publications.jrc.ec.europa.eu/repository/handle/JRC124118 (last access on 04.02.2023)

[117] Prognos /CSIL (2022): Analysis of key parameters of smart specialisation strategies (S3). Study on behalf of the European Commission. Available under: https://op.europa.eu/en/publication-detail/-/publication/3026007b-8be2-11ed-999b-01aa75ed71a1/language-en/format-PDF/source-279324673 (last access on 24.01.2023)

[118] Prognos /CSIL (2021): Study on prioritisation in Smart Specialisation Strategies in the EU. Study on behalf of the European Commission. Available under: https://ec.europa.eu/regional_policy/en/information/publications/studies/2021/study-on-prioritisation-in-smart-specialisation-strategies-in-the-eu (last access on 13.01.2023)

[119] Ministry of Investment, Regional Development and Informatization of the Slovak Republic (2021): Research and Innovation Strategy of the Slovak Republic 2021-2027 (Draft). Available online: https://www.mirri.gov.sk/wp-content/uploads/2018/10/Research-and-innovation-strategy-for-smart-specialisation-of-the-Slovak-Republic-2021-2027.pdf (last access 17.02.2023)

Figure 25: Priority areas of Slovakia in the S3 2014-2020

Source: ECCP (2023), based on Prognos /CSIL (2021).

S3 priority areas of Ukrainian regions

Several regions in Ukraine began developing S3 before the war. From initially three pilot regions (Zaporizhia, Kharkiv, and Odesa regions), this approach was supposed to be scaled-up to 25 regions.[120] In 2019, all Ukrainian regions have started working on the development of S3 priorities as part of their regional development strategies and have included a broad range of actors (e.g., from the research sector) in the process. However, the new Russian military aggression since February 2022 has impeded the process of S3 in Ukraine (especially with regard to the EDP and the development of transformative roadmaps). It also needs to be emphasised that not only the S3 is a rather new concept for Ukraine regions but that also the Russian military aggression can be expected to have severe implications for Smart Specialisation in Ukraine. For instance, the Kharkiv region in eastern Ukraine was one of the first Russian targets in the invasion in 2022 and faces massive destruction from Russian attacks.[121] It can be expected that this has fundamental implications for the regional (production) capacities.

In the following, the information provided on the S3 Platform[122] as well as information from the Ukrainian Institute for economics and forecasting[123] serve as the main basis for the analysis. Figure 26 provides an overview of the (pre-war) priority areas of the 25 regions in Ukraine. No priority areas are available for Crimea due to the illegal Annexation of Russia in 2014. Here, the number of priority areas varies between the Ukrainian regions. While for Lviv seven priority areas are identified, there is only one priority area available for the region of Donetsk. From a thematic perspective, it can be highlighted that the **priority areas of those regions address a wide range of topics** since these priority areas can be linked to seven overarching topics. These topics range from Agrofood & Bioeconomy over Health & Life Sciences to Tourism, Cultural & Creative Industries. Moreover, these priority areas of the Ukrainian regions also show profound links to key objectives like the **Twin Transition** since the priority areas can thematically be linked to the Digital Transition (e.g., ICT & Industry 4.0) and especially the Green Transition (e.g., Agrofood & Bioeconomy, Energy & Energy Storage). Moreover, the S3 priority areas of the Ukrainian regions correspond to many value chains of the previously identified key industrial ecosystems for further cooperation between the EU and Ukraine (e.g., “Agri-Food”, “Digital”, “Health” or “Textile”).

[120] see https://s3platform.jrc.ec.europa.eu/ukraine (last access 02.02.2023) and Alla Ivashchenko et al. (2020): Regional smart specialization in Ukraine: JRC methodology applicability. Available under: https://www.researchgate.net/publication/347845841_Regional_smart_specialization_in_Ukraine_JRC_methodology_applicability/fulltext/5ff50e53299bf1408874e6ae/Regional-smart-specialization-in-Ukraine-JRC-methodology-applicability.pdf?origin=publication_detail (last access 02.02.2023)

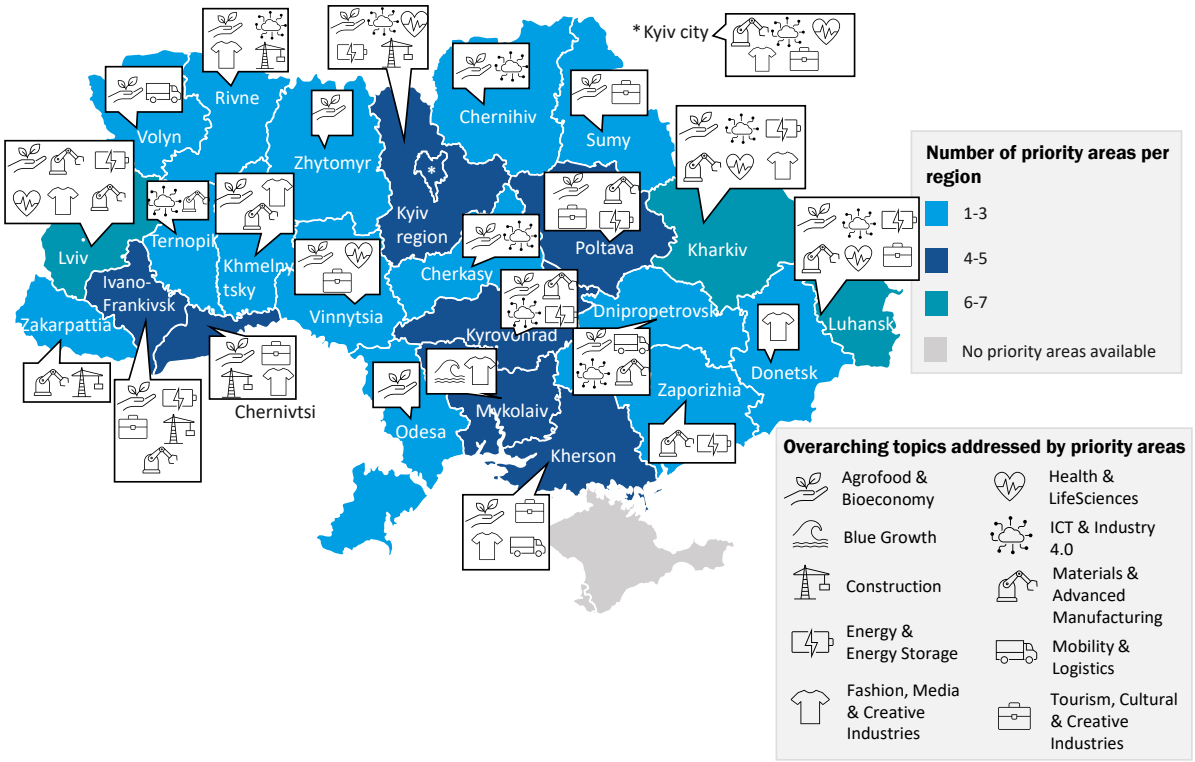
[121] https://www.dw.com/en/rebuilding-kharkiv-after-the-war-an-opportunity-to-modernize/a-64534117 (last access 10.03.2023)

[122] https://s3platform.jrc.ec.europa.eu/map (last access 15.02.2023)

[123] http://ief.org.ua/?lang=en (last access 13.03.2023)

This can be complemented by a JRC report on Smart Specialisation in the Eastern Partnership countries.[124] This report identifies the economic and innovation specialisation (prior to the war) of Ukraine in sectors related to food, wood, and metal products as well as machinery & equipment and manufacturing of motor vehicles. For science and technology specialisations the report by the JRC identifies domains related to health, energy, biotechnology, transportation, mechanical engineering as well as nanotechnology and materials The report identifies the domain "Software" as an innovative and dynamic niche for Ukraine.

Figure 26: Tentative overview of the number priority areas and their addressed overarching topics in the Ukraine



Source: ECCP (2023), own elaboration based on the S3 Platform (https://s3platform.jrc.ec.europa.eu/map, (last access 14.02.2023) and information from the Ukrainian Institute for economics and forecasting. Note: overarching topics addressed by the S3 priority areas have been established in the Study on prioritisation in Smart Specialisation Strategies in the EU; Ukrainian priorities have been assigned manually. See Table 5 in the Annex for a detailed overview.

Potential for interregional cooperation between Slovakia, the macro-region & Ukraine based on S3 priority areas

As mentioned above, there is a vast potential for interregional cooperation based on S3 and their priority areas. Moreover, a recent study shows that the largest cooperation potential can often be found in priorities that share thematic proximity.[125] Therefore, this input paper provides information on **regions and S3 in Slovakia and the macro-region that address the same overarching priority areas as the S3 of the Ukrainian regions** mentioned before. Based on these considerations, for each of the overarching priority areas, several priority areas in different Member States in the macro-region were identified (see

[124] JRC (2022): Smart Specialisation in the Eastern Partnership countries Potential for knowledge-based economic cooperation. JRC Technical Report. Available online: https://s3platform.jrc.ec.europa.eu/documents/20125/619532/JRC128524_01.pdf/5d94e925-771e-f9ab-a20d-636146365609?t=1668172026399 (last access 15.02.2023)

[125] Prognos /CSIL (2022): Analysis of key parameters of smart specialisation strategies (S3). Study on behalf of the European Commission. Available under: https://op.europa.eu/en/publication-detail/-/publication/3026007b-8be2-11ed-999b-01aa75ed71a1/language-en/format-PDF/source-279324673 (last access on 24.01.2023)

Table 6 to Table 15 in the Annex for a detailed overview of the regions by overarching priority area). For example, the Ukrainian region Lviv with its priority area "Agriculture & Agro-industrial complex, food industry, Bioeconomics" could potentially collaborate with more than 30 regions in Slovakia and the macro-region whose priority areas address the same overarching priority area (e.g., the national Slovak strategy and its priority area "Healthy food and environment" or the Romanian region South-West Oltenia with the priority area "Agriculture and food industry"). Other areas of collaboration potential include, for instance, the priority area "IT Industry" of Kyiv and the S3 priority " Information and communication technologies" of the Polish region Dolnośląskie. Again, it should be emphasised that this potential for cooperation is based on pre-war information on Ukrainian regions and is therefore likely to be affected by the war, as mentioned above.

5.2 Potential for cluster cooperation in Slovakia & the macro-region and Ukraine

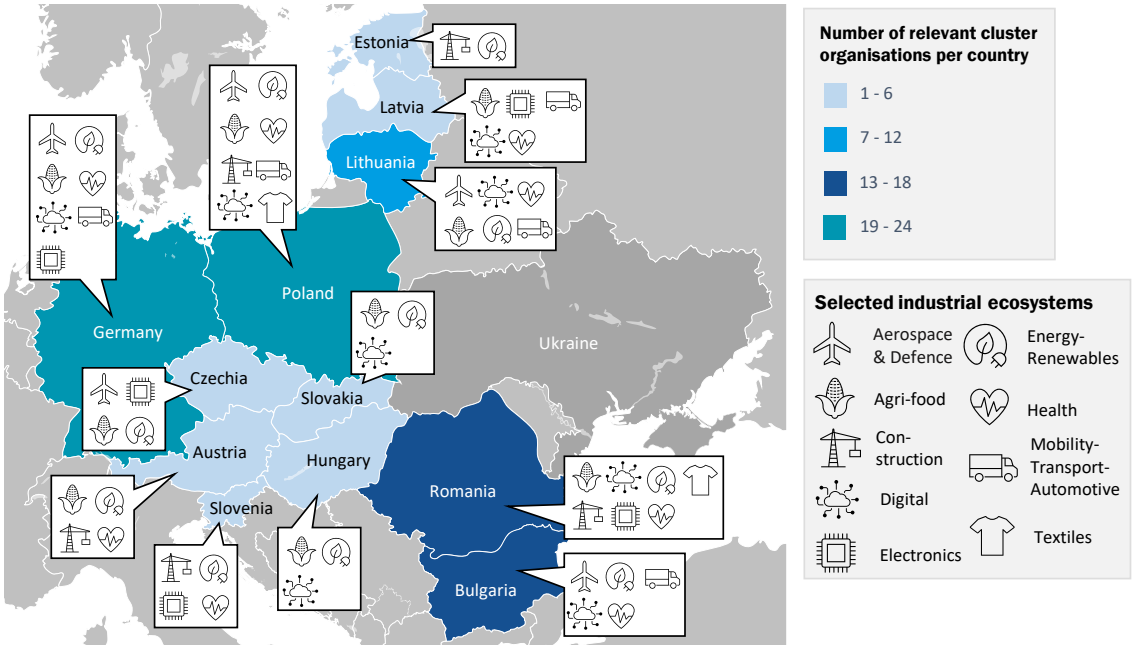
This analysis of the potential for interregional cooperation from a regional perspective in Section 5.1 is now complemented with an **analysis of the potential for interregional cooperation through cluster organisations**. As outlined above, the concept of cluster policy and smart specialisation are closely intertwined. Against this background, this section complements the previous assessment of interregional cooperation through S3 with an assessment of the potential for cluster cooperation between the macro-region including Slovakia and Ukraine. It identifies specific cluster organisations active in the previously identified nine industrial ecosystems that can be key areas for further cooperation between the EU and Ukraine. To estimate this potential for cluster collaboration in the macro-region including Slovakia and Ukraine, this assessment builds on the analysis started in Chapter 3. Here, information is provided on the cluster organisations operating in the nine identified key industrial ecosystems, which are in the focus of this Input Paper, and which have indicated on the ECCP that they are looking for international collaboration.

