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# Advanced Technologies for Industry – Policy brief

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Industrial and technology clusters and cluster-based  
policies in times of Covid-19

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## Section 1

### 1. Background

This Policy Brief has been developed in the framework of the Advanced Technologies for Industry (ATI) project, initiated by the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW), and the European Innovation Council and Small and Medium-sized Enterprises Executive Agency (EISMEA). Policy Briefs analyse national and regional policy measures focused on a specific challenge, technological area or mode of implementation, and they explore policy tools designed and implemented with the aim of fostering the generation and uptake of advanced technologies. The reports provide a comparative analysis and bring examples of relevant national and regional policy measures in the EU. This report focuses on industrial and technology clusters, their role in the adoption of advanced technologies and related policy implications in the times of the Covid-19 pandemic.

The way technology is produced and diffused across different countries and regions tends to be uneven. Economic geography largely determines the probability of knowledge spillovers<sup>1</sup> and hence is key in shaping the potential for technology development and uptake, but also industrial transformation. Geographical proximity is believed to facilitate unplanned interactions that are critical parts of the innovation process<sup>2</sup>. There are volumes of literature demonstrating that the diffusion of advanced technologies is indeed spatially bounded.

This flow relies upon the willingness of firms to inform others about their knowledge, which depends upon the trust established between actors. Clusters play an important role in industrial transformations as they can renew business models and reconfigure industrial value chains<sup>3</sup>.

Within the fabric of interlinked industrial ecosystems, technology clusters are integral to industrial competitiveness and economic performance. They hold a large share of a well-educated workforce engaged in technological fields<sup>4</sup>. Technology clusters pursue leading-edge innovation, and many companies seek insights on

emerging possibilities through access to tacit or codified knowledge<sup>5</sup>.

Also due to the above-mentioned reasons, cluster-based industrial development has been traditionally in the centre of implementing European, national and regional growth strategies. Cluster policies often concern various technological domains and technology-based sectors.

The geography of innovation has been, however, challenged by the current pandemic. The acceleration in technology adoption brought by the pandemic is likely to increase the importance of technology clusters even more.

In this context, the objective of this analysis has been to initiate a reflection on questions such as:

- How has the geography of technological innovation and diffusion been affected during the Covid-19 pandemic?
- What is the role of clusters and cluster-based industrial development policies in fostering technology-based resilience?
- How to adapt cluster-based policies and nurture linkages both locally and internationally?

The report is structured around three main sections:

- Policy challenges,
- Policy responses, strategies and policy initiatives at EU, national and regional level,
- Policy considerations.

<sup>1</sup> See for instance Freeman, 1991, Romer, 1990, Feldman, 1994

<sup>2</sup> Asheim and Gertler, 2005

<sup>3</sup> European Commission (2015) Smart Guide to Cluster Policy

<sup>4</sup> Gagne, 2019

<sup>5</sup> HBS (2020). Tech clusters

## Section 2

# 2. Policy challenges: clusters, technology diffusion and the pandemic

### Key messages

The Covid-19 pandemic has had a long-term impact on economic trajectories and on human and social capital across the globe. In particular, it has accelerated digital transformation and certain aspects of technology diffusion. The environment in which clusters operate as localised ecosystems of related industries has changed, nevertheless firms in strong clusters have better prospects. Clusters are again perceived as a force of resilience in times of economic crisis. Inter-organisational linkages within clusters are instrumental in enabling the adoption of advanced technologies needed to promote industrial recovery.

The development of advanced technologies is highly concentrated and nurtured by specialised technology clusters. Professionals with advanced technology skills are thus found in specific locations, coinciding with high demand for advanced technology-related competences as the analysis of LinkedIn data also suggests.

The diffusion of new technologies into the broader economy and across industries takes time and requires organisational reconfigurations. The industries/sectors that have attracted the most advanced technology skills in 2020 and 2021 include environmental management, machinery, financial services, but also medical devices, marketing and advertising, and management consulting.

This section discusses the main recent trends that have impacted industrial and technology clusters in the wake of the Covid-19 pandemic. It first reiterates the role of clusters in the development of advanced technologies and in fostering technology diffusion. It highlights some of the key dimensions of cluster development that will need to be reconsidered and reflected in policies.

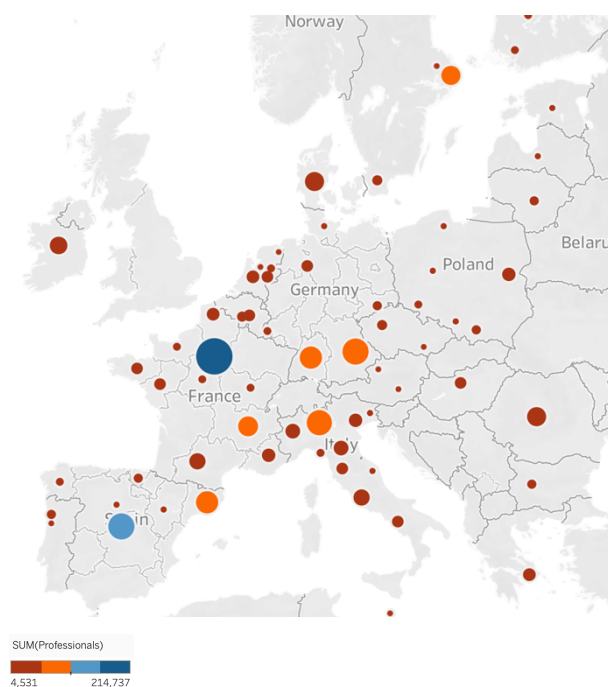
### 2.1 Role of industrial and technology clusters in the diffusion of advanced technologies

Clusters and cluster-based developments have been a popular concept worldwide, with a wide range of government initiatives also launched in Europe<sup>6</sup>. The notion is well-understood: clusters are considered as a regional ecosystem of related industries and competences featuring inter-industry interdependencies. They are defined as groups of firms, related economic actors and institutions that are located near each other and have reached a sufficient scale to develop specialised expertise<sup>7</sup>.

