

Priority Sector Report: Construction industry



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Introduction

The Cluster Mapping Approach

Clusters can be understood as regional concentrations of economic activities in related industries connected through local linkages and spill-overs that have long been known to be a competitive feature of the market economy.¹ They have a distinct geographic dimension, reflecting the dynamics of local spill-overs. Clusters are also deeply embedded in a broader geographic context: they serve markets elsewhere and are connected to other clusters with complementary strengths in regional, interregional or global value chains. This mirrors the role of location for firms: while local conditions provide the unique context for building distinct capabilities and strategic positions, national and international linkages are critical to access other markets, suppliers, and collaboration partner. Cluster mapping is of high relevance to better understand the key competences of the cluster actors as well as to review to what extent the respective value chain is properly covered.

This report provides perspectives on construction industry clusters across Europe. The report uses firm-level data to supplement the statistical data from national and EU statistical offices. This firm-based data significantly increases the robustness of the data, especially in countries like Germany that collect regional data through samples rather than reporting by all firms. It also enables performance of individual firms to be tracked over time, gaining more granular insights into patterns of entrepreneurship, SME performance and new business creation. The report is based on an enriched dataset that is compiled specifically for analysing detailed patterns of cluster evolution. The core of the dataset is the firm- and plant-level data sources from the Orbis database supplied by Bureau van Dijk. This dataset provides detailed data on the economic performance of firms. It allows the usage of data of firms' turnover, wage bill, capital, materials and employment, totalling more than 1 billion data points. The coverage is very good in most countries in Europe, and especially for larger limited liability companies. However, for some countries, significant gaps are still present.

Cluster stars per region

In this report, strong clusters are being determined based on the cluster mapping approach of the European Panorama for Clusters and Industrial Change, which measures cluster size, specialisation, employee productivity for the relevant industries in a region (covering three established categories), complemented by two new categories capturing SME (high-growth) performance and the innovation potential of global frontier firms.

¹ Ketels, C. 2017. Cluster Mapping as Tool for Development, Harvard Business School, http://www.hbs.edu/faculty/Publication%20Files/Cluster%20Mapping%20as%20a%20Tool%20for%20Development%20_%20report_ISC%20WP%20version%2010-10-17_c46d2cf1-41ed-43c0-bfd8-932957a4ceda.pdf

The extent to which regional clusters in traded sectoral industries or cross-sectoral (emerging) industries have achieved this specialised critical mass is shown by allocating them up to three so-called cluster stars for each of these following five categories:

- *Size*: total number of employees in full time equivalent units in the industry for a given region. This indicator captures general employment performance.
- *Specialisation*: degree of specialisation measured by a location quotient. The location quotient is calculated as the ratio between the industry's share of total employment in a given region and the industry's share of total employment in all the countries considered in the analysis. Values above unity imply high regional specialisation, with a location quotient of two corresponding to twice as many employees in an industry than would be expected if all employment was distributed evenly.
- *Productivity*: measured by the average wage per employee (in full time equivalent units) in the region as a proxy. Productivity levels vary across Europe and these differences are captured as part of the cluster strength measure.
- *SME performance*: measured by number of high-growth firms (i.e. have annual growth rates of 20% for turnover or employment over 3 years while respecting minimum employment and turnover size thresholds). Research suggests that entrepreneurial activity drives economic growth and entrepreneurship policy in highly developed economies should focus on potentially fast-growing new firms.
- *Innovation leaders*: measured by the number of global frontier firms (i.e. top 5% of firms in terms of productivity (value added based, per employee), calculated by adding up factor incomes going to employees (wages) and to capital owners (profits) within any given emerging industry or traded cluster and year) as the relative strength of such firms probably reflects their capacity to innovate, rapidly diffuse and replicate cutting-edge ideas.

For the first three dimensions, a star is assigned to regions that are in the top 20 per cent in Europe. These stars are then summed up for the years 2014, 2015 and 2016 to arrive at the final star rating, with a maximum of three stars for each category. For the latter two dimensions, three stars are assigned to regions that are in the top 20 per cent in Europe in the years 2008 – 2016, two stars for those in the top 20-40 per cent range and one in the top 40-60 per cent range. An industrial regional clusters can therefore be allocated a maximum of 15 cluster stars.

In terms of geographic scope, the analysis covers all the countries participating in the COSME programme, namely all 28 EU Member States, as well as Iceland, North Macedonia, Montenegro, Turkey, Albania, Serbia, Moldova, Armenia, Bosnia & Herzegovina and Ukraine. These regions are used as a pragmatic choice because they are likely to encompass the "economically relevant" regions; there is data available, and in most cases there is some level of government that can take action for this specific region.

For comparative purposes, OECD member states are included, such as Australia, Canada, Chile, Israel, Japan, Korea, Mexico, New Zealand, Norway, Switzerland and United States. Wherever possible, firm-level data are used at the NACE 4-digit and NUTS 3-digit level. In the maps, the data for the administrative boundaries is from EuroGeographics.

Cluster trends and case examples

The report also points to some transformation trends of relevance for the priority sector. This is foremost written though from a cluster perspective and based on the expertise gathered from the cluster mapping work carried out and not from an expert perspective nor extensive research of the priority sector concerned.

The report still offers a cluster case example with the identification of specialised SME intermediaries – so called cluster organisations – that manage the collaboration, networking and learning in a clusters and provide or channel tailored business support service to group of specialised SMEs in the priority area. Such cluster organisations can help firms to better engage with other local actors within their cluster and to organise collective actions to strengthen the local context. Moreover, they can reduce transaction costs for firms, especially SMEs, in building linkages to firms and collaboration partners in other locations.

Overview

The broad construction sector, that is, according to NACE F and including architecture, civil engineering and manufacturing of construction products among others, plays a strategic role in the EU economy, accounting for 9% of gross domestic product (GDP) and 18 million direct jobs.² It is a sector mainly composed by SMEs and microenterprises, therefore its internationalisation remains limited as the vast majority of these companies operate mainly at local level, while only the international contractors have a global outreach. Yet, considering the sustained slow-down of the European market and its moderate prospects, international competitiveness plays an increasingly important role for the long-term sustainability of the construction sector and several support initiatives are being adopted, both at Member State level and at the EU level.³

A recent study from the European Commission (2019) on the Internationalisation of SMEs from the European construction sector in third markets⁴ highlights, for instance, that intermediaries and clusters can play an important role in making the required connections, feeding information effectively between industry and policy-makers and translating the needs of

² European Commission (2016). The European construction sector: A global partner, European Commission, Brussels

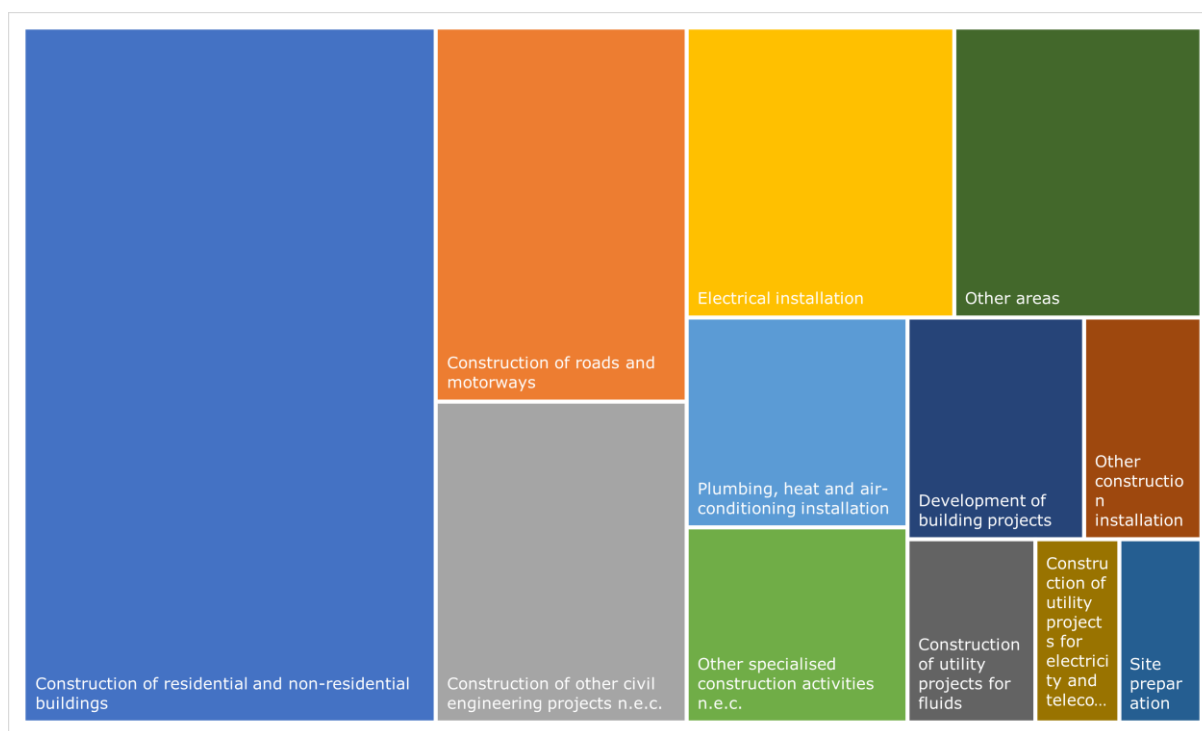
³ International competitiveness features prominently in Construction 2020, the strategic policy agenda for the construction sector in Europe. The Thematic Objective 5 “Fostering the global competitive position of EU construction enterprises” outlines policy measures foreseen in the construction 2020 action plan both for the Commission and national stakeholders. The Commission plays a key role in this regard, as it drives the trade policy of the EU as well as international cooperation on regulation and standards. Furthermore, it plays a key role in ‘business diplomacy’ and provides financial support via a number of financial instruments and cooperation funds. The EU is also active in promoting the internationalisation of SMEs through various support measures.