In total, **124 cluster organisations** in the macro-region and Slovakia are identified through this process. Figure 27 below shows the number of cluster organisations per country in the macro-region (incl. Slovakia) that are active in one of the nine industrial ecosystems previously identified and have provided the information in the ECCP that they are looking for international cooperation. Looking at the results, we can distinguish four groups:

1. The greatest opportunities are offered by the German (24) and Polish (23) cluster landscapes, which represent the two largest economies in the macro-region and an already well integrated system of supply chains. The ecosystems where most cluster organisations are active are "Mobility-Transport-Automotive" (11 cluster organisations), "Health" (10 cluster organisations), and "Digital" (9 cluster organisations).
2. To the south, Romania (18 cluster organisations) and Bulgaria (15 cluster organisations) represent the second largest cluster grouping. Its industrial ecosystems where most cluster organisations are active are "Digital" (16 cluster organisations), "Energy-Renewables" (6 cluster organisations), and "Health" (4 cluster organisations).
3. To the west, the group of Austria (5 cluster organisations), Czechia (6 cluster organisations), Hungary (4 cluster organisations), Slovakia (6 cluster organisations), and Slovenia (4 cluster organisations) account together for 25 relevant cluster organisations. The industrial ecosystems with most active cluster organisations are "Energy-Renewables" (6 cluster organisations), "Digital" (5 cluster organisations), and "Agri-food" (4 cluster organisations).
4. The Baltic group accounts for 19 cluster organisations in total and are led by Lithuania (12 cluster organisations) followed by Latvia (7 cluster organisations) and Estonia (2 cluster organisations). The industrial ecosystems where the most cluster organisations are active are "Digital" (6 cluster organisations), "Health" (3 cluster organisations), and "Agri-food" (3 cluster organisations).

A comprehensive list of all relevant cluster organisations sorted by industrial ecosystem can be found in Table 4 in the Annex. As outlined in Section 3.3, finding partners in other industrial sectors and/or regions are key for organising and rebuilding regional supply chains. Hence, this overview can serve as a starting point for **identifying suitable partners for collaboration** in Slovakia, Ukraine and the macro-region.

Figure 27: Map of all cluster organisations in Slovakia and the macro-region that are active in the identified key industrial ecosystems and indicated interest for internationalisation



Source: ECCP (2023), own elaboration based on https://reporting.clustercollaboration.eu/all (last access 07.02.2023). The underlying data is presented in Table 3 in the Annex

In conclusion, based on this assessment of the potential for interregional cooperation through smart specialisation strategies and cluster organisations, there is **considerable potential for further cooperation** between Ukraine, Slovakia, and the wider macro-region, and thus for further integration of Ukrainian cluster organisations and enterprises into EU value chains. In this context, initiatives included in the newly adopted Single Market Programme for 2023-2024[126] and related calls[127], which aim at facilitating the integration of Ukrainian SMEs into the European market play an important role in strengthening the economic ties between the EU and Ukraine.

[126] see https://commission.europa.eu/system/files/2023-02/C_2023_1119_F1_ANNEX_EN_V3_P1_2487751.PDF (last access 01.03.2023)

[127] see https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/smp-cosme-2023-smeua-01;callCode=null;freeTextSearchKeyword=;matchWholeText=true;typeCodes=1,0;statusCodes=31094501,31094502,31094503;programmePeriod=2021%20-%202027;programCcm2Id=43252476;programDivisionCode=null;focusAreaCode=null;destinationGroup=null;missionGroup=null;geographicalZonesCode=null;programmeDivisionProspect=null;startDateLte=null;startDateGte=null;crossCuttingPriorityCode=null;cpvCode=null;performanceOfDelivery=null;sortQuery=sortStatus;orderBy=asc;onlyTenders=false;topicListKey=topicSearchTablePageState (last access 01.03.2023) and https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/smp-cosme-2023-eyeua-01;callCode=null;freeTextSearchKeyword=;matchWholeText=true;typeCodes=1,0;statusCodes=31094501,31094502,31094503;programmePeriod=2021%20-%202027;programCcm2Id=43252476;programDivisionCode=null;focusAreaCode=null;destinationGroup=null;missionGroup=null;geographicalZonesCode=null;programmeDivisionProspect=null;startDateLte=null;startDateGte=null;crossCuttingPriorityCode=null;cpvCode=null;performanceOfDelivery=null;sortQuery=sortStatus;orderBy=asc;onlyTenders=false;topicListKey=topicSearchTablePageState (last access 01.03.2023)

Bibliography

Alla Ivashchenko et al. (2020): Regional smart specialization in Ukraine: JRC methodology applicability. Available under: https://www.researchgate.net/publication/347845841_Regional_smart_specialization_in_Ukraine_JRC_methodology_applicability/fulltext/5ff50e53299bf1408874e6ae/Regional-smart-specialization-in-Ukraine-JRC-methodology-applicability.pdf?origin=publication_detail (last access 02.02.2023)

Dermastia, M. et al (2022): Impacts and Potentials of the Ukraine Crisis on Supply Chains Development for the Danube Region. Available online: https://www.researchgate.net/profile/Gerd-Meier-Zu-Koecker/publication/362175408_Impacts_and_Potentials_of_the_Ukraine_Crisis_on_Supply_Chains_Development_for_the_Danube_Region/links/62da8692f3acdd5dc20e4805/Impacts-and-Potentials-of-the-Ukraine-Crisis-on-Supply-Chains-Development-for-the-Danube-Region.pdf?origin=publication_detail (last access 21.02.2023)

Cabinet of Ministers of Ukraine (2019): Strategy for the development of the sphere of innovation activity until 2030 ("Innovation Development Strategy 2030"). https://zakon.rada.gov.ua/laws/show/en/526-2019-%D1%80?lang=uk#Text (in Ukrainian, last access 13.03.2023)

Cabinet of Ministers of Ukraine (2021): National Economic Strategy 2030. https://www.kmu.gov.ua/npas/pro-zatverdzhennya-nacionalnoyi-eko-a179 (in Ukrainian; last access 22.02.2022)

Cabinet of Ministers of Ukraine (2021): National Strategy for Regional Development 2021-2027. https://zakon.rada.gov.ua/laws/show/695-2020-%D0%BF#Text (in Ukrainian, last access 23.02.2023)

ECCP (2020): Responding to COVID19: The role of clusters in supply chain adjustments. Available online: https://clustercollaboration.eu/sites/default/files/WYSIWYG_uploads/dp2_supply_chains_final.pdf (last access 21.02.2023)

ECCP (2021): European Cluster Panorama Report 2021. Available under: https://clustercollaboration.eu/sites/default/files/2021-12/European_Cluster_Panorama_Report_0.pdf (last access 10.01.2023)

ECCP (2022): Report on the survey Identification of disruptions in value and supply chains. Available online: https://clustercollaboration.eu/sites/default/files/news_attachment/Report%20on%20the%20survey%20Identification%20of%20disruptions%20in%20value%20and%20supply%20chains.pdf (last access 21.02.2023)

ECCP (2022): Report on the survey "Solutions to Supply Chain Disruptions in the EU". Available online: https://clustercollaboration.eu/sites/default/files/document-store/ECCP_SC_Disruptions_Report_final.pdf (last access 21.02.2023)

European Cluster Observatory (2014): Cluster Collaboration and Business Support Tools to Facilitate Entrepreneurship, Cross-sectoral Collaboration and Growth. Available under: https://clustercollaboration.eu/sites/default/files/eu_initiatives/cluster-collaboration-and-business-

support-tools-to-facilitate-entrepreneurship-cross-sectoral-collaboration-and-growth_en_0.pdf (last access 21.02.2023)

European Commission (2013): The role of clusters in smart specialisation strategies. Available under: https://op.europa.eu/en/publication-detail/-/publication/2fe44194-e5a8-42b7-ac14-9c9b8e157de3 (last access on 02.02.2023)

European Commission (2022): Decoupling from Russia – Monitoring supply chains adjustment in the EU. Single Market Economics Papers. Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)

Institute for Economic Research & Policy Consulting (2022): New Monthly Enterprises Survey. Ukrainian Business in Wartime. Issue 8 (December 2022). Available online http://www.ier.com.ua/files/Projects/2023/TDF/%D0%B0%D0%BD%D0%B3%D0%BB_%D0%B7%D0%B2%D1%96%D1%82.pdf (last access 22.02.2023)

Institute for Economic Research & Policy Consulting (2023): Monthly Economic Monitoring of Ukraine (February 2023). Available online http://www.ier.com.ua/files/Projects/2023/%D0%9C%D0%95%D0%9C%D0%A3/MEMU%20Feb%202023%20En.pdf (last access 22.02.2023)

JRC (2022): Smart Specialisation in the Eastern Partnership countries Potential for knowledge-based economic cooperation. JRC Technical Report. Available online: https://s3platform.jrc.ec.europa.eu/documents/20125/619532/JRC128524_01.pdf/5d94e925-771e-f9ab-a20d-636146365609?t=1668172026399 (last access 15.02.2023)

Khan, M. and Akbar, M. (2013): The Impact of Political Risk on Foreign Direct Investment. Available online: https://mpra.ub.uni-muenchen.de/47283/ (last access 15.02.2023)

Ministry of Investment, Regional Development and Informatization of the Slovak Republic (2021): Research and Innovation Strategy of the Slovak Republic 2021-2027 (Draft). Available online: https://www.mirri.gov.sk/wp-content/uploads/2018/10/Research-and-innovation-strategy-for-smart-specialisation-of-the-Slovak-Republic-2021-2027.pdf (last access 17.02.2023)

Movchan, V. & Rogoff, K. (2022): International trade and foreign direct investment. In Rebuilding Ukraine: Principles & Policies. Available online: https://scholar.harvard.edu/files/rogoff/files/movchan_and_rogoff_international_trade_and_foreign_direct_investment_with_book_cover.pdf (last access 21.02.2023)

OECD (2002): Foreign Direct Investment for Development. Available online: https://www.oecd.org/investment/investmentfordevelopment/1959815.pdf (last access 15.03.2023)

Prognos /CSIL (2021): Study on prioritisation in Smart Specialisation Strategies in the EU. Study on behalf of the European Commission. Available under: https://ec.europa.eu/regional_policy/en/information/publications/studies/2021/study-on-prioritisation-in-smart-specialisation-strategies-in-the-eu (last access on 13.01.2023)

Prognos /CSIL (2022): Analysis of key parameters of smart specialisation strategies (S3). Study on behalf of the European Commission. Available under: https://op.europa.eu/en/publication-detail/-/publication/3026007b-8be2-11ed-999b-01aa75ed71a1/language-en/format-PDF/source-279324673 (last access on 24.01.2023)

OECD (2016): OECD Science, Technology and Innovation Outlook 2016 – Cluster Policy and Smart Specialisation. Available under: https://www.oecd-ilibrary.org/docserver/sti_in_outlook-2016-28-en.pdf?expires=1628167848&id=id&accname=guest&checksum=54667669BA762145CD40965A391C05BE (last access on 02.02.2023)

OECD (2022): International investment implications of Russia's war against Ukraine. Available online: https://www.oecd-ilibrary.org/finance-and-investment/international-investment-implications-of-russia-s-war-against-ukraine_a24af3d7-en (last access 15.02.2023)