The development of advanced technologies is spatially concentrated and highly nurtured by technology clusters as the analysis of LinkedIn data suggests. A distinctive feature of tech clusters is the specialised skillsets of many local workers, which becomes a powerful magnet to the area. The geographical concentration can be captured by the number of professionals with advanced technology skills located in regions and

cities and with the share of job posts requiring advanced technology skills (as published via LinkedIn in March 2021) (see Figure 1 and Figure 2).

Figure 1: Concentration of professionals with advanced technology skills as published on LinkedIn (March 2021)



Source: Technopolis Group, based on LinkedIn data

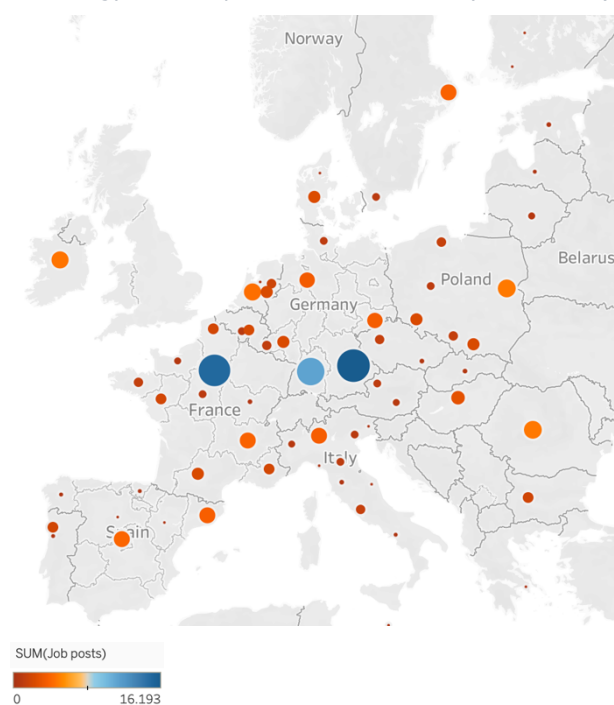
<sup>6</sup> European Commission, Smart Guide to Cluster Policy, 2016

<sup>7</sup> Ibid



Skills indicators for the ATI project have been constructed based on data sourced from LinkedIn. Keywords capturing skills by advanced technology have been defined and queries have subsequently been constructed to filter the database by location and industry. The results have to be interpreted in light of the representativeness of the LinkedIn sample per country and region (for more information about harnessing LinkedIn data please see the ATI methodological report<sup>8</sup>).

Figure 2: Concentration of job posts requiring advanced technology skills as published on LinkedIn (March 2021)



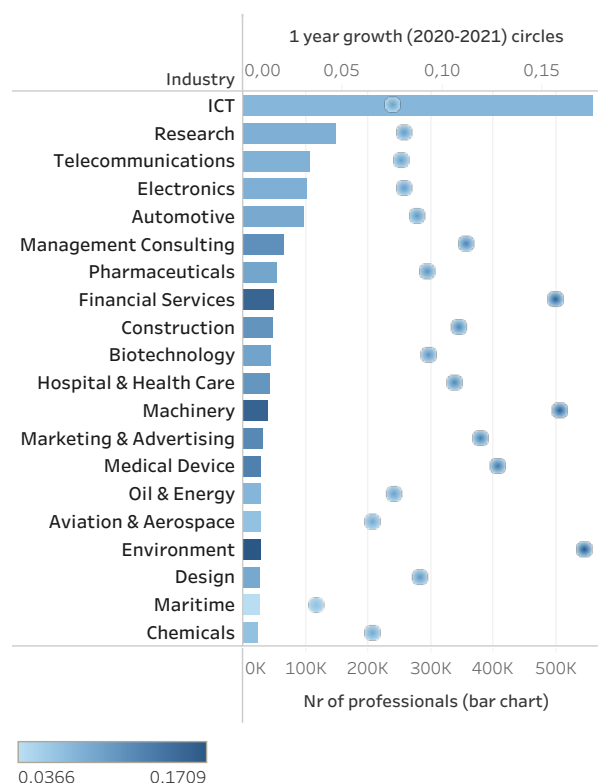
Source: Technopolis Group, based on LinkedIn data

Clusters are not static but in constant dynamics. The trajectory of industrial development is shaped by the evolutionary processes of new technologies, enhanced skills and entrepreneurship<sup>9</sup>. The diffusion of new technologies into the broader economy and across industries takes time and often requires organisational reconfigurations<sup>10</sup>. In this regard, technology clusters underpin closely-related industrial sectors as well as different value segments.