⁴ https://ec.europa.eu/growth/content/final-report-internationalisation-smes-european-construction-sector-third-markets_en

industry into actionable policy – e.g. by adopting a more holistic approach to support SME internationalisation.

While often considered a traditional and low-tech industry, construction industry is undergoing important transformation processes, driven by the introduction of new technologies, greater attention to environmental sustainability and energy efficiency. A new cross-sectoral industry, (smart) construction industry is emerging on the European landscape. The broad construction industry (definition according to NACE F) is generally covering transport, energy, communication, water and waste infrastructures, buildings (housing, public services, commercial and industrial), construction services (architecture, engineering, technical consultancies), manufacturing and trading of construction products and extraction of materials. Still, as Figure 1 illustrates the biggest share of employment (about 35%) takes place in the sub-sector “construction of residential and non-residential buildings”.

Figure 1. Construction industry composition based on employments on NACE industry classifications 2008.



In 2016, the average wage in the construction industry within specialised clusters that represent regional geographic concentrations of construction employment was 47 600 euros,⁵ whereas it was 39 200 euros in other locations.⁶ The average employment in specialised clusters was about double of that of other locations and in total about 34% of the employment in the construction sector is based in specialised clusters.

⁵ A specialised cluster has a specialisation rate of over 1.5 – measured by the location quotient – and has more than 500 employees in the given industries. Values above unity imply high regional specialisation, with a location quotient of 1.5 corresponding to 1.5 times as many employees in an industry than would be expected if all employment was distributed evenly.

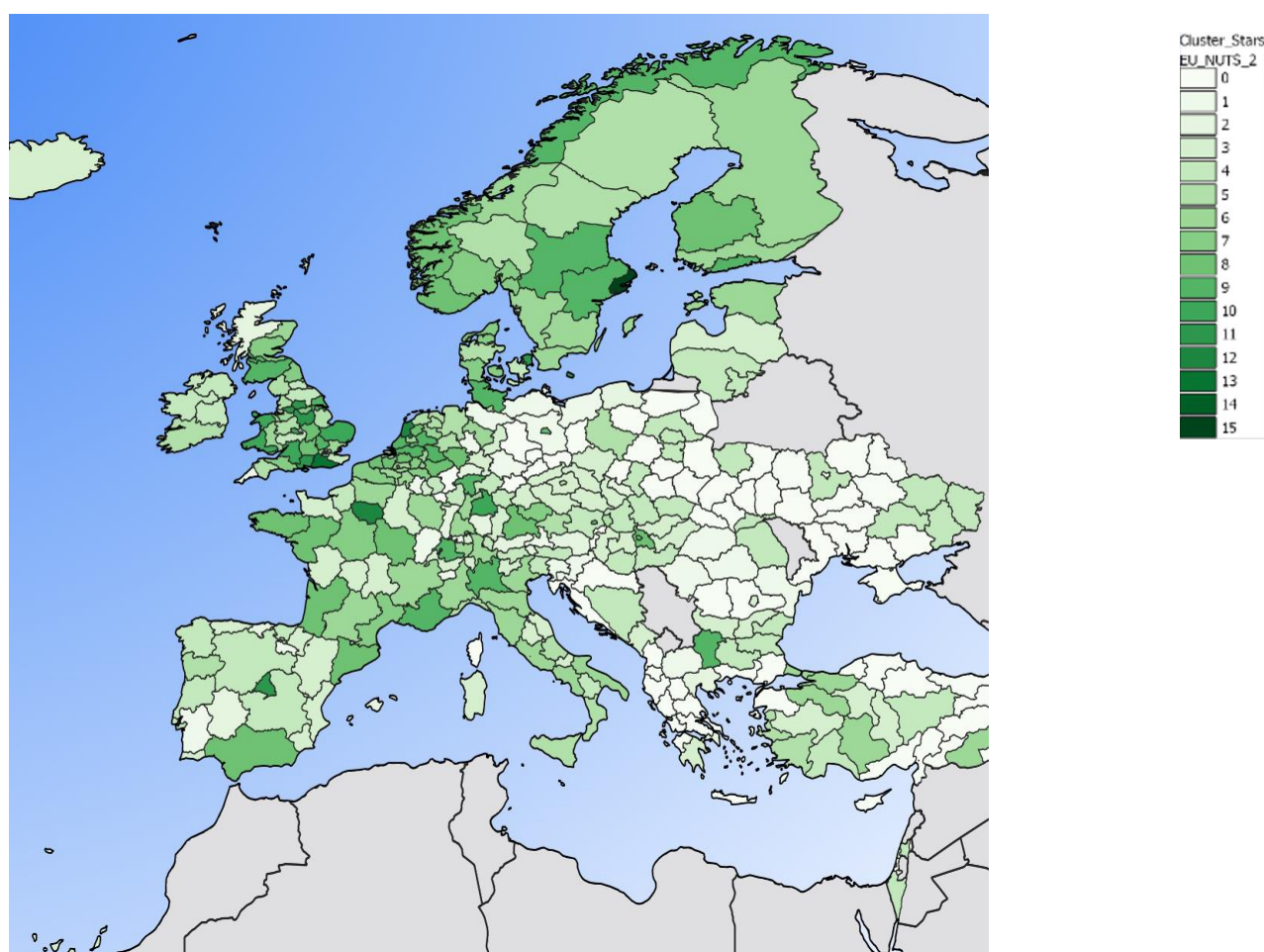
⁶ Estimation based on construction industry and construction products and services traded cluster data.

Table 1. Basic facts of construction industry.

	Specialised clusters	Other locations
Number of NUTS 2 regions	70	255
Average employment 2018	111 100	58 200
Annual change in employment 2016-2018	1.6 %	1.5 %
Average wage 2016	47 600 €	39 200 €
Annual change in wages 2014-2016	0.1 %	0 %

Figure 2 profiles all European regions according to the Cluster Stars in construction industry. Most of the regions with strong clusters in the industry are located in the north and west of Europe with high concentrations in the Benelux and the Nordic countries as well as in the United Kingdom and France.

Figure 2. Cluster Stars in construction industry in Europe (2016).



Note The depth of the green colour indicates the region’s star rating on a scale from 0 to 15.

Stockholm is the leading cluster star region with 15 stars, followed by other capital areas and British regions. Indeed, among the 17 regions that receive at least 10 Cluster Stars, there are eleven regions from the United Kingdom. The following Table 2 gives an overview of the top 20 regional clusters across Europe.

Table 2. European top 20 regions in construction industry (Cluster Stars, 2016).