Ukrainian Cluster Alliance (2022): Draft National Cluster Development Programme 2027. https://www.clusters.org.ua/blog-single/proyekt-naczionalnoyi-programy-klasternogo-rozvytku-do-2027/ (in Ukrainian; last access 22.02.2023)

Annex

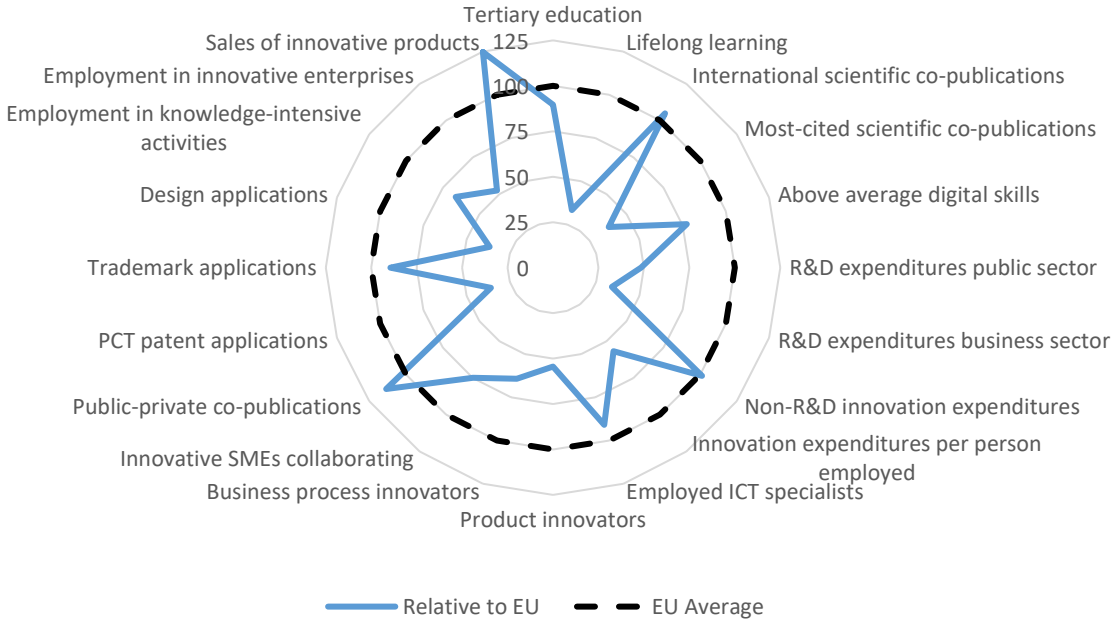
Innovation levels in Slovakia, Ukraine and the macro-region

As a fundamental pillar of the assessment of the innovation levels, we look at the level of innovativeness in Slovakia and Ukraine on a country-level via the European Innovation Scoreboard (EIS) in the following. This performance scoring is constituted by a total of 32 indicators subcategorised under 12 “Innovation dimensions”.

Slovakia

According to the most recent available data of the European Innovation Scoreboard, Slovakia can be classified as an “Emerging Innovator” meaning it scores below the EU average. In terms of the innovation dimensions, the country seems to only perform better in sales impact relative to the EU average. This is particularly reflected in the innovation indicator “sales of innovative products”. Apart from this indicator, Slovakia also performs above average in areas like “Public-private co-publications” and “Non-R&D innovation expenditures”. Overall, while Slovakia has strength in sales of innovations, digitalization, and use of ICTs, there is still room for improvement in other areas to improve its innovation performance.

Figure 28: Innovation Performance of Slovakia in the European Innovation Scoreboard (2021)



Source: European Commission (2022): European Innovation Scoreboard 2022

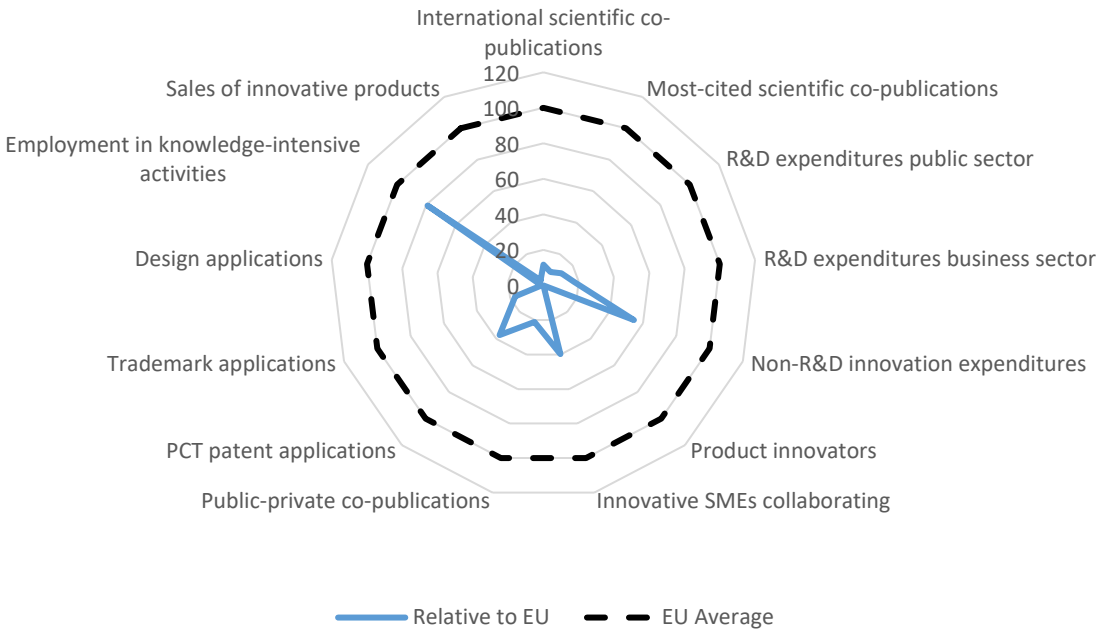
Ukraine

Based on the innovation performance of Ukraine, the 2022 European Innovation Scoreboard classifies it as an "Emerging Innovator". However, despite being in the same category, Ukraine's summary innovation index score of 33 is significantly lower than that of Slovakia, which highlights its suboptimal innovation performance relative to other countries in Europe. This lower performance is particularly apparent in the dimensions of "Linkages," "Intellectual Assets," and "Innovators". R&D expenditures in both the business and public sectors have experienced a decline, leading to values of 17.4% and 12.2% of the EU average,

respectively (See Figure 29). On the other hand, the indicator for product innovators has a value of zero after dropping by 6.9 percentage points compared to the previous year.

Nevertheless, the European Innovation Scoreboard also identifies strengths of the Ukrainian innovation ecosystem. Notably, Ukraine performs well in the dimension of "Employment Impacts", with a high rating for knowledge-intensive activities, standing at 79.2% relative to the EU average. This finding underscores a skilled workforce and suggests potential for future development. Furthermore, Ukraine has venture capital expenditures close to the EU average, with a value of 88% relative to the EU average. Additionally, compared to other indicators, starting a business in Ukraine is relatively easy, which may positively impact the country's innovation ecosystem. In summary, while there are areas for improvement, Ukraine's strengths provide a solid foundation for continued growth and advancement in the innovation domain.

Figure 29: Innovation Performance of Ukraine in the European Innovation Scoreboard (2022)



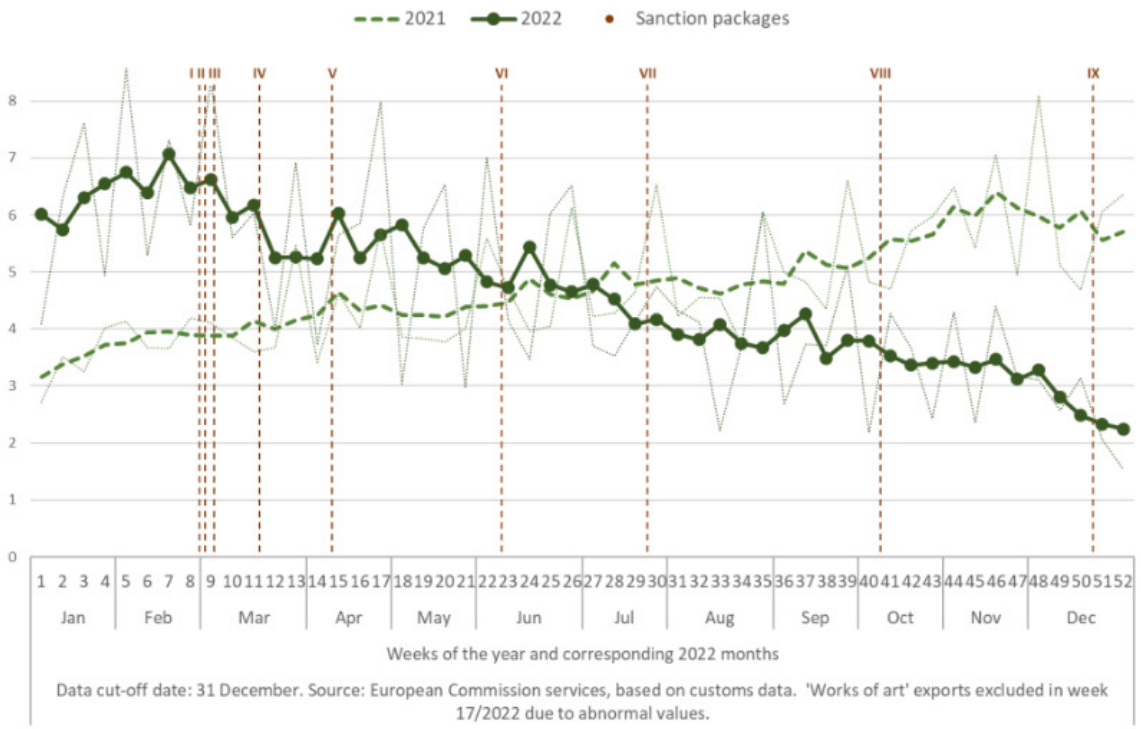
Source: European Commission (2022): European Innovation Scoreboard 2022

Macro-region

The macro-region is composed of a mix of “Strong Innovators”, “Moderate Innovators”, and “Emerging Innovators”. Germany and Austria are the two countries belonging to the macro-region that are classified as “Strong Innovators” meaning their innovation performance score is above the EU average which can be traced to high values across dimensions, such as “Linkages” and “Innovators”. Czechia and Slovenia in the Danube region, and Estonia and Lithuania in the Baltic Sea region are considered “Moderate Innovators”, performing near the EU average. Innovation performance becomes weaker downstream the Danube River, with countries like Bulgaria and Romania performing comparatively lower, thus being considered “Emerging Innovators”.