How technologies are diffused across industries can be captured by tracking the employment and mobility patterns of professionals with advanced technology skills (an analysis possible to perform based on LinkedIn data). Figure 3 shows that while naturally it is the information and communication technology (ICT) industry, research and telecommunication that employ the most tech talent, sectors that also concentrate the highest share of advanced technology skilled professionals are electronics, automotive but also management

consulting. In terms of the weaker signals and looking at the highest growth in attracting advanced technology talent, sectors such as environmental management, machinery and financial services, but also medical devices, marketing and advertising, as well as management consulting have also seen a relevant growth in terms of technological skills.

Figure 3: Diffusion of professionals with advanced technology skills across industries and sectors



Source: Technopolis Group, based on LinkedIn data

Beyond industrial clusters, technology development and diffusion is also enhanced by the broader innovation system and the global innovation networks in which clusters operate and participate. Ecosystems of related industries do not operate in a vacuum. In ecology, the requirements for an ecosystem to be healthy are “the openness of the system, the diversity of species, the active interaction between species, the smooth circulation of energy, a natural selection mechanism, and an intentional chaos”<sup>11</sup>. To this end, global innovation networks secure international knowledge flows that needs to be paid attention to.

## 2.2 The impact of Covid-19 on the factors of cluster development and cluster-based policies

The pandemic has not just shaken the economy and our society to its core, but it has also changed some of the organisational principals of industrial

<sup>8</sup> <https://ati.ec.europa.eu/reports/eu-reports/advanced-technologies-industry-methodological-report>

<sup>9</sup> ibid

<sup>10</sup> Izsak et al (2014) European Cluster Trends, European Cluster Observatory

<sup>11</sup> Entezaria, 2019

agglomerations. Both the supply and demand side of various industries – such as aviation, automotive, pharmaceuticals, textiles, banking, electronics, tourism and high-tech – have been profoundly changed, and so too the gravitational forces that shape the creation of clusters. Some of the behavioural changes will affect the location decisions and collaboration patterns of businesses for years to come. Covid-19 hit clusters specialised in certain local and service-based industries hard. But it also prompted a rush to deliver so-called ‘recovery products’, including digital transformation services<sup>12</sup>.

Clusters have been traditionally seen as ecosystems that can better protect businesses during economic crises. As various researchers concluded, industries that are part of a strong cluster environment register higher growth in jobs, startup activity, innovation and resilience to economic shocks<sup>13</sup>. However, it has to be noted as well that regions with core industries, which have been negatively impacted by the Covid-19 recession, have had broader spillover effects<sup>14</sup>. In the times of a crisis, the decline of a core industry can mean the decline of others nearby<sup>15</sup>.

Several studies such as the research of Delgado (2021) argue that **industry diversification, inter-firm linkages and pooling resources among related industries can mitigate shocks**, and help local economies bounce back more easily. Business transformation through clusters, however, happens in a shift towards activities that are additional to those which the cluster originally addressed<sup>16</sup>. As Hausmann and Hidalgo (2011) point out in the Atlas of Economic Complexity, individuals are limited in the things they can effectively know and use in production so society **needs to be able to re-aggregate the chunks of knowledge** by building novel connections. Consequently, the ability of clusters to re-connect their knowledge will be key in the context of the current economic crisis.

The pandemic has had an impact also on the efforts to build technology clusters. These clusters thrive on **proximity, global talent and trade, all of these factors profoundly hampered**. These benefits may be dampened in years ahead due to the virus itself and the consequent business and political changes.

Industry stakeholders, as part of their ecosystems, need to adapt to a new and fast-changing environment by **renewing their forms of private-private, public-private and public-public collaboration**. Challenges lie ahead in terms of rebuilding local interactions, supply

chains and global value chains. The Covid-19 pandemic has had long-term affects on the key determining factors of cluster development and industrial ecosystem trajectories. The conditions have changed not only for supplier chain interactions, but also for local and global knowledge spillovers, innovation collaboration, talent flows and access to skills and entrepreneurship. Table 1 summarises these key challenges.

*Table 1: New challenges of cluster agglomerations faced as a consequence of the pandemic*

| Challenges   |
|--|
| <b>Reorganisation of cluster supply chain networks:</b> firms and industries need to rethink their business supply chain models given uncertainties around supply shortages and increased benefits from procuring inputs from local partners.  |
| <b>Renewal of science-industry collaboration:</b> bridging the commercialisation gap has become even more important than ever, and new cooperation models are needed to bring together technology developers and industry actors for advanced technology development.  |
| <b>Reinforcing tech clusters and their links to other clusters:</b> technology clusters strengthen innovation at the level of the firm and they play an important role in regional economies. Creating better linkages with related industries can, in turn, foster industrial renewal and technological transformation towards a more rapid recovery. |
| <b>Finding new ways to access talent:</b> while some industries are facing critical issues in reskilling and redeploying staff to adapt to the changing context, demand for tech workers remains high. The rapid shift towards remote working has prompted changes in the way talent and skills are sourced/accessed.                                  |
| <b>Reshaping global value chains:</b> with business travel on hold, tacit knowledge flows have also been affected, which affects the organisation of global value chains. This is both a challenge and opportunity to reshape connections and reconnect clusters in new ways internationally.  |

Source: authors

Three forces of agglomeration are needed to ensure clusters function well as the famous concept developed by Marshall in the 1920s points out, notably: knowledge spillovers, labour market pooling and customer-supplier interactions. All three have been impacted by Covid-19 and will be analysed below.