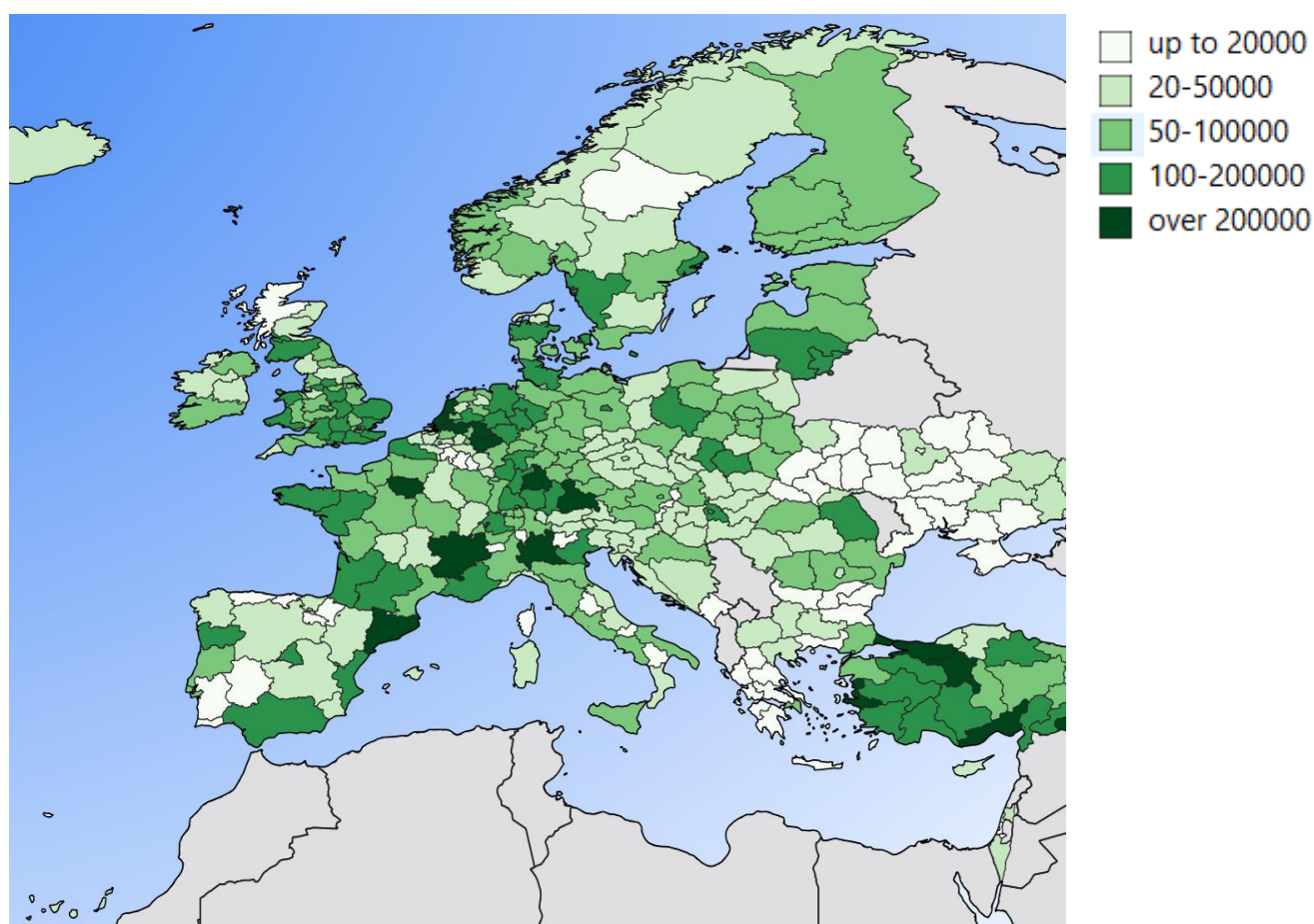
Cluster stars							
	Region	Size (0-3)	Specialisation (0-3)	Productivity (0-3)	SME performance (0-3)	Innovation leaders (0-3)	Total stars (0-15)
1	SE11 - Stockholm	3	3	3	3	3	15
2	UKJ2 - Surrey, East and West Sussex	3	1	3	3	3	13
3	FR10 - Île de France	3	0	3	3	3	12
3	NL32 - Noord-Holland	3	3	3	3	0	12
5	DK01 - Hovedstaden	3	3	3	0	2	11
5	ES30 - Comunidad de Madrid	3	3	0	2	3	11
5	UKD3 - Greater Manchester	3	2	0	3	3	11
5	UKE4 - West Yorkshire	3	3	0	3	2	11
5	UKF1 - Derbyshire and Nottinghamshire	3	3	0	3	2	11
5	UKI3 - Inner London - West	0	3	2	3	3	11
5	UKJ3 - Hampshire and Isle of Wight	3	3	0	2	3	11
12	DE11 - Stuttgart	3	0	3	1	3	10
12	UKG3 - West Midlands	3	1	0	3	3	10
12	UKH1 - East Anglia	3	3	0	2	2	10
12	UKK1 - Gloucestershire, Wiltshire and Bristol/Bath area	3	2	0	3	2	10
12	UKL1 - West Wales and The Valleys	3	3	0	2	2	10
12	UKM2 - Eastern Scotland (NUTS 2013)	3	0	3	2	2	10
18	BG41 - Yugozapaden	0	3	0	3	3	9
18	CH02 - Espace Mittelland	3	3	3	0	0	9
18	DE71 - Darmstadt	3	0	3	0	3	9

Other 9 Cluster Star regions include DEA1 - Düsseldorf, DEF0 - Schleswig-Holstein, FI1B - Helsinki-Uusimaa, FRL0 - Provence-Alpes-Côte d'Azur, ITC4 - Lombardia, NL22 - Gelderland, NL33 - Zuid-Holland, NL41 - Noord-Brabant, NO07 - Nord-Norge, SE12 - Östra Mellansverige, SE31 - Norra Mellansverige, UKE1 - East Yorkshire and Northern Lincolnshire, UKH2 - Bedfordshire and Hertfordshire, UKI4 - Inner London - East and UKM3 - South Western Scotland

Employment

Figure 3 illustrates the employment pattern in the construction industry in Europe, showing several regions all over Europe employing more than 200,000 workforces. Accordingly, the core of the construction industry employment lies in Turkey, France, Germany and the Netherlands.

Figure 3. Leading European regions in construction industry (Full Time Equivalents, 2016).



Note: The depth of the green colour indicates the full time equivalent employment in the construction industry on a scale from “up to 20 000” to “over 200 000”.

Five Turkish regions – namely Istanbul; Sanliurfa, Diyarbakir; Ankara and Izmir – are among the top 10 European regions with the highest number of employment in the construction industry, with about 890 000, 250 000, 230 000 and 220 000 employees. Two French regions – Île de France (i.e. Paris) and Rhône-Alpes – and three German regions, – Stuttgart, Upper Bavaria (Oberbayern) and Düsseldorf – make their way to top 10 with respectively about 400 000, 270 000, 240 000, 230 000 and 220 000 employees. Zuid-Holland is also one of the regions with the highest number of employees in the industry.

As the mere employment figures by default favour regions with a larger population, the following table not only provides the figures for the top employment regions but also indicates the extent of the regional specialisations, expressed by the location quotient (which as displayed as a map by Figure 8 later on). A value above 1 indicates that a region is more specialised than the average region of similar size. A value of 1.5, together with a threshold of 5 000 employees is used to identify a specialised clusters.

Table 3. Top 20 European regions with the highest number of employment in the construction industry (Full Time Equivalents, 2016).

Region	Employees	Specialisation	Region	Employees	Specialisation
TR10 - Istanbul	889 300	1,8	ITC4 - Lombardia	216 700	0,6
FR10 - Île de France	401 500	0,9	TR62 - Adana, Mersin	214 800	2,0
NL33 - Zuid-Holland	275 700	1,8	ES51 - Cataluña	211 600	0,7
FRK2 - Rhône-Alpes	274 000	1,1	NL41 - Noord-Brabant	209 800	1,9
TRC2 - Sanliurfa, Diyarbakir	254 200	3,4	NL32 - Noord-Holland	207 500	1,7
DE11 - Stuttgart	237 800	1,3	TR42 - Kocaeli, Sakarya, Düzce, Bolu, Yalova	206 700	1,8
TR51 - Ankara	234 800	1,4	DEA2 - Köln	206 600	1,1
DE21 - Oberbayern	228 800	1,1	IE02 - Southern and Eastern (NUTS 2013)	202 700	1,3
TR31 - Izmir	220 600	1,6	TR41 - Bursa, Eskisehir, Bilecik	194 900	1,6
DEA1 - Düsseldorf	218 200	1,1	DE71 - Darmstadt	188 400	1,1

Enterprises

As a consequence of the dynamism and progressive transformation of emerging industries, the boundaries of emerging industries are changing. Smart materials, eco-building, sustainable hotels⁷, intelligent systems and smart technologies to control building operations (e.g. heating, security, etc.) are amongst the trends that are profoundly changing the value chain of the construction industry and increasing the interlinkages between this industry and other manufacturing and service sectors.

⁷ The European Commission works on a number of initiatives in the area of sustainable tourism and the Commission Communication, 'Agenda for a sustainable and competitive European tourism' proposes solutions to the challenges in the area. For more information, see https://ec.europa.eu/growth/sectors/tourism/offer/sustainable_en

Digitalisation in the built environment will have significant impact for the everyday life and society. It creates an opportunity to improve comfort of living, efficiency in the management of resources and safety. Smart components embedded into buildings and infrastructure can both monitor and react to changes in the surroundings. They can play an important role in the context of monitoring the state of the ageing EU infrastructure, or even its resilience against earthquakes, natural phenomena.⁸ Equally, lighting and heating can be modified automatically or on-demand, locally or remotely. Such solutions rely on embedded sensors, connectivity solutions and cloud platforms that enable data to be gathered and analysed in real-time. On the other hand, in the context of Europe's ageing population and increasing requests for the functionalities of the built environment, digitalisation's role will keep increasing.

The main driver of digitalisation in the sector is Building Information Modeling (BIM). It serves as the focal software platform for integrated design, modelling, planning, and collaboration, thereby "providing all stakeholders with a digital representation of a building's characteristics in its whole lifecycle".⁹ By supporting a transparent and seamless flow of information between all stakeholders, BIM facilitates their collaboration throughout the different project phases. This translates into large efficiency gains, with lower costs, faster delivery with less miscommunications, inaccuracies and delays, growing business opportunities and lower emissions and waste.¹⁰ Although a relatively traditional sector, construction is the main adopter of drones used from construction oversight, to scanning of the thermal performance and structural condition of buildings.¹¹