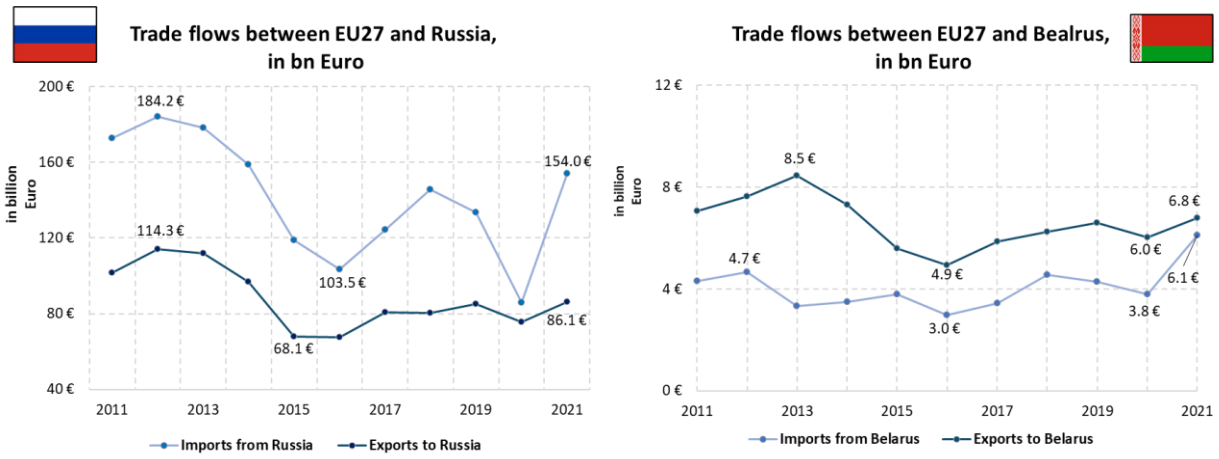
Development of import and export

Figure 30: Weekly trade flows between the EU and Russia, 2021 and 2022



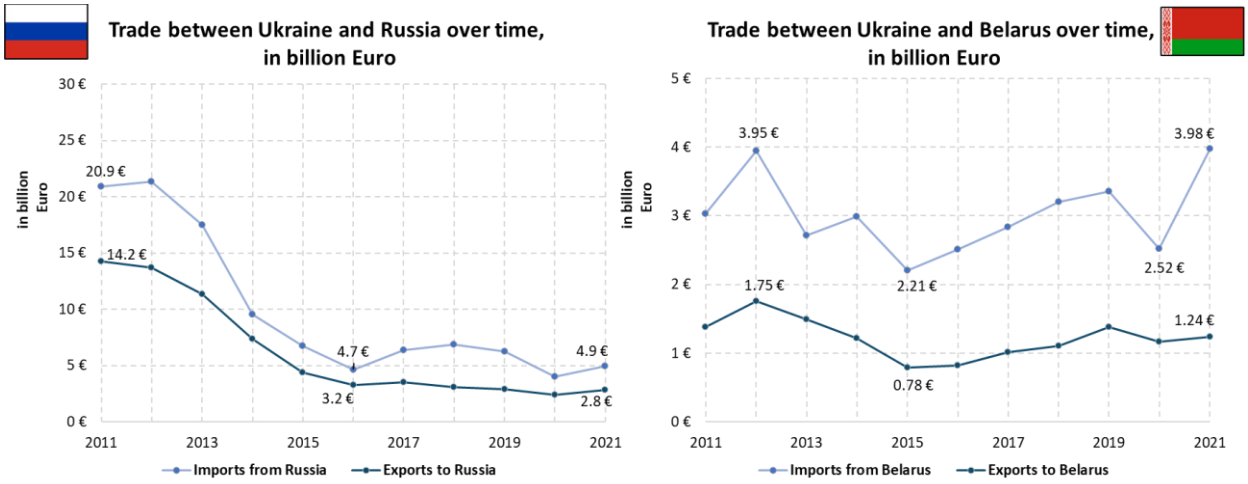
Source: European Commission (2023): Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023). Note: the chart shows values in billion Euros, the bolder line show 5-week moving averages, the lighter ones show the raw data.

Figure 31: Import and Export between the EU27 and Russia / Belarus from 2011 to 2021, values in billion Euro



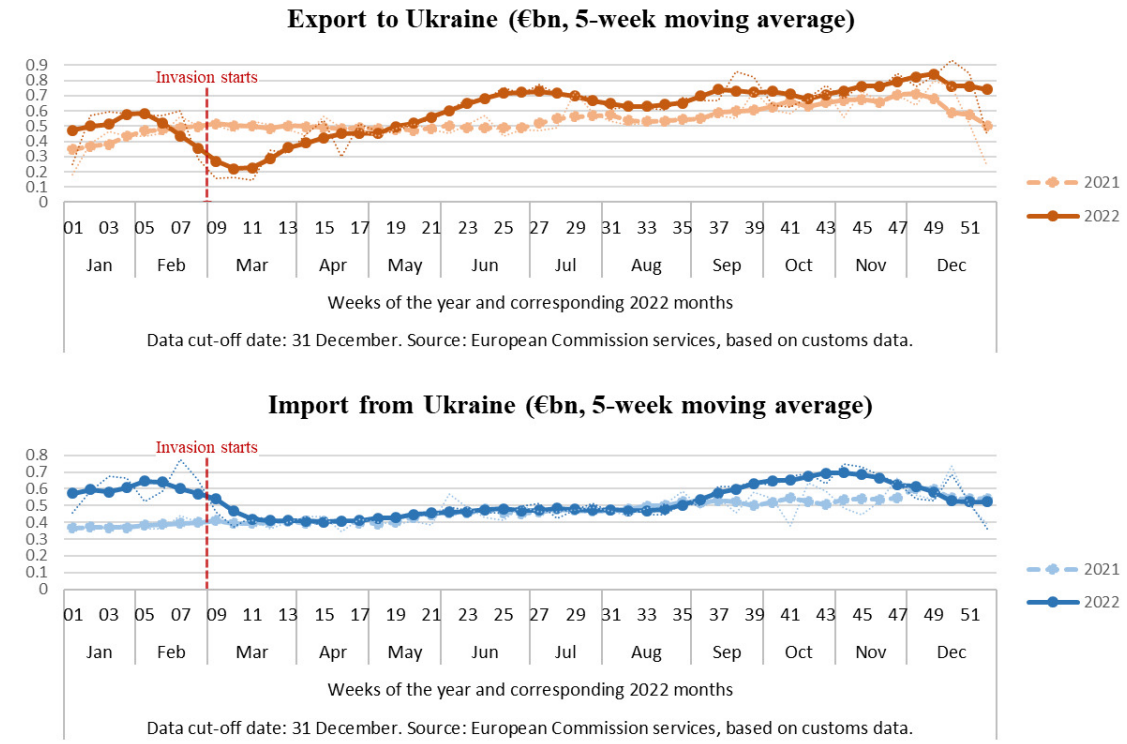
Source: ECCP (2023), own calculation based on UN Comtrade Database. Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

Figure 32: Import and Export between Ukraine and Russia / Belarus from 2011 to 2021, values in billion Euro



Source: ECCP (2023), own calculation based on UN Comtrade Database. Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

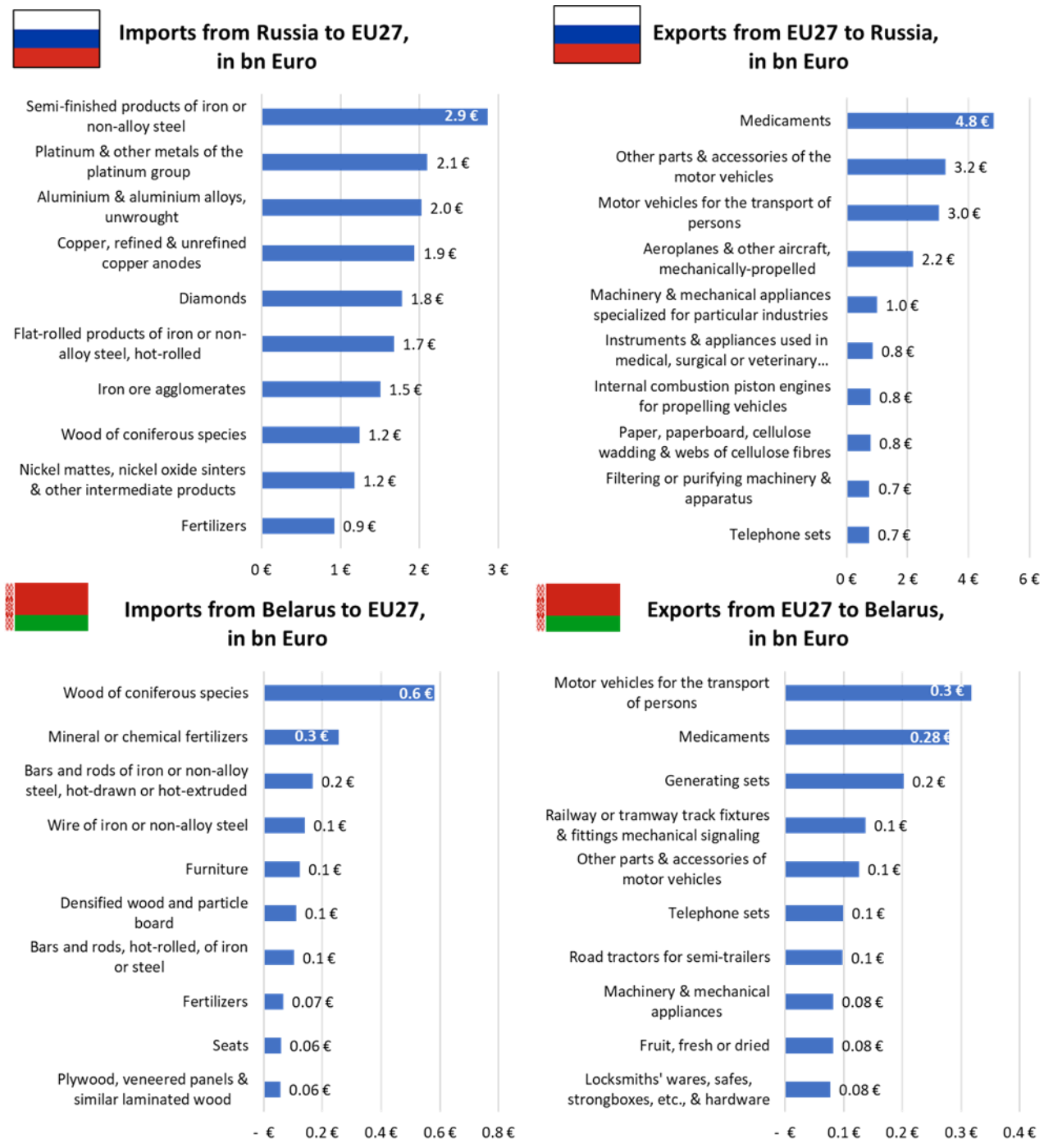
Figure 33: Development of trade between the EU and Ukraine in 2022, by export to Ukraine and import from Ukraine



Source: European Commission (2023)

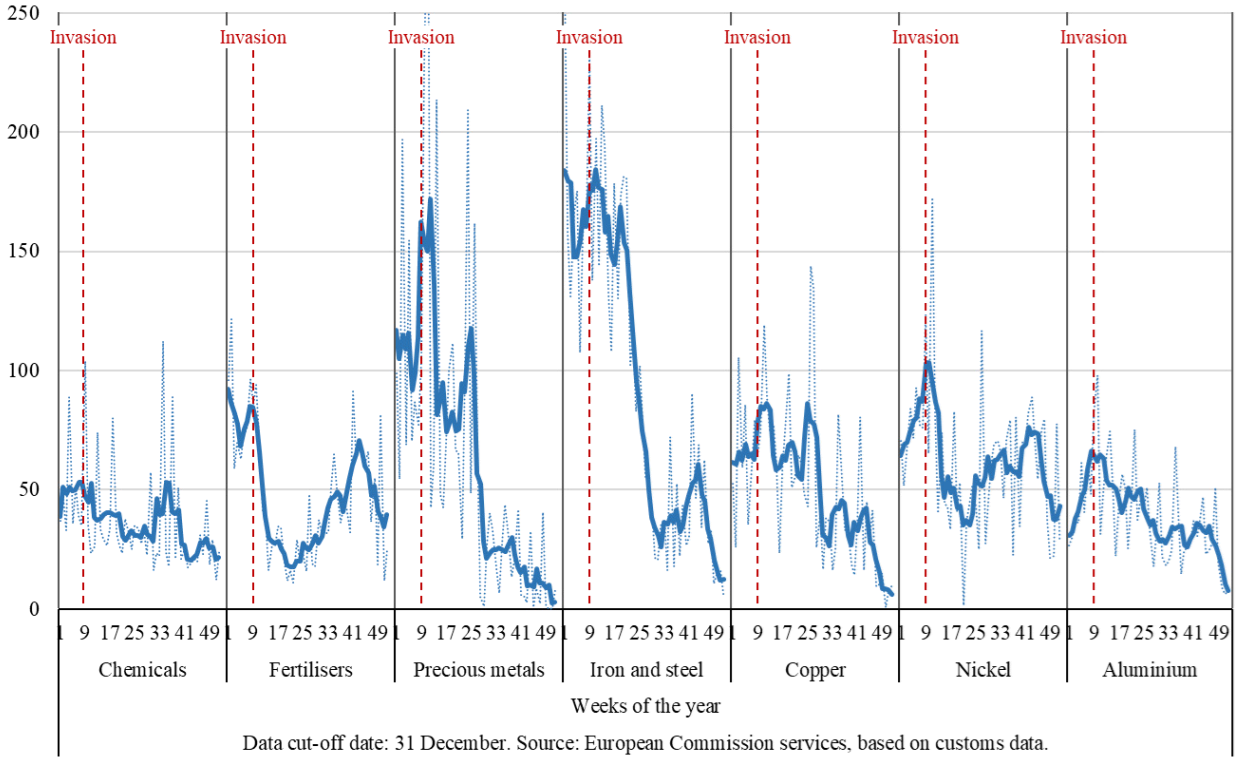
Overview of the most traded commodities

Figure 34: Overview of the 10 most traded commodities between the EU27 and Russia/ Belarus in 2021, excl. mineral fuels and unspecified goods, by import and export, values in billion Euro