### Knowledge spillovers

During the pandemic, advanced digital technologies have become even more important than ever for business survival. Both manufacturing and service industries have been

<sup>12</sup> Delgado (2021)

<sup>13</sup> Delgado/Porter (2018) Delgado (2018, 2020)

<sup>14</sup> European Commission, 2020

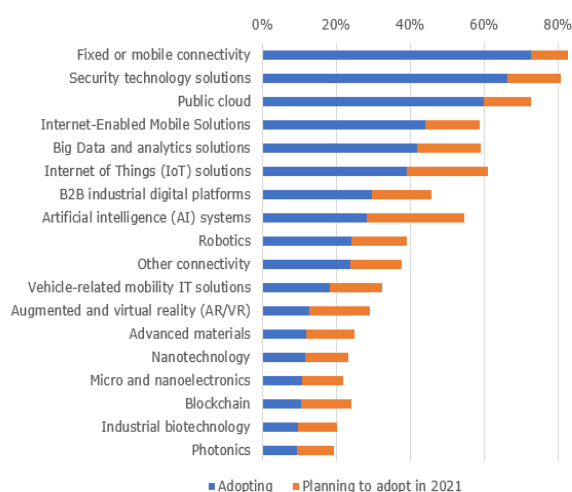
<sup>15</sup> <https://www.brookings.edu/>

<sup>16</sup> Derbyshire, 2014

put to the test how fast they can adapt to Industry 4.0 technologies and create even more agile and flexible production systems. To this end, technology developers and innovators had to find new ways of collaborating in a digital world.

Within the ATI project, a business survey was conducted about the level of uptake of advanced technologies in 2019 and 2020<sup>17</sup>. The results of the survey produced evidence of growing interest in advanced technologies even before the full effects of Covid-19 could be felt. Figure 4 below offers an overview of the ATI survey results across the whole sample and for all advanced technologies. Several advanced technologies have become more important for businesses, such as connectivity, security, cloud and artificial intelligence. The survey further investigates the scope of each individual technology, offering results by vertical market/industry sector among others.

Figure 4: Which of the following technologies is your organisation using or planning to use?



Source: ATI, Advanced Technologies for Industry Survey, November 2020

**New types of science-industry collaborations are needed since the new economic context is forcing industries to reinvent themselves** and reorientate their production. Some industries had to switch to making medical textiles or medical equipment instead of clothes and car components as the analysis of Euratex<sup>18</sup> provides

an example for. Several companies in the textiles and fashion supply chain, which is a sector of regional specialisation in Lombardy (Italy), reconfigured production to make face masks and surgical garments, even using materials found in automotive, agriculture and building applications. Resilience and rapid reorganisation will become more of a standard operating procedure. The pandemic has also presented an opportunity to look for new niches, combinations and variations. For instance, clusters around 3D printing can be mobilised for rapid fabrication tasks. Specialised companies, digital fabrication laboratories and universities can 3D print items such as valves and missing parts that cannot be sourced due to broken value chains and logistics issues caused by border closures or travel restrictions<sup>19</sup>.

**Knowledge spillovers are hampered between startups and other cluster stakeholders.** As a result, industrial clusters may face a drop in innovation and entrepreneurial activity. Startups but also established firms find it harder to build new relationships with potential employees, investors and buyers. Also, networks of sales teams of high-tech startups have been broken down which affects their sales numbers<sup>20</sup>.

Industry stakeholders report missed networking and partnership opportunities due to the pandemic. The Barcelona Mobile World Congress, Facebook's Global Marketing Summit and Google's annual developer conference are some of the key industry events cancelled in the past year. According to a recent report<sup>21</sup>, the economic loss resulting from the cancellation of these events is estimated around €1 bn. Without trade shows, networking opportunities and seminars, startups and entrepreneurs cannot meet investors and customers, build relationships, or close deals. They have to reinvent themselves in order to stay in business.

**Beyond the effects on local linkages, global innovation networks are being reshaped as well.** Many experts fear that there are genuine risks to international openness and collaboration on innovation<sup>22</sup>. As the Global Innovation Index (GII) 2020 also demonstrates, the geography of innovation continues to shift. Over the years, India, China, the Philippines and Vietnam are the economies with the most significant progress in their GII innovation ranking over time.

<sup>17</sup> The Advanced Technologies for Industry Survey sample consisted of 1 500 interviews of European organisations with more than 10 employees in Denmark, France, Germany, Italy, Poland, Spain and Sweden. The survey was carried out between September and November 2020 and interviews were conducted through a web-based platform (CAWI – Computer-Aided Web Interviews), as well as via a Computer-Aided Telephone Interviewing (CATI) system. Additional information on survey methodology can be found in the Advanced Technologies for Industry Survey - Methodological Report available here: <https://ati.ec.europa.eu/reports/eu-reports/advanced-technologies-industry-methodological-report>

<sup>18</sup> <https://euratex.eu/news/euratex-contributes-to-response-to-covid19/>

<sup>19</sup> Kieslinger B, et al (2021) Covid-19 Response From Global Makers: The Careables Cases of Global Design and Local Production.

<sup>20</sup> Angelucci (2021). COVID-19's impact on tech companies: The good and bad

<sup>21</sup> McKinsey, 2020

<sup>22</sup>

<https://www.wipo.int/publications/en/details.jsp?id=4471&plang=EN>





Given the fact that cluster organisations are predominantly tasked with stimulating more innovative activities in cooperation with other companies, research organisations and universities, their support services need to adapt and take into account the changing nature of collaboration patterns and possibilities, both locally and internationally.