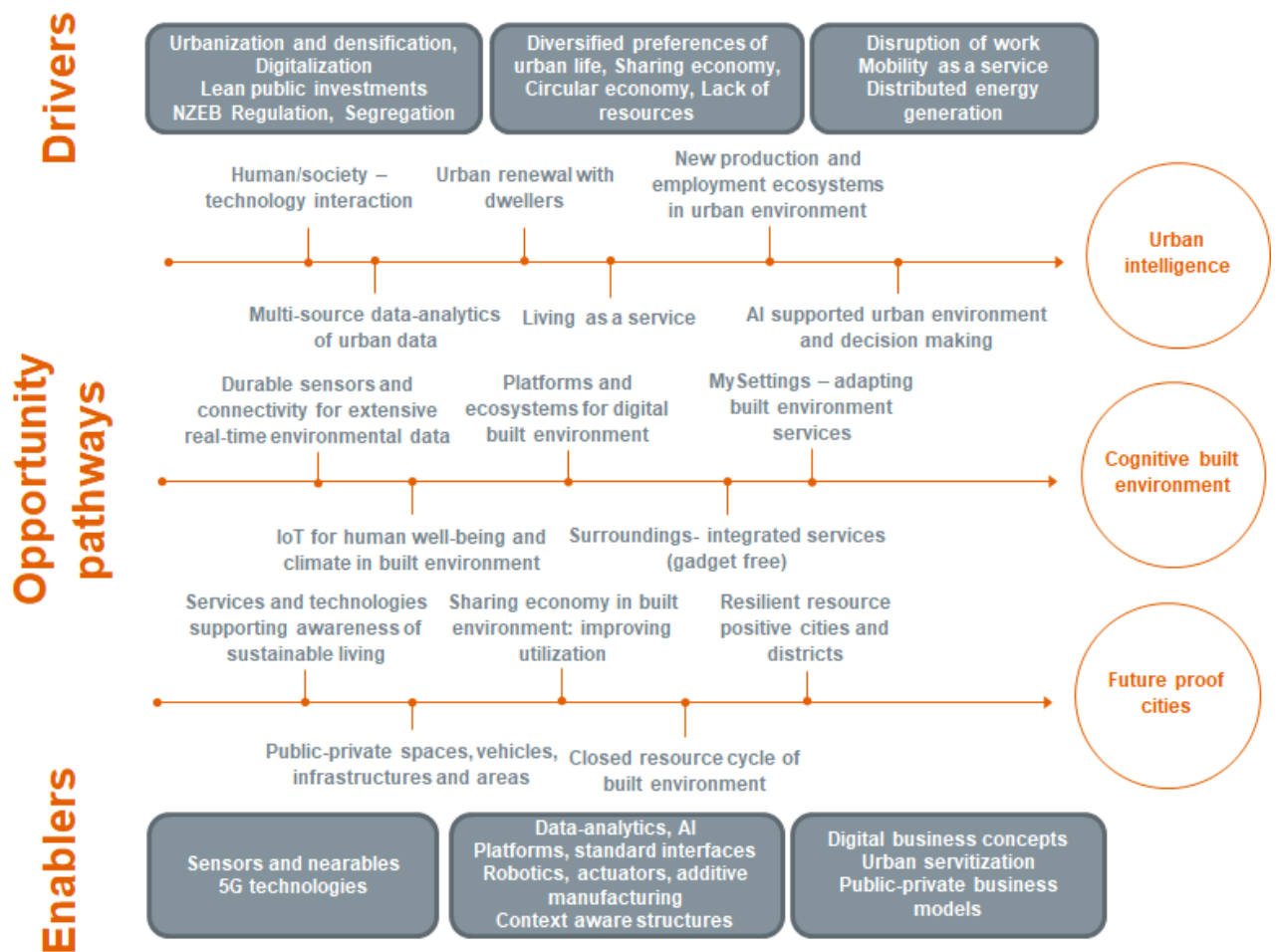
⁸ Cauzzi, C., Gasparini, P., Wiemer, S. et al. (2016) Preface to the special issue "Strategic applications of real-time risk mitigation strategies and tools: case studies and lessons learned in REAKT". Bull Earthquake Eng 14: 2437. <https://doi.org/10.1007/s10518-016-9966-8>

⁹ Joint Research Centre (2017). Building Information Modelling (BIM) standardization http://publications.jrc.ec.europa.eu/repository/bitstream/JRC109656/jrc109656_bim.standardization.pdf

¹⁰ European Construction Sector Observatory (2019). Building Information Modelling in the EU construction sector. Trend Paper Series, March 2019. <https://ec.europa.eu/docsroom/documents/34518>

¹¹ European Construction Sector Observatory (2019). Integrating digital innovations in the construction sector, the case of 3D Printing and Drones in construction. Trend Paper Series, March 2019. <https://ec.europa.eu/docsroom/documents/34517>

Figure 4. Urbanization and strained infrastructures pose pressures towards design of our living environment.



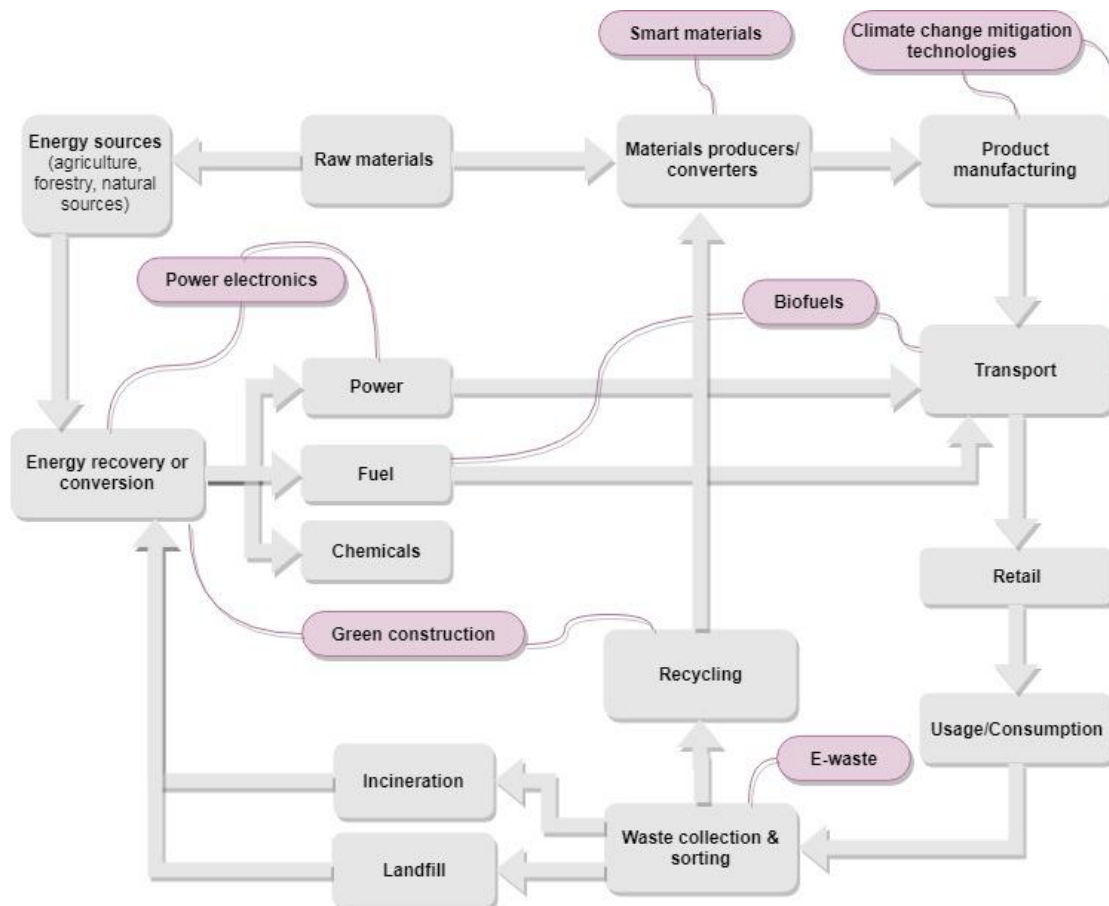
Source: Technical Research Centre of Finland VTT

Building sustainably means building responsibly, reducing waste and helping preserve the environment in the construction activities. Smart construction equipment such as smart windows, smart shade, roofing, ceilings, smart concrete and smart bricks, uses new materials are being developed to perform better against changes in electricity, magnetic, waves or heat. These materials respond to environmental considerations, in that they are eco-friendlier, lead to less energy consumption, and guarantee a more sustainable recycling process.¹² However, the benefits of many technological advances will materialize only if the whole ecosystem is ready. This calls for a holistic perspective taking account all of the public and private sector actors along the construction value chain.

¹² EOCIC (2019). European Cluster and Industrial Transformation Trends Report.

Digitalisation of the construction sector is increasingly recognised as a potential game changer for the sector, which could contribute significantly to sustainable development and the EU 2020 Strategy.¹³

Figure 5. The cross-sectoral value chain for a smart and green construction industry.



Source: CSIL (Centre for Industrial Studies)

The following Table 4 illustrates the top European regions in terms of the corresponding number of enterprises in the construction industry. Firm-level data has been used to also identify high-growth firms and rapidly growing start-ups, industry leaders and global frontier firms.¹⁴ Due to the availability of the data and differences in accounting rules across countries,

¹³ European Commission (2012). Strategy for the sustainable competitiveness of the construction sector and its enterprises <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52012DC0433>

¹⁴ *High-growth firms* have annual growth rates of 20% for turnover or employment over 3 years while having at least 20 employees at the end. A *rapidly growing start-up*, on the other hand, is a firm that possesses from 3 to 20 employees and that experiences such a high average turnover, employment or asset growth over a one-, two- or three-year period that it belongs to the top 10% of firms within any given industry. *Industry leader* is a company that belongs to the top 1% of companies having the highest turnover or the highest profits in any particular year in the industry. *Global frontier firms* are the top 5% of firms in terms of productivity (value added based, per employee), calculated by adding up factor incomes going to employees (wages) and to capital owners (profits) within any year.

the results have to be interpreted however with some caution. Still, it brings a more dynamic view to the cluster mapping and analysis.