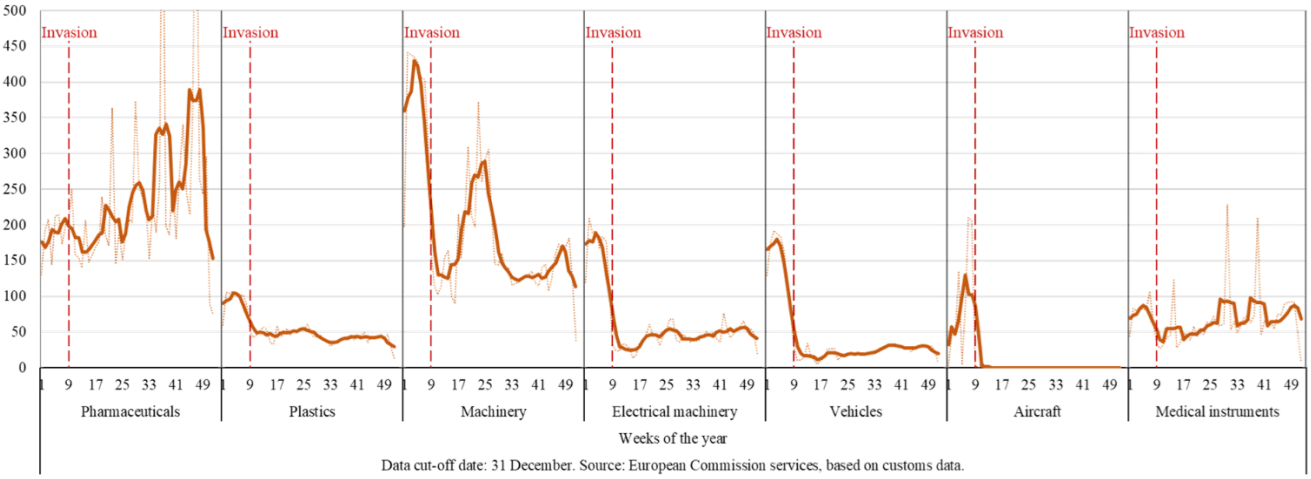
Source: ECCP (2023), own calculation based on UN Comtrade Database. Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

Figure 35: Most important Chapters of EU import from Russia (€M, 5-week moving average)



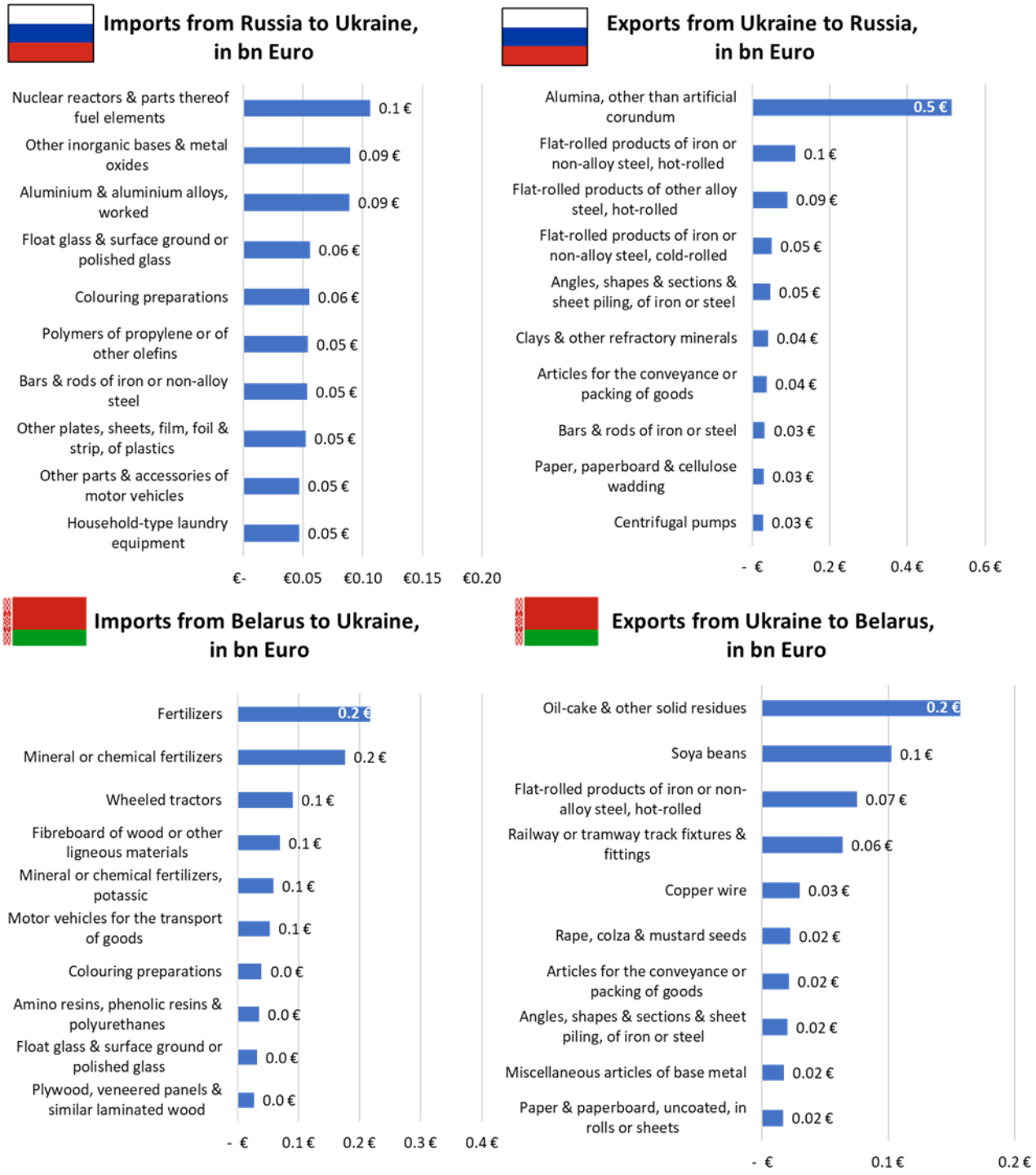
Source: European Commission (2023): Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)

Figure 36: Most important Chapters of EU export to Russia (€M, 5-week moving average)



Source: European Commission (2023): Available online: https://ec.europa.eu/docsroom/documents/53694/attachments/1/translations/en/renditions/native (last access 14.03.2023)

Figure 37: Overview of the 10 most traded commodities between Ukraine and Russia/ Belarus in 2021, excl. mineral fuels and unspecified goods, by import and export, values in billion Euro



Source: ECCP (2023), own calculation based on UN Comtrade Database. Note: The value of the trade capacity was converted into Euro using the average conversion rate from Eurostat.

Figure 38: Development of most important chapters of import from Ukraine to EU, in 2022

Source: European Commission (2023)

Figure 39: Development of most important chapters of export from EU to Ukraine, in 2022

Source: European Commission (2023)

Cluster organisations in Slovakia, Ukraine & the macro-region

Table 1: Overview of cluster organisations in Slovakia and their addressed EU Industrial Ecosystems

N°	Cluster organisation	Industrial Ecosystem
1	Bioeconomy Cluster	Agri-food
2	BITERAP	Digital
3	Cassovia New Industry Cluster (CNIC)	Digital
4	Council of Slovak Exporters	Agri-food
5	Cybersecurity Cluster	Digital
6	Energy Cluster of Presov Region	Energy Intensive Industries
7	FINTECH & INSURTECH ASSOCIATION OF SLOVAKIA	Digital
8	Food Chamber of Slovakia	Agri-food
9	HEMP CLUSTER	Energy Intensive Industries
10	House of events innovation	Creative and Cultural Industries
11	Industry Innovation Cluster Slovakia	Digital
12	INOVATO CLUSTER	Digital
13	Ipel Energy Environmental Cluster	Creative and Cultural Industries
14	Klaster AT+R	Electronics
15	Kosice IT Valley	Digital
16	National Energy Cluster NEK	Renewable Energy
17	Regional Development Cluster	Creative and Cultural Industries
18	REPRIK: REGIONALNY PRIEMYSELNY INOVACNY KLASTER RIMAVSKA KOTLINA	Renewable Energy
19	SAPI - renewable energy cluster	Renewable Energy
20	Slovak Electric Vehicle Association (SEVA)	Mobility-Transport-Automotive
21	Slovak Game Developers Association	Creative and Cultural Industries
22	Slovak National Hydrogen Associatio - Claster	Renewable Energy
23	Slovak Plastic Cluster	Mobility-Transport-Automotive
24	Slovak Smart City Cluster	Digital
25	Smart Industry Association - Industry4UM	Digital
26	SME BOOSTER & INNOVATIONS CLUSTER	Digital

Source: ECCP (2023), data retrieved on 07.02.2023.

Table 2: Overview of cluster organisations in Ukraine and their addressed EU Industrial Ecosystems

N°	Cluster organisation	Industrial Ecosystem
1	Agrofoodcluster Kharkiv	Agri-food
2	Association of Industrial Automation of Ukraine (APPAU)	Digital
3	CBIT - Cluster of Bukovina innovation technologies	Digital
4	Cherkasy IT Cluster	Digital
5	International Interregional Agro Industrial Cluster of Kherson Region "Eastern Food Technologies Plus" Ukraine	Agri-food
6	International Medical Cluster	Health
7	Kharkiv Fashion Cluster	Textiles
8	Kharkiv IT Cluster	Digital
9	Konotop IT cluster	Digital
10	Kyiv IT Cluster	Digital
11	Precarpathian eco-energy cluster	Renewable Energy

12	**Public Union "Ukrainian Maritime Cluster"**	**Digital**
13	**Publishing and Printing Cluster**	**Creative and Cultural Industries**
14	**Ukrainian Automotive and Mobility Cluster**	**Mobility-Transport-Automotive**
15	**Ukrainian Logistics Alliance**	**Mobility-Transport-Automotive**
16	**Ukrainian Organic Cluster**	**Digital**
17	**Zaporizhzhia Cluster "Engineering – Automation – Machinery" (EAM)**	**Electronics**

Source: ECCP (2023), data retrieved on 22.02.2023.

Table 3: Number of cluster organisations in the macro-region including Slovakia that are operating in the identified key industrial ecosystems and have indicated interest in international collaboration

	Aerospace & Defence	Agri-food	Construction	Digital	Electronics	Energy-Renewables	Health	Mobility-Transport-Automotive	Textile	Total
Austria	0	1	1	0	0	1	2	0	0	**5**
Bulgaria	1	0	0	8	0	3	1	2	0	**15**
Czechia	2	1	0	0	2	1	0	0	0	**6**
Estonia	0	0	1	0	0	1	0	0	0	**2**
Germany	1	2	0	2	3	3	8	5	0	**24**
Hungary	0	1	0	1	0	2	0	0	0	**4**
Latvia	0	1	0	1	1	0	1	1	0	**5**
Lithuania	1	2	0	5	0	1	2	1	0	**12**
Poland	2	1	2	7	0	2	2	6	1	**23**
Romania	0	1	1	8	1	3	3	0	1	**18**
Slovakia	0	1	0	4	0	1	0	0	0	**6**
Slovenia	0	0	1	0	1	1	1	0	0	**4**
Total	**7**	**11**	**6**	**36**	**8**	**19**	**20**	**15**	**2**	**124**

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Table 4: List of all cluster organisations in the macro-region including Slovakia that are operating in the identified 9 key industrial ecosystems and have indicated interest in international collaboration

Aerospace & Defence

Cluster organisation	Region	Website
Aviation Valley / Dolina Lotnicza	Poland: Podkarpackie	http://www.dolinalotnicza.pl/
Cluster Aero-Space Technologies, Research and Applications/ CASTRA	Bulgaria: South-West (Bulgaria)	http://www.castra.org
Czech Optical Cluster	Czechia: Central Moravia	www.optickyklastr.cz/en
Hamburg Aviation e.V.	Germany: Hamburg	https://www.hamburg-aviation.de/en.html
Laser and Engineering Technologies Cluster (LITEK)	Lithuania: Sostinės regionas	http://www.litek.lt
Moravian Aerospace Cluster, z.s.	Czechia: Central Moravia	http://www.aero-cluster.cz/en
Silesian Aviation Cluster	Poland: Śląskie	http://www.aerosilesia.eu