### Labour-market, talent sourcing and access to skills

A recent Cedefop<sup>23</sup> analysis highlighted the negative impact of the pandemic on recruitment and skills needs in the EU. While some industries are facing critical issues to reskill and redeploy staff to fit the changing context, demand for tech workers is robust.

The consequences for clusters are manifold. With digital product development in place, tech companies can develop products virtually, keeping up business activity while helping them to recruit design talent from around the world instead of being limited to specific locations. For example, several technology companies in Europe and worldwide put in place more permanent structures for working from remote locations. The dispersion of technical talent internationally will weaken the network effect historically coming from tech employees' geographical proximity to one another. The importance of some locations will change since some might lose from attractiveness due to high density and less safety.

This is both a threat for current industrial strongholds and an opportunity for locations that previously had a tough time attracting the best talent but can now reignite the local economy. The spread of talent is an opportunity for more remote locations offering a higher quality of life (also safer conditions in a pandemic situation) to develop their neighbourhoods and related new industries via the newly arriving talented workforce.

### Customer-supplier interactions

Covid-19 has also affected company strategies in terms of location and business development decisions, which has consequences for clusters and their ability to generate innovation. Industries are being tested if they are resilient and flexible enough to **build new supply chains and reconfigure themselves**.

Under the changed circumstances, industrial and technology clusters have been forced to re-discover partnerships nearby and establish new

supply chain principles. The result of a recent research<sup>24</sup> shows that around 16-26% of world trade that could take place among different sets of countries has been seriously affected. Although there are limits to reconfiguring business partnerships, a rationalisation of supply chains is ongoing and shifts will be expected. Companies in industrial clusters need to re-evaluate if they can buy materials in a more resilient and efficient way, and whether they should diversify their suppliers in order to reduce risks in the future. Cluster stakeholders need to rethink their vulnerabilities and rethink their partnerships to better protect themselves against any further shock.

Although the tech sector has shown resilience, suffering far less than the retail, tourism, travel and entertainment sectors, they also had to bear the consequences of low inventory, supply constraints and product launch delays. For instance, Foxconn, Apple's iPhone manufacturer was forced to suspend assembly-line production in response to Covid-19. Although Apple proceeded to 'cautiously' resume production, it warned that it does not expect to meet its own revenue forecasts for the second quarter.

Customer-supplier interactions are also impacted by the new location decisions of companies. As **firms in a variety of industries reconsider their office locations, network of facilities, manufacturing plants and distribution channels**, clusters will naturally be affected (some weakened, others strengthened by new opportunities). A recent Thomas Industrial Survey<sup>25</sup> revealed that 64% of manufacturers planned to bring production and sourcing back to North America, and 25% of manufacturers were increasing their use of automation. It was also found that manufacturers are preparing for a more tightly controlled supply chain, and they are investing in efficiency gains through automation.

<sup>23</sup> <https://www.cedefop.europa.eu/en/news-and-press/news/coronavirus-and-european-job-market-how-pandemic-reshaping-skills-demand>

<sup>24</sup> Silicon Valley analysis, 2020

<sup>25</sup> <https://www.thomasnet.com/insights/manufacturer-response-to-covid-19-disruptions-increased-interest-in-automation-reshoring/>

## Section 3

### 3. Policy landscape and cooperation capacities

#### Key messages

Cluster-based economic development policies have been challenged not only by a need to adapt to the changed economic context, skills flows and supplier-customer relationships, but also to play a stronger role in the recovery and underpin local resilience. As a response to the pandemic, governments across Europe have bolstered their actions in supporting technology development and digital transformation, while also relying on the strengths and opportunities of existing cluster initiatives.

The European Commission has been facilitating the development of clusters through pan-European initiatives since the mid 2000s, including the provision of cluster metrics and by fostering cluster collaboration and policy exchange. At the national level, Business Finland supports clusters with a strong focus on renewal and works on a portfolio of clusters that have various levels of risk. Its new policy instrument revolves more strongly around large companies that can lead the way for cluster development and internationalisation. In the Netherlands, the Topsectors policy works on six cross-sectoral knowledge and innovation agendas. This shows a shift from a sector-oriented policy towards more cross-sectoral policy specifically fostering the uptake of advanced technologies during Covid times.

Cluster-based economic policies have become a popular tool for industrial development both at national and regional levels in the last two decades, harnessing the benefits of specialisation and avoiding the pitfalls of 'picking winners'. Cluster policies often concern various technological domains and high-tech sectors that have been included as part of the 'incentivised' cluster portfolio. As a response to the pandemic, governments across Europe have bolstered their actions in supporting technology development and digital transformation, while also relying on the strengths and opportunities of existing cluster initiatives.

This section presents the European context and introduces examples of national cluster policies that address some of the key recent challenges posed by new socio-economic realities. Examples and highlights from 2020 present recent cluster policy developments and how they address current challenges. The section also includes a reflection for future developments.

#### 3.1 European policy context

The **New Industrial Policy Strategy of the European Commission** presented in March 2020 and its update published in May 2021<sup>26</sup> recognises clusters as a powerful economic development tool to support industrial innovation. Its objective is to transform European industry and make it greener, more circular and more digital, while remaining

competitive on the global stage. The strategy also identifies a series of factors to support industrial transformation and partnerships also relevant for clusters.

#### European cluster initiatives

The **European Cluster Collaboration Platform**<sup>27</sup> (ECCP) is the main hub facilitating cluster cooperation within the EU and beyond. It connects over 1000 cluster organisations across Europe. Under the ECCP a Covid online support centre has been set up to help cluster members find important information about new funding measures and take inspiration from best practices.