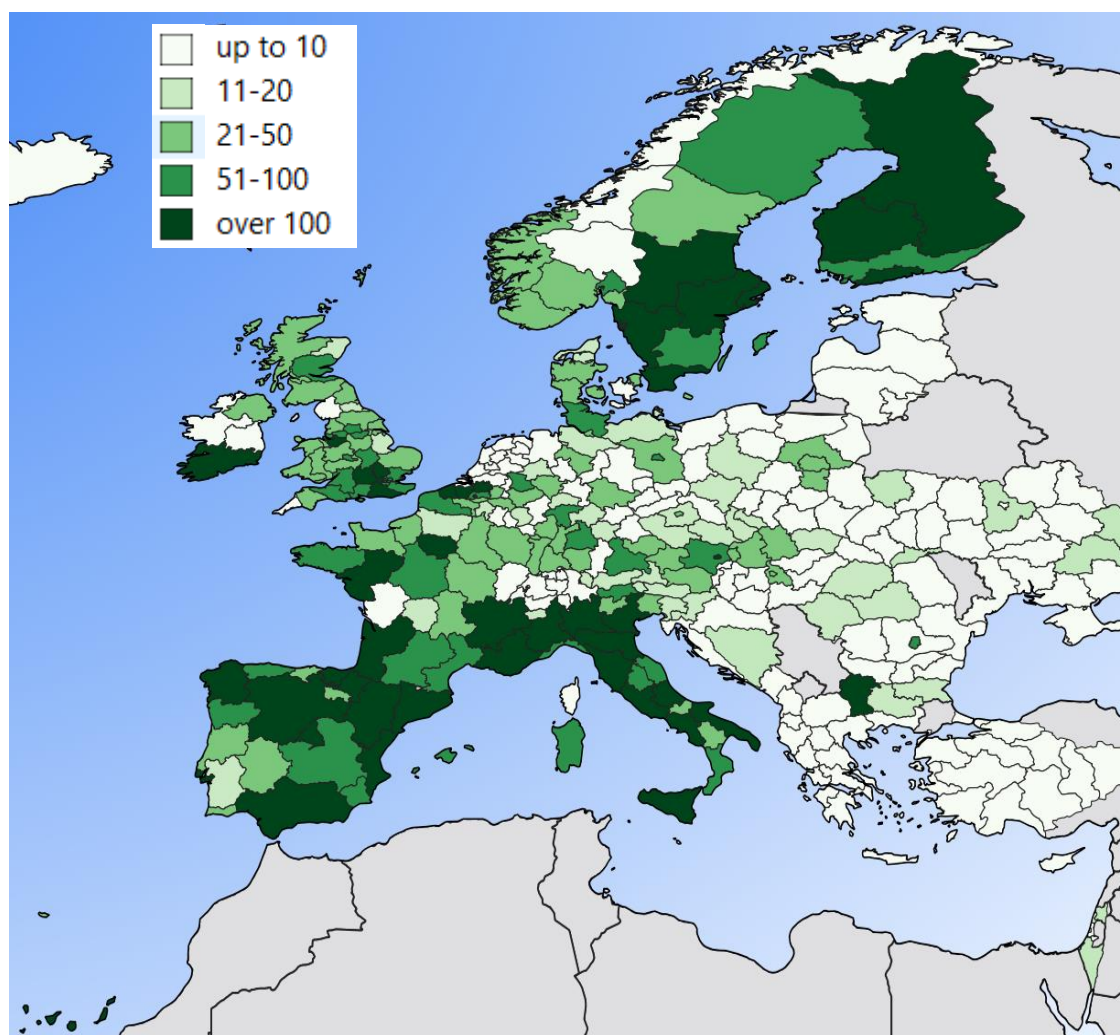
Table 4. Top 20 European regional construction industry clusters according to number of high-growth firms and start-ups, industry leaders and global frontier firms (global share of enterprises, per million people, 2016).

Cluster performance in detail: SME performance driven by high-growth firms						Innovation potential driven by industry leaders (top 1%) and global frontier firms (top 5%)				
Region	Turnover	Employees	Assets	Start-ups	Avg	Region	Turnover	Profit	Value Add	Avg
BG41 - Yugozapaden	1.4	1.6	1.0	0.2	1.0	UKI3 - Inner London - West	2.8	3.7	1.3	2.6
RO32 - Bucharest-Ilfov	0.9	1.1	0.8	0.7	0.9	UKH2 - Bedfordshire and Hertfordshire	2.2	1.3	0.4	1.3
LV00 - Latvia	1.0	1.1	0.8	0.1	0.7	SE11 - Stockholm	1.1	1.1	1.2	1.2
BG33 - Severoiztochen	1.0	1.1	0.7	0.0	0.7	FI1B - Helsinki-Uusimaa	1.7	0.6	1.1	1.1
BG34 - Yugoiztochen	0.9	1.1	0.7	0.1	0.7	UKE2 - North Yorkshire	1.8	1.2	0.3	1.1
ITI4 - Lazio	0.3	0.3	0.3	1.9	0.7	NL31 - Utrecht	1.9	1.2	0.0	1.1
LT00 - Lithuania	1.1	1.0	0.5	0.0	0.7	PT30 - Regiao Autonoma da Madeira	0.5	1.6	0.6	0.9
SE11 - Stockholm	0.6	0.6	0.6	0.6	0.6	BE10 - Brussels-Capital Region	0.8	1.1	0.5	0.8
ITC4 - Lombardia	0.2	0.2	0.2	1.8	0.6	NO01 - Oslo og Akershus	1.1	0.9	0.3	0.8
BG42 - Yuzhen Tsentralen	0.7	0.9	0.5	0.0	0.5	ES30 - Madrid	0.7	0.8	0.7	0.8
NO07 - Nord-Norge	0.9	0.0	1.0	0.2	0.5	AT13 - Wien	0.5	1.1	0.4	0.7
EE00 - Estonia	0.8	0.5	0.7	0.0	0.5	UKD6 - Cheshire	0.3	1.0	0.6	0.7
NO01 - Oslo og Akershus	0.6	0.0	0.7	0.6	0.5	NL33 - Zuid-Holland	1.0	0.9	0.0	0.6
ITF3 - Campania	0.3	0.3	0.3	1.0	0.4	BE21 - Antwerp	0.8	0.5	0.6	0.6
PT11 - North	0.5	0.6	0.5	0.2	0.4	UKJ1 - Berkshire, Buckinghamshire and Oxfordshire	0.6	0.8	0.3	0.6
NO05 - Vestlandet	0.7	0.0	0.7	0.3	0.4	UKJ2 - Surrey, East and West Sussex	0.9	0.5	0.3	0.6
NO06 - Trondelag	0.8	0.0	0.8	0.1	0.4	ITH5 - Emilia-Romagna	0.7	0.5	0.5	0.5
SE12 - East Middle Sweden	0.5	0.5	0.5	0.1	0.4	FR10 - Ile-De-France	0.7	0.5	0.4	0.5
FI1B - Helsinki-Uusimaa	0.5	0.4	0.5	0.3	0.4	BE25 - West-Flanders	0.2	0.7	0.7	0.5
SE23 - West Sweden	0.5	0.4	0.5	0.2	0.4	SE22 - South Sweden	0.6	0.4	0.5	0.5

Note: The measures above are relative, that is, the number of high growth firms – with respect to turnover, employment or asset growth – rapidly growing start-ups, industry leaders – with respect to turnover or profit – and global frontier firms is divided by the region's population (million people).

The SME performance in the construction industry is especially high in countries like Bulgaria, Romania and Norway. The Baltic States (i.e. Estonia, Latvia and Lithuania) and its Baltic Sea region neighbours Finland and Sweden are performing well in this regard. Global frontier firms can be partly found from the same regions. In addition, regions from Belgium, France, Italy, Spain, Ireland and the United Kingdom host a number of global frontier firms too (see Figure 6).

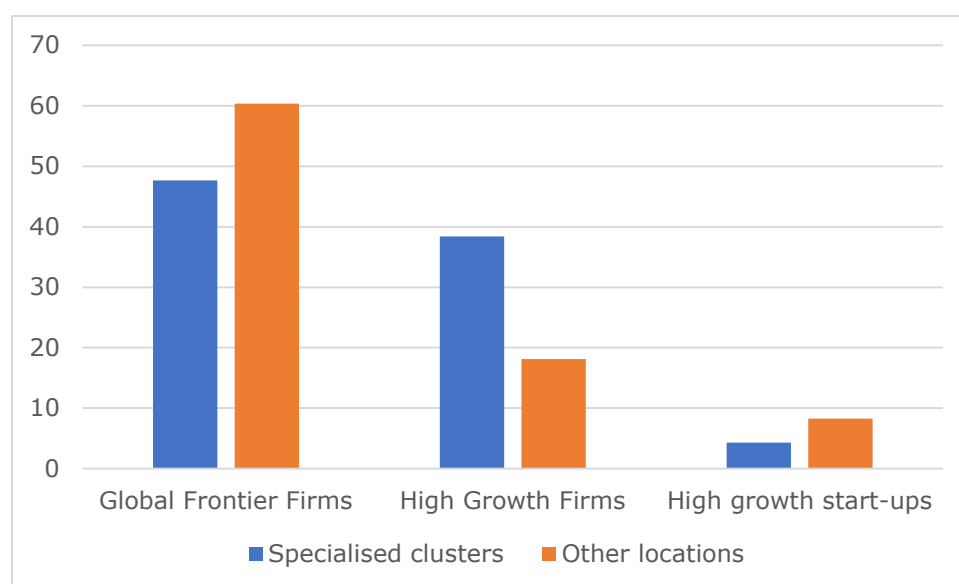
Figure 6. Leading European regions in construction industry (global frontier firms, 2008-2016).



Note: The depth of the green colour indicates the occurrences of global frontier firms in the region during the period from 2008 to 2016 on a scale from "up to 10" to "over 100".