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Agri-food

Cluster organisation	Region	Website
AgroTransilvania Cluster	Romania: North-West (Romania)	http://www.agrocluster.ro
Austrian Centre of Industrial Biotechnology (acib)	Austria: Styria	http://www.acib.at
Bavarian Food Cluster	Germany: Bavaria	https://www.cluster-bayern-ernaehrung.de/
Council of Slovak Exporters	Slovakia: Bratislava	www.exporteri.sk
CREA Hydro&Energy, z.s.	Czechia: South-East (Czechia)	http://www.creacz.com
Food Products Quality Cluster	Latvia: Latvia	http://www.ppkk.lv/en/about-ppkk
foodRegio	Germany: Schleswig-Holstein	http://www.foodregio.de
iFood Cluster	Hungary: South Transdanubia	http://ifoodklaszter.hu/
National Food Cluster Lithuania	Lithuania: Sostinės regionas	https://nacionalinismaistoukioklasteris.eu
NUTRIBIOMED Cluster	Poland: Dolnośląskie	http://www.nutribiomed.pl/

SMART food cluster	Lithuania: Sostinės regionas	http://smartfoodcluster.com

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Construction

Cluster organisation	Region	Website
Building Innovation Cluster @Business Upper Austria - OÖ Wirtschaftsagentur GmbH	Austria: Upper Austria	https://www.b-i-c.at/
COP Cluster	Poland: Warsaw-Capital	https://www.klastercop.pl/
Estonian Wooden Houses Cluster	Estonia: Estonia	https://woodhouse.ee/
Lublin Enterprise Cluster	Poland: Lubelskie	http://www.klaster.lublin.pl
Technology Enabled Construction Cluster - TEC	Romania: Bucharest-Ilfov	http://www.clustertec.ro
Wood Industry Cluster Slovenia	Slovenia: West Slovenia	http://www.lesarski-grozd.si/en/

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Digital

Cluster organisation	Region	Website
Association for innovation, business excellence, services and technology	Bulgaria: South-West (Bulgaria)	http://aibest.org/
Smart Digital Solutions cluster	Lithuania: Sostinės regionas	https://www.smartdscluster.lt/en/
Banat Software Cluster by ARIES-TM	Romania: West (Romania)	www.banatsoftware.eu
BCCS (Blockchain Cybersecurity and Compliance Solutions) Cluster	Lithuania: Sostinės regionas	https://bccs.tech/
Bulgarian Digital Cluster	Bulgaria: North-Central (Bulgaria)	https://www.digitalcluster.eu
Bulgarian Fashion Association	Bulgaria: North-East (Bulgaria)	https://www.bgfa.eu
Bulgarian Fintech Association	Bulgaria: South-West (Bulgaria)	https://fintechbulgaria.org/
Business Hive Vilnius Cluster	Lithuania: Sostinės regionas	http://www.bhv.lt
Cloudimpuls	Romania: West (Romania)	https://cloudimpuls.eu/

Cluj IT Cluster	Romania: North-West (Romania)	http://www.clujit.ro
Cluster Information and Communication Technologies Blagoevgrad	Bulgaria: South-West (Bulgaria)	http:/www.ict-cluster.eu
Cluster of Manufacturing Innovators - CoMI	Lithuania: Sostinės regionas	https://klaster.lt/
Cluster Sofia Knowledge City	Bulgaria: South-West (Bulgaria)	http://www.knowledgesofia.eu/en/
Cybersecurity Cluster	Slovakia: Central Slovakia	https://clusterkb.sk/en/#news
Danube Engineering Hub	Romania: South-Muntenia	https://clusterdeh.ro/
Digital Knowledge Cluster	Poland: Warsaw-Capital	https://knowledgecluster.pl
Digital Rocket LT	Lithuania: Sostinės regionas	http://www.digitalrocket.lt
FINTECH & INSURTECH ASSOCIATION OF SLOVAKIA	Slovakia: Bratislava	https://finas.sk/en/domov/
Green Technology Cluster	Romania: Bucharest-Ilfov	http://greentechnology.ro
ICT Cluster	Bulgaria: South-West (Bulgaria)	http://www.ictcluster.bg/en/
Innovative cluster Simulation models in medicine	Bulgaria: South-West (Bulgaria)	http://smm-cluster.com/
IT-Security Cluster	Germany: Bavaria	https://www.it-sicherheitscluster.de/team/dr-matthias-kampman/
IT&C Cluster "Lower Danube"	Romania: South-East (Romania)	https://itcluster.ro/
Latvian IT Cluster	Latvia: Latvia	http://www.itbaltic.com
Mazovia Cluster ICT	Poland: Warsaw-Capital	http://www.klasterict.pl
Metal Processing Cluster	Poland: Podlaskie	https://www.metalklaster.pl/en
Polish Technological Platform on Photonics	Poland: Mazowieckie-Regional	www.pptf.pl
Poznan Science and Technology Park | Waste-Klaster	Poland: Wielkopolskie	https://waste-klaster.pl/
Science, Technology and Educational Platform for Photonics (STEPP) Cluster	Hungary: South Great Plain	http://steppcluster.eu/en/
SINOTAIC - Silesian IoT Cluster	Poland: Śląskie	http://www.sinotaic.com
Slovak Smart City Cluster	Slovakia: East Slovakia	http://www.smartcluster.sk

Smart Alliance Cluster	Romania: Bucharest-Ilfov	http://smartalliance.ro/
SME BOOSTER & INNOVATIONS CLUSTER	Slovakia: Central Slovakia	https://www.sbic.sk/en/
Software Development Association Poland	Poland: Małopolskie	https://www.sodapl.com/
SpectroNet c/o Technologie- und Innovationspark Jena GmbH	Germany: Thuringia	https://www.spectronet.de
Transilvania IT Cluster	Romania: North-West (Romania)	http://transilvaniait.ro

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Electronics

Cluster organisation	Region	Website
Cluster Sensor technology Bavaria / Strategic Partnership for Sensor Technologies	Germany: Bavaria	www.sensorik-bayern.de
Czech Marine Cluster, z. s.	Czechia: Central Moravia	https://czech-marine-cluster.com/contact/
ETREC Cluster - Electro-Technical Regional Cluster	Romania: Centre (Romania)	http://www.etrec.ro
InnoZent OWL e.V.	Germany: North Rhine-Westphalia	www.innozentowl.de
Klastr Mechatronika, z.s.	Czechia: South-West (Czechia)	https://www.klastrmechatronika.cz
Latvian Electrical Engineering and Electronics Industry Association	Latvia: Latvia	https://www.letera.lv/
Organic Electronics Saxony (OES)	Germany: Saxony	https://oes-net.de/en/home/
TECES, Green Tech Cluster	Slovenia: East Slovenia	http://www.teces.si

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Energy-Renewables

Cluster organisation	Region	Website
BalticNet-PlasmaTec e.V.	Germany: Mecklenburg-Western Pomerania	http://www.bnpt.eu

CANEPARO	Romania: Bucharest-Ilfov	http://caneparo.org
Cluster Green Transport	Bulgaria: South-West (Bulgaria)	https://gtcluster.eu/en/home/
Cluster of Applied Earth Sciences	Hungary: South Transdanubia	http://www.appliedearthsciences.org/
Green Energy Romanian Innovative Biomass Cluster	Romania: Centre (Romania)	http://www.greencluster.ro
Green Solutions Low Danube	Romania: South-East (Romania)	https://greendanube.ro/
Green Synergy Cluster	Bulgaria: South-Central (Bulgaria)	http://en.greensynergycluster.eu/
Lithuanian Photovoltaic Technology Cluster	Lithuania: Sostinės regionas	http://fetek.lt
Lower Silesian Technological Park Cluster	Poland: Dolnośląskie	https://www.darr.pl/dolnoslaski-park-technologiczny/
Nanoprogress	Czechia: North-East (Czechia)	http://www.nanoprogress.eu
OÖ Energiesparverband - Cleantech-Cluster Energy	Austria: Upper Austria	https://www.energiesparverband.at/en
Power Electronics Cluster within ECPE e.V.	Germany: Bavaria	http://www.clusterle.de/international
REGIONALNY PRIEMYSELNY INOVACNY KLASTER RIMAVSKA KOTLINA REPRIK	Slovakia: Central Slovakia	http://www.reprik.sk
Renewable Energy Sources Cluster	Bulgaria: South-West (Bulgaria)	http://www.res-cluster.com/
Rhine-Neckar Metropolitan Region Ltd.	Germany: Baden-Württemberg	https://www.m-r-n.com/was-wir-tun/themen-und-projekte/projekte/clusternetzwerk-energie-und-umwelt
SiEnE, Slovenian Energy and Environment Partnership in Defence	Slovenia: East Slovenia	SiEnE.teces.si
South West Hungarian Engineering Cluster	Hungary: South Transdanubia	www.ddgk.hu
Tehnopol Greentech Cluster	Estonia: Estonia	https://www.tehnopol.ee/en/business-services/greentech-cluster/
Warsaw Collaboration Cluster Network	Poland: Warsaw-Capital	https://wcc.net.pl/

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Health

Cluster organisation	Region	Website
BioCon Valley GmbH®	Germany: Mecklenburg-Western Pomerania	http://www.bioconvalley.org
BioLAGO e.V. the health network	Germany: Baden-Württemberg	http://www.biolago.org/en/home/
BioM Biotech Cluster Development GmbH	Germany: Bavaria	https://www.bio-m.org/en.html
BioRN - Life Science Cluster Rhine-Neckar	Germany: Baden-Württemberg	http://biorn.org/
DIGITAL HEALTH AND INNOVATION CLUSTER BULGARIA	Bulgaria: South-West (Bulgaria)	http://www.dhicluster.bg/?lang=en
EPSI - European Platform for Sport Innovation	Germany: Bavaria	https://epsi.eu/
Health technology cluster iVita	Lithuania: Sostinės regionas	http://ivita.lt
health.textil	Germany: Saxony	https://www.healthtextil.de/
HealthCapital - Cluster Healthcare Industries Berlin Brandenburg	Germany: Berlin	https://www.healthcapital.de/en/
Human.technology Styria GmbH	Austria: Styria	http://www.humantechnology.at
Information Technologies in Medicine (MedIT)	Lithuania: Sostinės regionas	http://www.meditcluster.com
INNOVATIVE CLUSTER FOR HEALTH	Romania: South-East (Romania)	https://clustersanatate.ro/
Latvian Health tourism cluster	Latvia: Latvia	https://healthtravellatvia.lv/en/
Life Science Nord	Germany: Hamburg	http://www.lifesciencenord.de
Lublin Medicine- Medical and Wellness Cluster	Poland: Lubelskie	http://www.medicine.lublin.eu
MedSilesia - The Silesian Network of Medical Devices	Poland: Śląskie	www.medsilesia.com
North-East Innovative Regional Cluster for Structural and Molecular Imaging (IMAGO-MOL)	Romania: North-East (Romania)	https://www.imago-mol.ro

Photonics Austria	Austria: Styria	https://www.photonics-austria.at/
ROHEALTH- The Health and Bioeconomy Cluster	Romania: Bucharest-Ilfov	http://www.rohealth.ro/
Slovenian Innovation Hub, European Economic Interest Grouping (SIH EEIG)	Slovenia: West Slovenia	www.sis-egiz.eu

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Mobility-Transport-Automotive

Cluster organisation	Region	Website
Baltic Automotive Components Cluster (BACC)	Lithuania: Sostinės regionas	http://www.bacc.lt
BALTIC SEA & SPACE CLUSTER	Poland: Pomorskie	https://www.bssc.pl/
Bydgoszcz Industrial Cluster Tool Valley (BIC)	Poland: Kujawsko-pomorskie	http://www.klaster.bydgoszcz.pl/
Cluster for Digital Transformation and Innovations	Bulgaria: South-West (Bulgaria)	https://dticluster.org/
Cluster Mobility & Logistics	Germany: Bavaria	https://www.mobilitylogistics.de/
East Automotive Alliance	Poland: Podkarpackie	http://www.eaa-wsm.pl
Electric vehicles industrial cluster	Bulgaria: South-West (Bulgaria)	http://www.emic-bg.org/content/item/1
Green and Smart Technology Cluster	Latvia: Latvia	http://greentechlatvia.eu
Logistics-Initiative Hamburg Managment GmbH	Germany: Hamburg	https://www.hamburg-logistik.net
Maritime Cluster Northern Germany	Germany: Hamburg	https://maritimes-cluster.de
North South Logistics & Transport Cluster	Poland: Pomorskie	http://www.klasterlogtrans.pl/
Polish Automotive Group PGM	Poland: Podkarpackie	www.pgm.org.pl/en
Rail.S e.V.	Germany: Saxony	http://www.rail-s.de
ROBONOM - AUTONOMOUS SERVICE ROBOTS	Germany: Baden-Württemberg	https://www.robonom.de/english/