In the context of the ECCP, the European Clusters Alliance initiated a highly relevant discussion group to address the challenges of the Covid-19 pandemic, notably **the European Alliance Against Coronavirus**<sup>28</sup>. By joining over 500 experts, the alliance discussed a wide range of Covid-related topics, including prototyping of respirators and 3D printing, public procurement, economic and social impacts, exit strategy, homologation, social economy or ICT solutions.

The **European Strategic Cluster Partnerships** have been launched by the European Commission through financial incentives (under the COSME programme) to encourage clusters from Europe to intensify collaboration across regions and sectors. These EU cluster partnerships are expected to pool resources and knowledge with a view to working concretely together on joint strategies. The

<sup>26</sup>

[https://ec.europa.eu/commission/presscorner/detail/en/ip\\_21\\_1884](https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1884)

<sup>27</sup> [Clustercollaboration.eu](https://clustercollaboration.eu)

<sup>28</sup> <https://clustercollaboration.eu/news/european-alliance-against-coronavirus-joining-competences-quick-recovery>



objective is to undertake actions in the common interest of their SME members. The ultimate goal of this action is to boost economic growth and competitiveness in Europe.

In addition to current cluster networking actions, the European Commission has also proposed a new instrument called Joint Cluster Initiatives – **Euroclusters** within the new Single Market Programme. Euroclusters will focus on finding solutions on critical inputs and technologies and apply them in business to support resilient, green and digital Europe<sup>29</sup>.

### European partnerships

Horizon Europe supports the establishment of so-called **'Institutionalised Partnerships'**<sup>30</sup>, where the EU participates in research and innovation funding programmes undertaken by country representatives who joined the initiative. Proposals focus on key digital technologies, smart networks and services, circular economy and innovative health.

### Important projects of common European interest

In its Communication published in 2014<sup>31</sup>, the European Commission presented the criteria under which state aid is compatible with the internal market rules, as so-called Important Projects of Common European Interest (IPCEI). IPCEIs have the following characteristics: they contribute to the objectives of the EU and have an impact on competitiveness, sustainability, or value creation across the Union. Projects involve more than one EU Member States, have positive spillover effects on the internal market and society and benefit more than the country and companies involved.

Through the IPCEI framework, €1.75 bn is provided for microelectronics by France, Germany, Italy and the UK, aiming to mobilise an additional €6 bn in private investments to research and develop innovative technologies and components in microelectronics. The IPCEI in the field of batteries aims at supporting research and innovation in the battery value chain. The project, called 'European Battery Innovation' was prepared by Austria, Belgium, Croatia, Finland, France, Germany, Greece, Italy, Poland, Slovakia, Spain and Sweden, who provide up to €2.9 bn in funding in the coming years. The public funding is

expected to unlock an additional €9 billion in private investments. The project complements the first IPCEI in the battery value chain<sup>32</sup>.

### 3.2 National cluster policies

Modern cluster policy includes a number of specific policy instruments, in particular the use of cluster initiatives, but takes a much broader view on how to design and implement ongoing policies in fields like innovation, internationalisation, SME support, workforce development, and the ability to attract investment. In today's economic environment, the capacity of clusters can be harnessed not only to support the recovery but also to boost technology diffusion and acceleration.

Two examples of national cluster policies are presented in this section in order to highlight their role in reshaping supply chain relationships and to drive the digitalisation of firms.

#### Supply chain (re)configurations, Finland

Finland has a strong history of bringing companies, research organisations and other stakeholders together. In 2018, it initiated a more structured cluster policy. While in Finland the term 'ecosystem policy' is used, in this policy brief we will refer to this as 'cluster policy'<sup>33</sup>. Business Finland commissioned an evaluation of its policy in 2020<sup>34</sup>.

The Finnish cluster policy is part of a set of policies aimed at strengthening the country's economy. As outlined by the OECD<sup>35</sup> in 2017, Finland should focus on diversification and value creation by creating new sources for growth as well as revitalising traditional industries. The role of SMEs should also be strengthened. Internationalisation and innovation are key elements in the policy portfolio of Business Finland, the main organisation in this field. Besides the adoption of new technologies, innovation is important for stimulating renewal, i.e. new sources for growth and revitalising traditional industries. Societal challenges, and in particular sustainability, are also centrally positioned in the policy portfolio.

Business Finland mostly uses financial instruments and account managers to support the clusters. At the start of the cluster policy implementation phase, existing collaborations and the Growth

<sup>29</sup> European Expert Group on Clusters (2020) Recommendation report

<sup>30</sup> [https://ec.europa.eu/info/horizon-europe/european-partnerships-horizon-europe\\_en](https://ec.europa.eu/info/horizon-europe/european-partnerships-horizon-europe_en)

<sup>31</sup> Criteria for the analysis of the compatibility with the internal market of the state aid to promote the execution of important projects of common European interest, COM 2014/C 188/02, [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0620\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0620(01)&from=EN)

<sup>32</sup>

[https://ec.europa.eu/commission/presscorner/detail/en/IP\\_21\\_226](https://ec.europa.eu/commission/presscorner/detail/en/IP_21_226)

<sup>33</sup> <https://www.businessfinland.fi/en/for-finnish-customers/services/ecosystems>

<sup>34</sup>

<https://www.businessfinland.fi/ajankohtaista/uutiset/2021/ekosysteemipolitiikka-vastaa-suomen-talouden-haasteisiin2>  
<sup>35</sup> OECD (2017). OECD Reviews of Innovation Policy: Finland 2017

Engine<sup>36</sup> instrument were used to set up a large number of clusters during 2018 and 2019. Funding from this instrument can be used for the targeted and systematic development of innovation cooperation within enterprise-driven clusters.