Different from other priority sector report areas, regions with specialised clusters do not locate a higher rate of global frontier firms or rapidly growing start-ups than other locations (see Figure 7 below). This can be because much of this activity takes place in capital regions (see the Appendix of European top regions with respect to Cluster Stars). However, most of these regions are not specialised clusters in the construction industry, but have location quotients in the range of 1.0 to 1.5.¹⁵

Figure 7. Average number of global frontier firms, high-growth firms and rapidly growing start-ups in the specialised clusters and other locations (construction industry, 2016).



¹⁵ Values above unity imply high regional specialisation, with a location quotient of 1.5 corresponding to 1.5 times as many employees in an industry than would be expected if all employment was distributed evenly.

Case: Walloon construction clusters¹⁶

Business clusters¹⁷ were launched by the Walloon Government in 2000 to encourage cooperation and partnerships among the Walloon companies – both SMEs and large companies¹⁸. CAP Construction¹⁹ and Eco-Construction²⁰ are two business clusters in the fields of environment and sustainable development.

CAP Construction aims to bring together builders, architects, producers and suppliers of materials and services who are adopting the 2020 European goal of massively reducing energy consumption. *Eco-Construction*, on the other hand, is a business cluster of companies whose goal is environmental construction. It promotes urban and architectural choices that favour natural incorporate bioclimatic principles, use of green or natural materials, use of renewable energies and/or low-emission fuels and good thermal insulation of the building.

Interaction among clusters has always been good, with research centre and universities building a very good network over the years, especially within cross-sectoral clusters in emerging smart construction industry of CAP Construction and Eco-construction.

Ecological trends and the popular wave towards more green energies are welcomed by companies in general. Many companies try now to optimise their processes to lower their CO2 emissions (e.g. program Lean and Green²¹). This is particularly true for Eco-construction cluster, which has benefitted from and taken advantage of these trends in their business.

Some mega trends are seen as both an opportunity and a challenge. For example, **customisation of products and services** is seen as a great opportunity for clusters to differentiate themselves to current and potential clients from the competition. This also entails that products and services should be produced at a rapid enough pace to meet evolving demands and become available immediately. The cluster Eco-construction tailored its products towards wood construction, as wood's popularity in the field of construction exponentially rose in the last 15 years. However, customisation of products requires both human and financial resources. For the clusters that do not have these, customisation of products and services can thus be perceived as a challenge.

¹⁶ EOCIC (2018). Regional assessment report – Wallonia.

¹⁷ The Walloon Decree on Support and Development of Business Clusters recognised business clusters as: "A network of businesses that is a de facto association, a non-profit association, an economic interest grouping and/or a European economic interest grouping in an organisation of the production system, established at the initiative of companies operating in the Walloon Region, which may possibly involve the participation of university institutions, research centres, and training centres".

¹⁸ Cadre conceptuel et opérationnel pour une politique de Clusters en Wallonie, MERIT and Ernst & Young, 2000.

¹⁹ For more information see: <http://clusters.wallonie.be/cap2020-fr/qu-est-ce-que-cap2020.html?IDC=6111&IDD=30355>

²⁰ For more information see: <http://clusters.wallonie.be/ecoconstruction-fr/>

²¹ See: <http://www.logisticsinwallonia.be/lean-and-green-en-pratique>

New technologies can help firms both tailor their products and services according to the demand, and increase their production rates. In the field of eco-construction in particular, stakeholders mention that it is especially important to know what is new on the market and what are the new and most innovative eco-friendly materials. Eco-friendly technologies are now part of new industries such as Mobic²² and Stabilame²³.

Finally, it appears that **Big Data is the trend that is mostly seen as a real challenge** for clusters. This is because most clusters do not yet have the means to acquire the adequate software to process such data nor the expertise to efficiently use it. Digitisation and treatment of data can therefore be a very important challenge, especially in the building and construction sector. Big data is particularly important in the field of logistics, as this area is about flows of goods, information and money. In this respect, the flow of information becomes enormous through digital developments. Companies dealing with logistics must therefore have the competences to capture, treat and exploit information to have a better visibility in their supply chain.

Case: Smart Housing Småland²⁴

Smart Housing Småland (SHS) functions as an accelerator and catalyst for businesses and as an engine of the regional innovation and growth system. It is built on the Småland region's areas of strength, wood and glass. In 2013, it won Vinnova's (the Swedish Governmental Agency for Innovation Systems) Vinnväxt competition, awarding it ten years of financing aimed at establishing a nationally and internationally strong and attractive innovation centre. SHS has taken the lead on starting a European meta-cluster in industrial wood construction together with Arena Skog in Norway and Innobyg in Denmark. Initially they will focus on seven countries in the Baltic Sea region. The cluster aims for continuous development of digital processes and adaptation of planning processes, industrial production, building processes, construction, user-centric design and business models.

Cases: Digital Innovation Hubs²⁵ for the construction industry

Two examples from the pan-European network of Digital Innovation Hubs that help companies to benefit from digital opportunities in the construction industry are: nZEB Smart House in Thessaloniki, Greece and Brightlands Materials Center in Geleen, the Netherlands.

The *CERTH/ITI nZEB Smart House*²⁶ is a rapid prototyping and novel technologies demonstration infrastructure resembling a real domestic building where occupants can experience actual living scenarios while exploring various innovating smart Internet of Things

²² See <http://www.mobicsa.be/>

²³ <https://www.stabilame.be/>

²⁴ <http://smarthousing.nu>

²⁵ See <https://ec.europa.eu/digital-single-market/en/digital-innovation-hubs>; <https://dihnet.eu> and a catalogue is available at <https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool>

²⁶ <https://smarthome.iti.gr/>

(IoT)-based technologies with provided Energy, Health, Big Data, Robotics and Artificial Intelligence (AI) services. It combines enhanced construction materials and intelligent ICT solutions creating a future-proof, sustainable and active testing, validating and evaluating ecosystem.

*Brightlands Materials Center*²⁷ develops innovative materials solutions for a sustainable future in collaborations with industry, academia and entrepreneurs. It aims to apply its materials knowledge to the development of innovative and well-designed new applications meeting industrial and societal needs. In particular, the center works with polymeric materials studying, for example, their mechanical properties, optical properties of coatings and polymer films and polymer melt processing, such as extrusion and injection molding.

European Strategic Cluster Partnerships for smart specialisation investments (ESCP-S3)

The ESCP-S3 action of the COSME Framework Programme of the European Commission contribute to boost industrial competitiveness and investment within the EU. The ESCP-S3 are facilitating **cluster cooperation** in thematic areas related to **regional smart specialisation** strategies and to increase the involvement of the industry in the context of the Smart Specialisation Platform for Industrial Modernisation²⁸.

An EU Cluster Partnership, Cyber Secure IoT Lighting and Home Automation systems for Smart Building (CYBER SECURE LIGHT) aims to foster interregional business-to-business collaboration deals in the smart building/IT/cyber security sector. It has started 6 business cooperation initiatives and technology transfer projects in the sector and provides them with a joint highly-expertise extensive mentoring and tailored support to facilitate commercial alliances, access to finance and investments, and technology transfer cooperative agreements.²⁹

Regional specialisation

Measuring regional specialisation of the construction industry can provide interesting insights to what extent a region is stronger than would be expected in this sector given its overall size, compared to the average employment size in the industry across all regions. Regional specialisation can be measured by the Location Quotient (LQ).³⁰ Figure 8 shows to what extent European regions are specialised in the construction industry.

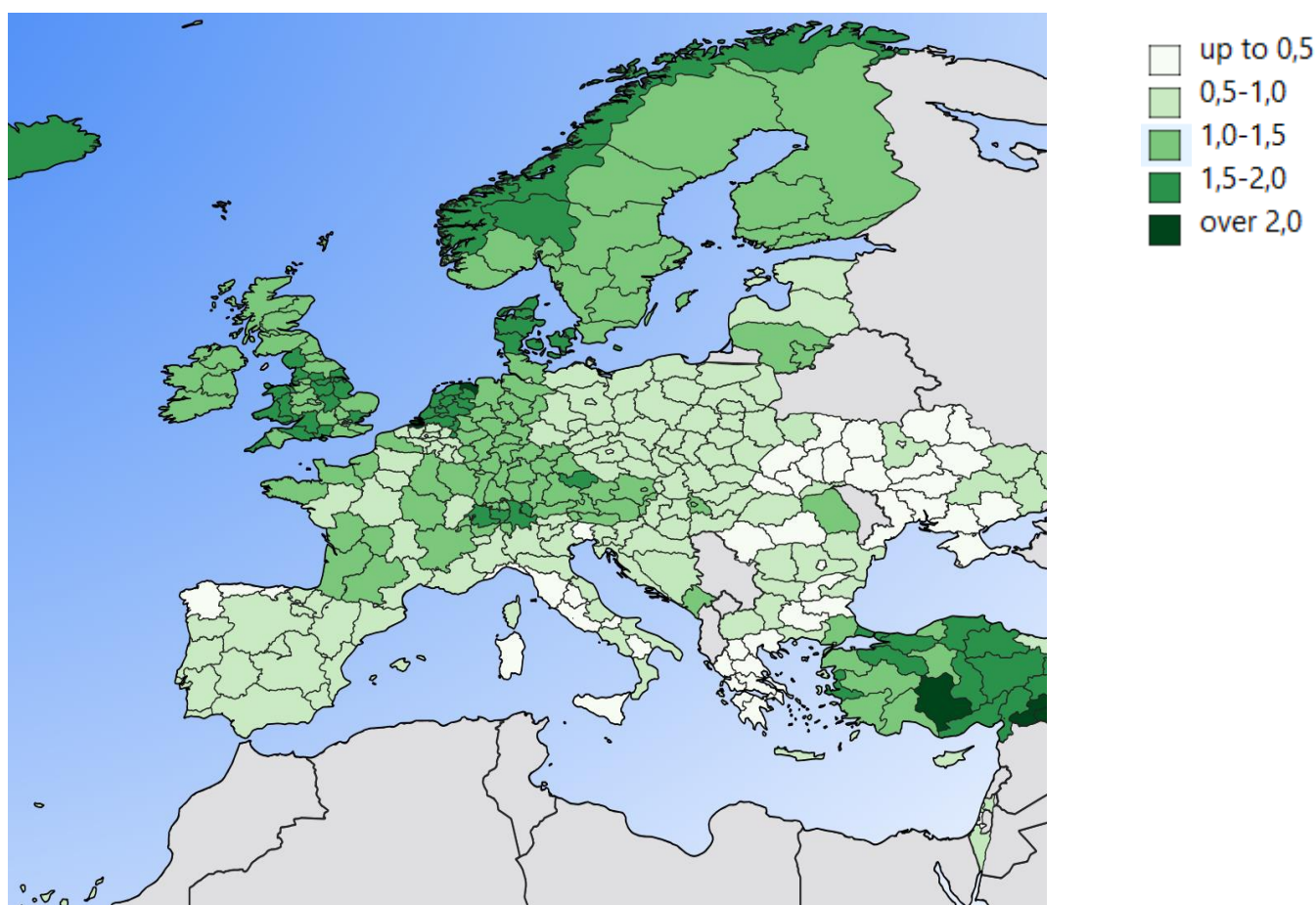
²⁷ <https://www.brightlandsmaterialscenter.com/>