Silesia Automotive & Advanced Manufacturing	Poland: Śląskie	http://silesia-automotive.pl/

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

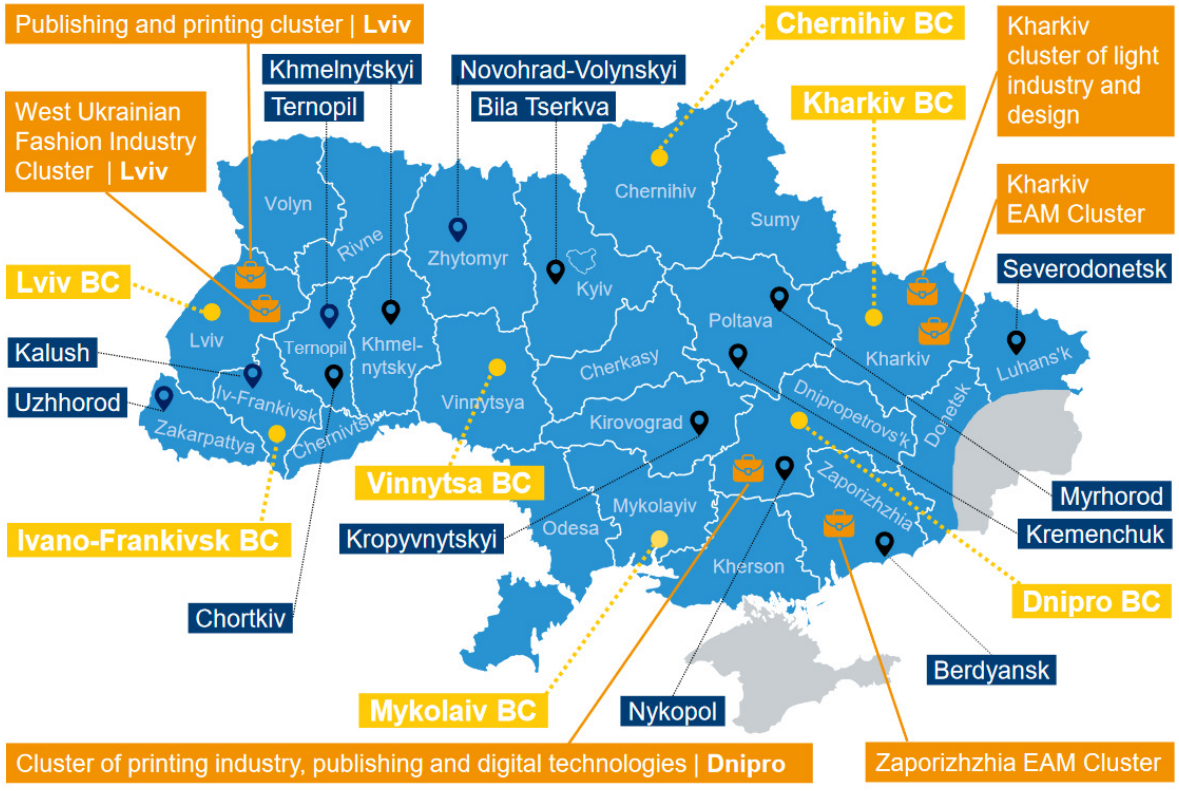
Textile

Cluster organisation	Region	Website
ASTRICO NORD-EST TEXTILE CLUSTER	Romania: North-East (Romania)	http://www.astricone.eu/
Polish Cluster of Composite Technologies	Poland: Małopolskie	http://pktk.pl/en/home/

Source: ECCP (2023), own elaboration, data retrieved on 05.01.2023.

Internationalisation activities and capacity building of Slovak and Ukrainian clusters through cluster support initiatives

Figure 40: Overview of involved clusters and other economic stakeholders in the GIZ project "Supporting trade between Ukraine and the European Union"



Source: GIZ (2023): available under: https://www.giz.de/en/downloads/giz2021-en-partners-location.pdf.

Interregional cooperation through Smart Specialisation Strategies (S3)

Table 5: Overview of priority areas of Ukrainian regions

Region	Priority area	Overarching priority area
Cherkasy	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	IT Industry	ICT & Industry 4.0
Chernihiv	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	IT Industry	ICT & Industry 4.0
Chernivtsi	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	Tourism/recreation	Tourism, Cultural & Creative Industries
	Wood industry/furniture/construction&design materials	Construction
	Light/Textile industry	Fashion, Media & Creative Industries
Dnipro (part of Dnipropetrovsk region)	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	Transport & Logistic	Mobility & Logistics
Dnipropetrovsk	Mechanical engineering	Materials & Advanced Manufacturing
	IT Industry	ICT & Industry 4.0
	Chemical Industry	Materials & Advanced Manufacturing
Donetsk	Creative industry	Fashion, Media & Creative Industries
Ivano-Frankivsk	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	Energy	Energy & Energy Storage
	Tourism/recreation	Tourism, Cultural & Creative Industries
	Wood industry/furniture/construction&design materials	Construction
	Chemical Industry	Materials & Advanced Manufacturing
Kharkiv	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	Mechanical engineering	Materials & Advanced Manufacturing
	IT Industry	ICT & Industry 4.0
	Energy	Energy & Energy Storage
	Pharmaceutics/Medicine/Healthcare	Health & Life Sciences
	Creative industry	Fashion, Media & Creative Industries
Kherson	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	Creative industry	Fashion, Media & Creative Industries
	Transport & Logistic	Mobility & Logistics
Khmelnytsky	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	Mechanical engineering	Materials & Advanced Manufacturing
	Light/Textile industry	Fashion, Media & Creative Industries
Kyiv	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	IT Industry	ICT & Industry 4.0
	Energy	Energy & Energy Storage
	Pharmaceutics/Medicine/Healthcare	Health & Life Sciences
	Wood industry/furniture/construction&design materials	Construction
Kyiv city	Mechanical engineering	Materials & Advanced Manufacturing
	IT Industry	ICT & Industry 4.0
	Pharmaceutics/Medicine/Healthcare	Health & Life Sciences
	Tourism/recreation	Tourism, Cultural & Creative Industries
	Creative industry	Fashion, Media & Creative Industries
Kyrovohrad	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
	Mechanical engineering	Materials & Advanced Manufacturing

	IT Industry	ICT & Industry 4.0
	Energy	Energy & Energy Storage
Luhansk	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
Luhansk	Mechanical engineering	Materials & Advanced Manufacturing
Luhansk	IT Industry	ICT & Industry 4.0
Luhansk	Energy	Energy & Energy Storage
Luhansk	Pharmaceutics/Medicine/Healthcare	Health & Life Sciences
Luhansk	Tourism/recreation	Tourism, Cultural & Creative Industries
Luhansk	Chemical Industry	Materials & Advanced Manufacturing
Lviv	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
Lviv	Mechanical engineering	Materials & Advanced Manufacturing
Lviv	Energy	Energy & Energy Storage
Lviv	Pharmaceutics/Medicine/Healthcare	Health & Life Sciences
Lviv	Creative industry	Fashion, Media & Creative Industries
Lviv	Wood industry/furniture/construction&design materials	Construction
Lviv	Light/Textile industry	Fashion, Media & Creative Industries
Mykolaiv	Tourism/recreation	Tourism, Cultural & Creative Industries
Mykolaiv	Maritime industry, aqua industry	Blue Growth
Odesa	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
Poltava	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
Poltava	Mechanical engineering	Materials & Advanced Manufacturing
Poltava	Energy	Energy & Energy Storage
Poltava	Tourism/recreation	Tourism, Cultural & Creative Industries
Rivne	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
Rivne	IT Industry	ICT & Industry 4.0
Rivne	Creative industry	Fashion, Media & Creative Industries
Rivne	Wood industry/furniture/construction&design materials	Construction
Sumy region	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
Sumy region	Tourism/recreation	Tourism, Cultural & Creative Industries
Sumy region	Tourism/recreation	Tourism, Cultural & Creative Industries
Ternopil	Mechanical engineering	Materials & Advanced Manufacturing
Ternopil	IT Industry	ICT & Industry 4.0
Vinnytsia	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Agrofood & Bioeconomy
Vinnytsia	Pharmaceutics/Medicine/Healthcare	Health & Life Sciences
Vinnytsia	Tourism/recreation	Tourism, Cultural & Creative Industries
Volyn	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Volyn
Volyn	Transport & Logistic	Volyn
Zakarpattya	Mechanical engineering	Zakarpattya
Zakarpattya	Wood industry/furniture/construction&design materials	Zakarpattya
Zakarpattya	Chemical Industry	Zakarpattya
Zaporizhia	Mechanical engineering	Zaporizhia
Zaporizhia	Energy	Zaporizhia
Zhytomyr	Agriculture & Agro-industrial complex, food industry, Bioeconomics	Zhytomyr

ECCP (2023), own elaboration based on based on the S3 platform (https://s3platform.jrc.ec.europa.eu/map, last access 14.02.2023) and Ukrainian Institute for economics and forecasting. Note: overarching topics addressed by the S3 priority areas have been established in Study on prioritisation in Smart Specialisation Strategies in the EU and Ukrainian priorities have been assigned manually.

Table 6: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Agrofood & Bioeconomy

Country	Region	Priority area	Overarching priority area
Austria	Austria (National strategy)	Bioeconomy and sustainability	Agrofood & Bioeconomy
Czechia	Czechia (National strategy)	Sustainable agriculture and environmental application sectors	
Germany	Baden-Württemberg	Information and Communication Technologies (ICT), Green IT and Smart Products	
Germany	Bremen	Environmental economy and environmental technologies	
Germany	Bremen	Food and luxury food industry	
Germany	Hessen	Environmental technology, energy technology and resource efficiency	
Germany	Lower Saxony	agriculture and food industry	
Germany	Mecklenburg-Western Pomerania	Nutrition	
Germany	Saxony	Environment and resources	
Germany	Saxony-Anhalt	Food and agriculture	
Germany	Schleswig-Holstein	Nutritional Sciences	
Hungary	Hungary (National Strategy)	Agricultural Innovation	
Hungary	Hungary (National Strategy)	Healthy local food	
Hungary	Hungary (National Strategy)	Sustainable environment	
Latvia	Latvia (National strategy)	Knowledge-intensive bioeconomy	
Lithuania	Lithuania (National strategy)	Agricultural innovation and food technologies	
Poland	Dolnośląskie	High quality food	
Poland	Kujawsko-Pomorskie	Healthy and safe food	
Poland	Łódzkie	Innovative agriculture and agri-food industry	
Poland	Lubelskie	bioeconomy	
Poland	Lubuskie	Green economy	
Poland	Mazowieckie	Food safety	
Poland	Opolskie	Food and agriculture technologies	
Poland	Podlaskie	Agri-food industry and value chain sectors	
Poland	Śląskie	Green economy	
Poland	Świętokrzyskie	Modern Agriculture and Food Processing	
Poland	Warmińsko-Mazurskie	High Quality Food	
Poland	Wielkopolskie	Biomaterials and food for sophisticated consumers	
Poland	Zachodniopomorskie	Modern agri-food processing	
Romania	Centre / Centru	agri-food sector	
Romania	North-East / Nord-Est	agri-food	
Romania	South-West Oltenia / Sud-Vest Oltenia	Agriculture and food industry	
Romania	Sud Muntenia/South Muntenia	Agriculture and food industry	
Romania	Sud-Est/South-East	Agri-food and fishing industry	
Romania	West/Vest	agri-food	
Slovakia	Slovakia (National strategy)	Healthy food and environment	

Slovenia	Slovenia (National strategy)	Sustainable food production	

Source: ECCP (2023)