For clusters that revolve around upcoming platform companies, capital loans are also available. Only a selection of the supported clusters received Growth Engine funds. Other clusters were mainly supported using funding instruments that directly cover the innovation and internationalisation activities of (collaborating) companies.

In 2021, a new policy instrument<sup>37</sup> was set up that revolves strongly around large global companies taking a leading role in the clusters. The instrument is based on a challenge/competition to identify companies with international operations that are well positioned to address future challenges and increase their R&D investments in Finland.

Overall, the clusters have a strong focus on renewal, reinforcing the innovation profile and activities of members. However, some clusters more strongly stimulate their members' take-up of technologies rather than innovation per se. In quite a few clusters, innovations are targeting digitalisation, sensors and cyber-physical systems as well as sustainability concepts like recycling. In some cases, the developments in the clusters aim for structural change in the value chains, often involving platform companies.

### Highlights from January 2020 to March 2021 and Covid-19

The clusters in Finland show evidence of being quite heterogeneous. For this policy brief, we will focus on three types of clusters revolving around: 1) multidisciplinary collaboration, 2) platforms, and 3) collaboration between 'old' and 'new' industry.

**The One Sea cluster** in Finland focuses on "*leading the way towards an operating autonomous maritime ecosystem by 2025*"<sup>38</sup> and is a good example of multidisciplinary collaboration. The cluster is quite mature and by focusing strongly on autonomous maritime activity they were able to set up strong collaborations between marine and IT experts/companies. The cluster identifies their activities as crucial for (further) optimisation and streamlining of the value chain. The alignment of new 'autonomous activities' benefits strongly from collaboration. There is also a distinct focus on the framework

conditions of future technologies, most importantly the regulatory framework aspects such as ethics and standards.

During the Covid-19 period, the cluster recognises that many companies are struggling, and that includes larger ones. At the same time, maritime traffic remains an important part of global logistics and the transport of vital resources and products. Worries about Covid contaminations on ships have increased the demand for systems that provide remote access to various onboard systems. An example is remote pilotage. Many of the One Sea members have increased their investments in digital technologies that could reduce personnel costs. While there are clear opportunities for these technologies, there are also worries about a lack of funds for developing them.

**The Smart Mobility cluster**<sup>39</sup> revolves around a platform company that aims to revolutionise the transportation sector. The platform company focuses on the *Mobility-as-a-Service* (MaaS) concept. This combines different public and private transport services (car-sharing, taxi services, trains, trams, etc.) into a new type of customer-friendly service concept, enabling consumers to choose the desired services with a single payment and interface (e.g. via mobile app) instead of needing to pay for many different services/tickets. This shift from a 'service/provider-centric' model towards a 'user/consumer-centric' model of transportation and mobility requires strong alignment in the value chain. While there is global interest in these developments, the demand for MaaS has not been strong enough and there were difficulties in realising client cases to demonstrate the solution.

In 2020, the transportation sector was hit heavily by the Covid-19 crisis (i.e. restricted mobility under lockdowns). This forced the cluster, at least temporarily, to focus on Finland and 'survival', instead of global projects and scaling. This focus on survival is strengthened due to the fact that the main players in the cluster are small companies without large cash reserves to fall back on. Broader policy bottlenecks, especially data regulations and the level of innovative public procurement, play a key role in the cluster. The lack of incentives by public authorities (cities, transport operators) to open up data interfaces and pilot new solutions is a particular challenge. In fact, governments are actively discouraging people from moving around too much under Covid conditions.

<sup>36</sup> <https://www.businessfinland.fi/en/for-finnish-customers/services/funding/growth-engines>

<sup>37</sup> <https://www.businessfinland.fi/en/for-finnish-customers/services/funding/funding-for-leading-companies-and-ecosystems>

<sup>38</sup> <https://www.oneseaecosystem.net/>

<sup>39</sup> <https://www.businessfinland.fi/en/whats-new/news/2020/booklet-for-finnish-solutions-for-smart-automotive-and-mobility-published>





**The BATCircle cluster**<sup>40</sup> is a good example of collaboration between 'old' and 'new' industry. The cluster aims at improving manufacturing processes among mining, metal and battery chemical industries, and to increase the recycling of lithium-ion batteries. The ecosystem consists of incumbent players that focus on the lower parts of the value chain, namely raw battery materials and creating precursors, as well as newer 'upcoming' players that focus on recycling. A key challenge is the global uncertainty about the recycling of (car) batteries. Currently, the majority of recycling takes place near battery manufacturing facilities to deal with faulty products, but it is still unclear where end-of-life batteries from electric vehicles will be recycled/processed. In Finland, a key challenge is that there is no large battery manufacturing company, so there is no full value chain.

While this will not change in the immediate term, there are three potential developments. First, businesses may move higher up the value chain, existing actors may seek to move from battery materials into precursors, or even components (e.g. cathodes). Second, new actors may be attracted to set up cell or battery manufacturing in the country. Third, Finland is trying to establish a foothold for battery recycling locally through a national programme with links to European programmes, maintaining a leading position in research, and working with smaller companies in the cluster.