²⁸ <https://s3platform.jrc.ec.europa.eu/industrial-modernisation>

²⁹ <https://www.clustercollaboration.eu/node/6502>

³⁰ A value higher than 1.0 means a given region is higher specialised than the European average. As of a value of 1.5, one speaks of specialised regional clusters.

Figure 8. Leading European regions in construction industry (Specialisation, 2016).



Note: The depth of the green colour indicates the region's Location Quotient (LQ) in the construction industry on a scale from "up to 0.5" to "over 2.0".

The Istanbul district has the highest number of construction employees, almost 900 000, and has one of the highest specialisation rates also, with 1.8 just outside the top 20 listing in the following Table 5. The most specialised regions in the construction industry locate in Turkey and in the Netherlands; the only exceptions in the top 20 list are Midtjylland in Denmark and Iceland.

The Netherlands is a global leader in energy efficiency in the built environment and has a wide range of schemes in place to stimulate efficiency improvements. The Energy Leap (Energiesprong) scheme is an innovative market development programme that was launched in 2010 with initial government funding of EUR 50 million to develop attractive and viable net-zero energy retrofit solutions for the mass market by 2020. It creates demand and market opportunities for large-scale retrofits of homes, offices, schools and care homes. The Netherlands also operates a number of schemes to provide financing, advice and networking opportunities to help SMEs to export and expand into foreign markets. Examples include the

EUR 102 million Dutch Trade and Investment Fund (DTIF) and a EUR 3.8 million internationalisation voucher scheme.³¹

Wider insights about “improving resource efficiency, environmental performance and business opportunities” of the EU Construction 2020 Strategy and further examples of national and regional policy measures are provided by the European Construction Sector Observatory³². Its analytical report on “Improving energy and resource efficiency” report provides an overview of the current resource efficiency and energy performance of buildings situation in the construction sector in the EU-28, paying particular attention to the characteristics of the building stock and the waste and emissions generated by construction activity.³³

Table 5. Top 20 European regions with the highest location quotients (specialisation) in the construction industry (Full Time Equivalents, 2016).

Region	Employees	Specialisation	Region	Employees	Specialisation
TRC2 - Sanliurfa, Diyarbakir	254 200	3.4	NL12 - Friesland (NL)	51 200	1.9
TRB2 - Van, Mus, Bitlis, Hakkari	126 500	2.9	DK04 - Midtjylland	105 300	1.9
TRC3 - Mardin, Batman, Sirnak, Siirt	100 400	2.7	NL41 - Noord-Brabant	209 800	1.9
TRA2 - Agri, Kars, Igdirdir, Ardahan	68 300	2.4	TR63 – Hatay, Kahramanmaras, Osmaniye	151 800	1.9
TRC1 - Gaziantep, Adiyaman, Kilis	148 700	2.4	NL42 - Limburg (NL)	86 000	1.9
NL11 - Groningen	53 600	2.3	IS00 - Ísland	30 100	1.9
TR52 - Konya, Karaman	144 500	2.1	NL21 - Overijssel	91 300	1.9
NL34 - Zeeland	32 100	2.1	NL23 - Flevoland	33 300	1.8
NL22 - Gelderland	168 800	2.0	NL13 - Drenthe	35 500	1.8
TR62 - Adana, Mersin	214 800	2.0	NL33 - Zuid-Holland	275 700	1.8

³¹ Hardiman, S. Insight into Construction in the Netherlands by the European Construction Sector Observatory. <https://www.construction21.org/articles/h/insight-into-construction-in-the-netherlands-by-the-european-construction-sector-observatory.html>

³² https://ec.europa.eu/growth/sectors/construction/observatory_en

³³ European Construction Sector Observatory (2019). Improving energy and resource efficiency. Analytical Report, January 2019. <https://ec.europa.eu/docsroom/documents/33883/attachments/1/translations/>

Summary

The construction industry plays a strategic role in the EU economy, accounting for 9% of gross domestic product (GDP) and 18 million direct jobs. While often considered a traditional and low-tech industry, construction industry is undergoing important transformation processes, driven by the introduction of new technologies, greater attention to environmental sustainability and energy efficiency. This transformation towards a smarter and greener construction industry requires new collaborations along and across the value chains and with different sectors and the integration of new service providers. It implies to adopt smart materials, intelligent systems, sustainable and digital tools, processes, products and services. Building sustainably means building responsibly by reducing waste and helping preserve the environment in the construction activities.

In 2016, the average wage in the construction industry was 47 600 euros, with specialised clusters, whereas it was 39 200 euros in other locations. The average employment in specialised clusters was about a double of those of other locations.

On average, specialised clusters host twice as many high-growth firms than other locations. On the other hand, different from other priority sector report areas, specialised clusters do not locate a higher rate of global frontier firms or rapidly growing start-ups than other locations – only high-growth firms. This can be because much of this activity takes place in capital regions. Most of these regions are not specialised clusters in the construction industry; they typically have location quotients in the range of 1.0 to 1.5.

Most of the strong regions in the industry are located in the north and west of Europe with high concentrations in the Benelux and the Nordic countries as well as in the United Kingdom and France. Stockholm is the leading cluster star region with 15 stars, followed by other capital areas and British regions. Indeed, among the 17 regions that receive at least 10 Cluster Stars, there are eleven regions from the United Kingdom.

Several regions all over Europe employ more than 200 000 workforces. Accordingly, the core of the construction industry employment lies in Turkey, France, Germany and the Netherlands. Four Turkish regions – Istanbul; Sanliurfa, Diyarbakir; Ankara and Izmir – are among the top 10 European regions with the highest number of employment in the construction industry. Two French regions –, Île de France (i.e. Paris) and Rhône-Alpes – and three German regions – Stuttgart, Upper Bavaria (Oberbayern) and Düsseldorf – make their way to top 10 with respectively about 400 000, 270 000, 240 000, 230 000 and 220 000 employees. Zuid-Holland is also one of the regions with the highest number of employees in the industry. The most specialised regions in the construction industry locate in Turkey and in the Netherlands; the only exceptions in the top 20 list are Midtjylland in Denmark and Iceland.

As there are many different professionals (e.g. engineers, architects to manufacturers) increasing interlinkages with other manufacturing and service sectors and new operations involved in the transition to a smarter and greener construction process, this has also increased

complexity for firms. With micro, small & medium-sized enterprises representing the highest portion of firms in the industry, it may be challenging for many firms to master this transition effectively.

Smart technological approaches, such as building information modelling (BIM), can translate however into large efficiency gains, with lower costs, faster delivery with less miscommunications, inaccuracies and delays, growing business opportunities and lower emissions and waste. The increasing digitalisation of the construction sector and the sustainability demand of customers are changing the composition and dynamics of the sector.

The benefits of many technological advances will materialise only if the whole regional ecosystem is ready to master the digitalisation challenge and meet the increasing sustainability demand. This calls for a holistic perspective taking account of the public and private sector actors along the construction value chain. Policy-makers need to embrace such complexity and provide differentiated support to the private sector depending on its characteristics. Public sector interventions are more effective when aligned and/or coordinated with private sector initiatives and can take different shapes including public procurement law, education and research & development, or private sector platform support etc.

The role of SME intermediaries, such as cluster organisations, can be crucial to promote and encourage the uptake of innovation amongst construction firms and help them to identify right steps and partners to team up with. The cluster organisations can help to make the connections with technology centres of the digital innovation hubs and with firms based in other clusters to promote their internalisation activities.