Table 7: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Blue Growth

Country	Region	Priority area	Overarching priority area
Germany	Bremen	Maritime economy and logistics	Blue Growth
Germany	Hamburg	Maritime economy, shipping	
Germany	Lower Saxony	maritime economy	
Poland	Pomorskie	Off-shore, port and logistics technologies	
Germany	Schleswig-Holstein	Maritime Economy	
Romania	Sud-Est/South-East	Engineering and shipping	

Source: ECCP (2023)

Table 8: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Construction

Country	Region	Priority area	Overarching priority area
Romania	Centre / Centru	Sustainable buildings and environment	Construction
Poland	Opolskie	Construction and wood technologies	
Poland	Świętokrzyskie	Resource-efficient construction industry	
Romania	West/Vest	Constructions	
Poland	Warmińsko-Mazurskie	Wood and Furniture	
Poland	Wielkopolskie	Interiors of the future	
Poland	Zachodniopomorskie	Wood and furniture products	
Poland	Zachodniopomorskie	Large-scale water and land constructions	
Romania	Centre / Centru	Forestry, wood processing and furniture industry	

Source: ECCP (2023)

Table 9: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Energy & Energy Storage

Country	Region	Priority area	Overarching priority area
Germany	Baden-Württemberg	Environmental Technologies, Renewable Energies and Resource Efficiency	
Germany	Berlin / Brandenburg	Energy Technology	
Germany	Bremen	Wind Energy	
Germany	Hamburg	Renewable Energies	
Germany	Lower Saxony	energy economy	

Germany	Mecklenburg-Western Pomerania	Energy and Climate	Energy & Energy Storage
Germany	Saxony	Energy	
Germany	Saxony-Anhalt	Energy, mechanical and plant engineering, resource efficiency	
Latvia	Latvia (National strategy)	Smart energetics	
Lithuania	Lithuania (National strategy)	Energy and sustainable environment	
Poland	Łódzkie	Energy (including renewable energy sources)	
Poland	Małopolskie	Sustainable energy	
Poland	Opolskie	Energy technologies and Renewable Energy	
Poland	Pomorskie	Eco-effective technologies in generation, transmission, distribution and consumption of energy and fuels, and in construction	
Poland	Śląskie	Energy	
Romania	North-East / Nord-Est	energy and environment	
Romania	South-West Oltenia / Sud-Vest Oltenia	Sustainable energy and the environment	

Source: ECCP (2023)

Table 10: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Fashion, Media & Creative Industries

Country	Region	Priority area	Overarching priority area
Austria	Austria (National Strategy)	Intellectual, social and cultural sciences (including social innovation)	Fashion, Media & Creative Industries
Germany	Bremen	Creative Industries	
Bulgaria	Bulgaria	New technologies in creative and recreational industries	
Romania	Centre / Centru	Textile and clothing	
Czechia	Czechia (National Strategy)	Creative Czech Republic	
Germany	Hamburg	Cultural and creative industries	
Germany	Hessen	Cultural and creative industries	
Poland	Łódzkie	Modern Textile and Fashion Industry (including design)	
Germany	Saxony-Anhalt	Media and creative industries (cross innovation technology)	
Slovakia	Slovakia	Digital Slovakia and creative industry	
Romania	Sud-Est/South-East	clothing industry	
Romania	West/Vest	Textiles	

Source: ECCP (2023)

Table 11: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Health & Life Sciences

Country	Region	Priority area	Overarching priority area
Austria	Austria (National Strategy)	Life sciences	

Czechia	Czechia (National strategy)	Health care, advanced medicine	Health & Life Sciences
Estonia	Estonia (National strategy)	Health technologies and services	
Germany	Baden-Württemberg	Health and Care	
Germany	Bavaria	Life Sciences	
Germany	Berlin / Brandenburg	Healthcare Management	
Germany	Bremen	Health management and life sciences	
Germany	Hamburg	Health Management	
Germany	Hamburg	Life Science	
Germany	Hessen	Life Sciences, Bioeconomics and Healthcare	
Germany	Lower Saxony	health and social economy	
Germany	Mecklenburg-Western Pomerania	Health and Life Sciences	
Germany	North Rhine-Westphalia	Health	
Germany	North Rhine-Westphalia	Life Science	
Germany	Rheinland-Pfalz	Life Sciences and Healthcare Industry	
Germany	Saarland	Life sciences and materials	
Germany	Saxony	Health and nutrition	
Germany	Saxony-Anhalt	Health and medicine	
Germany	Schleswig-Holstein	Life Sciences	
Hungary	Hungary (National strategy)	Healthy society and wellbeing	
Lithuania	Lithuania (National strategy)	Health technologies and biotechnologies	
Poland	Kujawsko-Pomorskie	Health and health tourism	
Poland	Łódzkie	Medical Industry, pharmaceuticals and cosmetics (including health resort medicine)	
Poland	Lubelskie	medicine and health	
Poland	Lubuskie	Health and quality of life	
Poland	Małopolskie	Life sciences	
Poland	Podlaskie	Medical sector and life sciences and value chain sectors	
Poland	Pomorskie	Medical technologies in the area of civilization and ageing-associated diseases	
Poland	Śląskie	Medicine	
Romania	Centre / Centru	medical and pharmaceutical sector	
Romania	NORTH-WEST/NORD-VEST	INNOVATION FOR HEALTH AND WELL-BEING	
Romania	South-West Oltenia / Sud-Vest Oltenia	Innovative fundamental and applied medicine	
Slovakia	Slovakia (National strategy)	Population health and medical technologies	
Slovenia	Slovenia (National strategy)	Health – medicine	

Source: ECCP (2023)

Table 12: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area ICT & Industry 4.0

Country	Region	Priority area	Overarching priority area
Austria	Austria (National strategy)	Information and communications technologies	

Bulgaria	Bulgaria (National strategy)	Informatics and ICT	ICT & Industry 4.0
Czechia	Czechia (National strategy)	Digital market technologies and electrical engineering	
Estonia	Estonia (National strategy)	Information and communication technology	
Germany	Bavaria	ICT	
Germany	Bremen	Information and communication technologies	
Germany	Hamburg	Media, IT, telecommunications	
Germany	Hessen	Information and communication technology (ICT)	
Germany	Mecklenburg-Western Pomerania	Information and communication	
Germany	North Rhine-Westphalia	Information and Communication Technologies	
Germany	Rheinland-Pfalz	Information and communication technology, software systems	
Germany	Saarland	information and communication technologies	
Germany	Saxony	Digital communication	
Germany	Saxony-Anhalt	Information and Communication Technologies (cross innovation technology)	
Germany	Schleswig-Holstein	Information technology, telecommunications and media	
Germany	Thuringia	Information and communication technologies, creative industries and services	
Hungary	Hungary (National strategy)	ICT (infocommunication technologies) and services	
Latvia	Latvia (National strategy)	Information and communication technologies	
Lithuania	Lithuania (National strategy)	Information and communication technologies	
Poland	Dolnośląskie	Information and communication technologies	
Poland	Kujawsko-Pomorskie	ICT services	
Poland	Kujawsko-Pomorskie	Industrial automation	
Poland	Łódzkie	IT and telecommunications (ICT)	
Poland	Lubelskie	information technology and automation	
Poland	Małopolskie	ICT	
Poland	Podkarpackie	Information and Telecommunications (ICT)	
Poland	Śląskie	ICT	
Poland	Świętokrzyskie	ICT	
Poland	Wielkopolskie	ICT-based development	
Poland	Zachodniopomorskie	ICT-based products	
Romania	North-East / Nord-Est	ITC	
Romania	NORTH-WEST/NORD-VEST	DIGITAL TRANSFORMATION: The regional digital agenda	
Romania	South-West Oltenia / Sud-Vest Oltenia	Information and Communication Technology (ITandC)	
Romania	West/Vest	ICT	

Source: ECCP (2023)

Table 13: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Materials & Advanced Manufacturing

Country	Region	Priority area	Overarching priority area
Austria	Austria (National strategy)	Materials sciences and intelligent manufacturing	Materials & Advanced Manufacturing
Germany	Bavaria	New and intelligent materials, nano- and micro-technology	
Germany	Bremen	Innovative materials	
Germany	Hessen	Nano and materials technology	
Germany	North Rhine-Westphalia	New materials	
Germany	Rheinland-Pfalz	Materials, material and surface technology	
Germany	Saxony	Raw materials	
Latvia	Latvia (National strategy)	Smart materials, technology and engineering systems	
Lithuania	Lithuania (National strategy)	New production processes, materials and technologies	
Poland	Dolnośląskie	Raw materials and recyclable raw materials	
Poland	Kujawsko-Pomorskie	Advanced materials and tools	
Poland	Łódzkie	Advanced construction materials (including design)	
Poland	Małopolskie	Electro technical and mechanical industries	
Poland	Małopolskie	Production of metals, metal products and non-metallic mineral products	
Poland	Opolskie	Metal and machine industry technologies	
Poland	Podlaskie	Metalworking, machine and boatbuilding industry and value chain sectors	
Poland	Świętokrzyskie	Metal and Casting Industry	
Poland	Zachodniopomorskie	Advanced metal products	
Romania	North-East / Nord-Est	textiles and new materials	
Romania	Sud-Est/South-East	ICT, High Tech, Nanotechnologies and Advanced Materials	
Slovenia	Slovenia (National strategy)	Development of materials as end products	

Source: ECCP (2023)

Table 14: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Mobility & Logistics

Country	Region	Priority area	Overarching priority area
Austria	Austria (National Strategy)	Mobility	
Germany	Baden-Württemberg	Sustainable Mobility	
Germany	Berlin / Brandenburg	Transport, mobility and logistics	
Germany	Bremen	Automotive industry and electric mobility	
Romania	Centre / Centru	Automotive and mechatronics industry	
Czechia	Czechia (National Strategy)	Transport means for the 21st century	
Poland	Dolnośląskie	Spatial mobility	
Germany	Hamburg	Logistics, transport	

Germany	Hessen	Innovative mobility and logistics concepts, electric mobility	Mobility & Logistics
Poland	Kujawsko-Pomorskie	Transport and mobility	
Lithuania	Lithuania (National Strategy)	Intelligent, green and integrated transport	
Germany	Lower Saxony	mobility economy	
Germany	Mecklenburg-Western Pomerania	Mobility	
Germany	North Rhine-Westphalia	Mobility and Logistics	
Poland	Podkarpackie	Automotive industry	
Germany	Rheinland-Pfalz	Automobile and commercial vehicle industry	
Germany	Saarland	Automotive and Production	
Germany	Saxony	Mobility	
Germany	Saxony-Anhalt	Mobility and logistics	
Slovakia	Slovakia (National Strategy)	Vehicles for the 21st century	
Slovenia	Slovenia (National Strategy)	Mobility	
Romania	South-West Oltenia / Sud-Vest Oltenia	Industrial engineering and transport	
Germany	Thuringia	Sustainable and Intelligent Mobility and Logistics	
Romania	West/Vest	automotive components production	
Poland	Wielkopolskie	Specialized logistics processes	
Poland	Zachodniopomorskie	Multimodal transport and logistics	

Source: ECCP (2023)

Table 15: Overview of Member States & regions in Slovakia and the macro-region that address the overarching priority area Tourism, Cultural & Creative Industries

Country	Region	Priority area	Overarching priority area
Austria	Austria (National Strategy)	Tourism	Tourism, Cultural & Creative Industries
Romania	Centre / Centru	IT sector and creative industries	
Romania	Centre / Centru	Spa and wellness tourism	
Czechia	Czechia (National Strategy)	Cultural and creative sectors	
Hungary	Hungary (National Strategy)	Inclusive and sustainable society, viable environment	
Poland	Kujawsko-Pomorskie	Cultural heritage, arts, creative industries	
Lithuania	Lithuania (National Strategy)	Inclusive and creative society	
Poland	Małopolskie	Creative and leisure industries	
Germany	North Rhine-Westphalia	Media and creative industries	
Romania	North-East / Nord-Est	health and tourism	
Slovenia	Slovenia (National Strategy)	Sustainable tourism	
Romania	South-West Oltenia / Sud-Vest Oltenia	Tourism and cultural identity	
Romania	Sud Muntenia/South Muntenia	Tourism and cultural identity	
Romania	Sud-Est/South-East	Tourism	
Poland	Świętokrzyskie	Trade Fair and congress industry	
Romania	West/Vest	Tourism	

Source: ECCP (2023)