Appendix

European top regions in construction industry (at least 8 Cluster Stars, 2016)

NUTS	Region	Cluster Stars	Employment 2018	Average annual change 2016-2018	Average wage 2016	Average annual change 2014-2016
SE11	SE11 - Stockholm	15	119 300	0,8 %	79 500 €	0,5 %
UKJ2	UKJ2 - Surrey, East and West Sussex	13	146 500	-9,9 %	69 400 €	-1,8 %
UKM2	UKM2 - Eastern Scotland	13	137 200	6,6 %	70 500 €	0,2 %
FR10	FR10 - Ile-De-France	12	401 500	4,8 %	69 200 €	1,8 %
NL32	NL32 - Noord-Holland	12	207 500	1,3 %	64 600 €	-3,4 %
DK01	DK01 - Hovedstaden	11	131 800	-1,3 %	86 000 €	-1,3 %
ES30	ES30 - Madrid	11	153 700	13,5 %	39 500 €	1,3 %
UKD3	UKD3 - Greater Manchester	11	162 900	-4,8 %	48 300 €	-3,3 %
UKE4	UKE4 - West Yorkshire	11	143 300	-2,2 %	57 400 €	0,5 %
UKF1	UKF1 - Derbyshire and Nottinghamshire	11	129 800	-4,9 %	55 100 €	4,8 %
UKI3	UKI3 - Inner London - West	11	43 000	3,3 %	76 300 €	5,2 %
UKJ3	UKJ3 - Hampshire and Isle of Wight	11	130 300	0,3 %	48 700 €	-2,0 %
DE11	DE11 - Stuttgart	10	237 800	0,1 %	45 200 €	-1,6 %
UKG3	UKG3 - West Midlands	10	157 600	-1,0 %	62 200 €	1,0 %
UKH1	UKH1 - East Anglia	10	138 500	-6,5 %	48 900 €	0,2 %
UKK1	UKK1 - Gloucestershire, Wiltshire and Bristol/Bath area	10	160 700	1,4 %	51 000 €	-4,1 %
UKL1	UKL1 - West Wales and The Valleys	10	120 000	-0,7 %	48 000 €	-4,0 %
BG41	BG41 - Yugozapaden	9	49 100	6,5 %	6 900 €	1,3 %
CH02	CH02 - Espace Mittelland	9	132 700	-0,9 %	81 800 €	-0,9 %
DE71	DE71 - Darmstadt	9	188 400	1,7 %	96 400 €	0,8 %
DEA1	DEA1 - Duesseldorf	9	218 200	2,3 %	53 700 €	0,5 %
DEF0	DEF0 - Schleswig-Holstein	9	147 300	5,8 %	47 100 €	-1,5 %
FI1B	FI1B - Helsinki-Uusimaa	9	81 500	-0,7 %	92 700 €	3,9 %
FR82	FR82 - Provence-Alpes-Cote D'Azur	9	N.A.	N.A.	46 700 €	1,1 %
ITC4	ITC4 - Lombardia	9	216 700	7,9 %	46 900 €	-2,0 %
NL22	NL22 - Gelderland	9	168 800	4,0 %	40 800 €	-0,5 %
NL33	NL33 - Zuid-Holland	9	275 700	5,0 %	34 500 €	1,5 %
NL41	NL41 - Noord-Brabant	9	209 800	4,0 %	46 400 €	-3,8 %
NO07	NO07 - Nord-Norge	9	34 800	4,1 %	71 100 €	0,8 %
SE12	SE12 - East Middle Sweden	9	91 500	1,6 %	73 200 €	-0,1 %

NUTS	Region	Cluster Stars	Employment 2018	Average annual change 2016-2018	Average wage 2016	Average annual change 2014-2016
SE31	SE31 - North Middle Sweden	9	38 700	0,7 %	78 400 €	0,0 %
UKE1	UKE1 - East Yorkshire and Northern Lincolnshire	9	54 000	-3,7 %	68 600 €	1,1 %
UKH2	UKH2 - Bedfordshire and Hertfordshire	9	96 800	-4,8 %	92 900 €	10,8 %
UKI4	UKI4 - Inner London - East	9	129 800	0,2 %	25 700 €	-0,5 %
UKM3	UKM3 - South Western Scotland	9	233 600	3,8 %	62 900 €	-6,1 %
AT13	AT13 - Wien	8	89 000	-0,2 %	65 700 €	0,6 %
BE21	BE21 - Antwerp	8	61 400	7,4 %	48 000 €	-0,5 %
BE23	BE23 - East-Flanders	8	50 000	5,3 %	50 200 €	2,8 %
BE25	BE25 - West-Flanders	8	41 800	-0,7 %	53 300 €	3,1 %
DE21	DE21 - Oberbayern	8	228 800	-3,2 %	63 400 €	2,6 %
DE30	DE30 - Berlin	8	123 100	2,1 %	54 400 €	0,5 %
DEA2	DEA2 - Koeln	8	206 600	-0,2 %	51 500 €	-4,4 %
DEA5	DEA5 - Arnsberg	8	167 200	0,1 %	49 600 €	-0,8 %
ES51	ES51 - Cataluna	8	211 600	10,4 %	38 200 €	-0,8 %
ES61	ES61 - Andalucia	8	147 000	11,1 %	33 100 €	-2,1 %
FI19	FI19 - Western Finland	8	69 800	3,6 %	78 800 €	1,4 %
FR26	FR26 - Bourgogne	8	66 400	14,9 %	53 600 €	-2,1 %
FR51	FR51 - Pays-de-la-Loire	8	126 500	-6,3 %	43 800 €	-2,2 %
FR52	FR52 - Bretagne	8	132 400	6,9 %	51 600 €	5,2 %
FR61	FR61 - Aquitaine	8	123 100	3,3 %	85 900 €	5,0 %
HU10	HU10 - Central Hungary	8	247 500	2,5 %	5 100 €	-5,4 %
IE02	IE02 - Southern and Eastern	8	233 600	3,8 %	62 700 €	-0,6 %
NL23	NL23 - Flevoland	8	33 300	7,0 %	NA	1,7 %
NO04	NO04 - Agder og Rogaland	8	46 900	-2,6 %	78 400 €	2,2 %
NO05	NO05 - Vestlandet	8	57 700	0,7 %	68 000 €	-1,6 %
UKF2	UKF2 - Leicestershire, Rutland and Northamptonshire	8	113 200	-0,8 %	54 400 €	1,4 %
UKJ1	UKJ1 - Berkshire, Buckinghamshire and Oxfordshire	8	136 100	-0,6 %	53 800 €	-2,5 %

European Observatory for Clusters and Industrial Change

The European Observatory for Clusters and Industrial Change (#EOCIC) is an initiative of the European Commission's Internal Market, Industry, Entrepreneurship and SMEs Directorate-General. The Observatory provides a single access point for statistical information, analysis and mapping of clusters and cluster policy in Europe, aimed at European, national, regional and local policy-makers, as well as cluster managers and representatives of SME intermediaries.



The aim of the Observatory is to help Europe's regions and countries design better and more evidence-based cluster policies and initiatives that help countries participating in the COSME programme to:

- develop world-class clusters with competitive industrial value chains that cut across sectors;
- support Industrial modernisation;
- foster Entrepreneurship in emerging industries with growth potential;
- improve SMEs' access to clusters and internationalisation activities; and
- enable more strategic inter-regional collaboration and investments in the implementation of smart specialisation strategies.

In order to address these goals, the Observatory provides an Europe-wide comparative cluster mapping with sectoral and cross-sectoral statistical analysis of the geographical concentration of economic activities and performance, made available on the website of the European Cluster Collaboration

Platform (ECCP)³⁴. The Observatory provides the following services:

- **Bi-annual "European Panorama of Clusters and Industrial Change"** that analyses cluster strengths and development trends across 51 cluster sectors and 10 emerging industries, and investigates the linkages between clusters and industrial change, entrepreneurship, growth, innovation, internationalisation and economic development;
- **"Cluster and Industrial Transformation Trends Report"** which investigates the transformation of clusters, new specialisation patterns and emerging industries;
- **Cluster policy mapping** in European countries and regions as well as in selected non-European countries;
- **"Regional Eco-system Scoreboard for Clusters and Industrial Change"** that identifies and captures favourable framework conditions for industrial change, innovation, entrepreneurship and cluster development;
- **"European Stress Test for Cluster Policy"**, including a self-assessment tool targeted at cross-sectoral collaboration, innovation and entrepreneurships with a view to boosting industrial change;

³⁴ <https://www.clustercollaboration.eu/>

- **Customised advisory support services** to twelve selected model demonstrator regions, including expert analysis, regional survey and benchmarking report, peer-review meeting, and policy briefings in support of industrial modernisation;
- **Advisory support service to European Strategic Cluster Partnerships**, in order to support networking between the partnerships and to support exchanges of successful practices for cross-regional collaborations and joint innovation investments;
- **Smart Guides** for cluster policy monitoring and evaluation, and for entrepreneurship support through clusters that provide guidance for policy-makers; and
- **Brings together Europe's cluster policy-makers and stakeholders** at four European Cluster Policy Forum events in 2018 and 2019, European Cluster Days and at the European Cluster Conference in May 2019 in Bucharest (Romania) in order to facilitate high-level cluster policy dialogues, exchanges with experts and mutual cluster policy learning.
- Online presentations and publications, discussion papers, newsletters, videos and further promotional material accompany and support information exchanges and policy learning on cluster development, cluster policies and industrial change.

More information about the European Observatory for Clusters and Industrial Change is available at: <https://www.clustercollaboration.eu/eu-initiatives/european-cluster-observatory>