As stated, Business Finland **supports clusters with a strong focus on renewal**. It therefore works on a portfolio of clusters that have various levels of risk. Some clusters are more mature and work closely with existing business activities, while others revolve more around innovative approaches and business models. Clusters heavily involved with platform companies therefore have a high-risk-high-reward profile, as the success of the cluster is strongly tied to the success of these platform companies. Covid-19 has put a strain on all businesses and on some clusters in particular (e.g. mobility cluster). How the effects of the crisis reflect on the performance of the ecosystems is yet to be seen. It is, however, clear that (some) clusters will not manage to reach their objectives. How Business Finland will cope with this is an ongoing discussion.

The overall approach of Business Finland has not changed due to the pandemic. The aim is still to stimulate renewal, as this is seen as vital to creating new sources for growth as well as revitalising traditional industries. Business Finland

will continue to bolster their clusters, through the cluster support instruments as well as their broader policy activities (i.e. innovation support or broader efforts in thematic areas such as batteries). Funding has therefore continued, but more flexibility is now offered to companies with ongoing projects. On a case by case basis, Business Finland allows companies to shorten the reporting period to allow for faster payments, it allows for a repayment-free period for loans and for extensions on funding terms and conditions when deemed necessary. Business Finland is also organising information sessions on Covid-19 for businesses, among others, on potential opportunities during the crisis.

### Reflection for future development

Based on the evaluation of the cluster policy performed in 2020/2021<sup>41</sup> there are potential future developments for Business Finland's wider cluster policy. First, the concept and indicator framework of the cluster policy could be reviewed to better outline what type of collaborative efforts will be supported, what type of performance is expected by what year, and how the full portfolio of clusters will support the overall objectives at the policy level. Business Finland could also work on better framing the development stages of the ecosystems, using a life-cycle approach to identify what type of support is required at what stage and explore what type of non-financial services could be added next to the financial instruments in the overall policy mix. These services could be aimed at training, peer-to-peer learning, as well as the internationalisation and professionalisation of cluster operations.

Furthermore, continued efforts could go towards supporting SMEs within the clusters and making sure their challenges and needs are well represented in the cluster strategy and implementation. Finally, the evaluation shows that many of the renewal activities revolve around innovations that are not yet optimally supported through favourable framework conditions. Further efforts to support constructive dialogue with regards to framework conditions (regulation, support for demonstration, etc.) is worth considering. This links to other policies that Business Finland employs, such as their larger sectoral programmes on batteries.

### Technology/digital uptake – Netherlands

The Netherlands' main policy instrument for stimulating collaboration between companies, knowledge institutions, governments and other players is the Topsector policy<sup>42</sup>. There are nine

<sup>40</sup> <https://batcircle.aalto.fi/en>

<sup>41</sup> The evaluation is available here: <https://www.businessfinland.fi/ajankohtaista/uutiset/2021/ekosysteempolitiikka-vastaa-suomen-talouden-haasteisiin2>

<sup>42</sup> <https://www.topsectoren.nl/>



Topsectors, such as Agri&Food, Life Science & Health and High-Tech Systems & Materials. The Topsector policy involves a large-scale public-private partnership from which many collaborative actions are launched. Clear examples are the knowledge and innovation agendas, the human capital agendas, work towards internationalisation and more recently, work on 'missions' to address major societal challenges. Another important part of the Topsector policy is its focus on key enabling technologies, such as nanotechnology, quantum technology and photonics. The Dutch government has defined a total of eight technology groups, among which digital technologies are included.

The focus on digital challenges and solutions within the Dutch Topsector policy has been increasing over the years. The Dutch Digital Delta team was set up to support the exchange of knowledge and innovations created between the Topsectors. While the Topsectors and Dutch Digital Delta<sup>43</sup> provide a framework for collaboration, these structures are not aimed specifically at supporting companies in their digitalisation. To stimulate companies to develop new opportunities in developing and applying smart technologies and digitalisation, the Smart Industry Initiative was set up. As part of the Smart Industry Implementation Agenda 2018-2021<sup>44</sup> a number of actions were outlined, including a roadmap, an assessment programme for companies to get started in smart industry, expertise centres, field labs and skills labs, as well as various programmes on specific topics such as cyber-security.

### Highlights from January 2020 to March 2021 and Covid-19

As part of the Smart Industry Implementation Agenda, all five Dutch regions<sup>45</sup> have started setting up Smart Industry Hubs where different players in the region work together on Smart Industry Projects. The hubs should be the go-to place for companies in the region with questions about Smart Industry and to gain access to field labs and also to funding and networks.

Another recent development in the Netherlands is the Dutch Artificial Intelligence Coalition. The Government has recognised the growing impact of AI on society and has decided to invest €2 bn in this field between 2020-2027<sup>46</sup>. The initiative was taken to start a collaboration with a range of stakeholders from government, education and businesses. One of the goals of the Coalition is to

develop a national AI network. It is also launching regional AI-hubs; regional clusters taking a coordinating role at both regional and national levels and bringing companies, knowledge institutes and other organisations together.

A third development that has impacted clusters in the Netherlands is the launch of European Digital Innovation Hubs<sup>47</sup> (EDIH). As part of the new Digital Europe Programme, the European Commission is stimulating the creation of regional one-stop shops that will help companies respond to digital challenges and become more competitive. The EDIHs will be supported by both the EU and Member States (or regions) and will provide at least four types of service to companies: Test before Invest, Support to Find Investment, Skills & Training and Innovation Ecosystem & Networking. In the Netherlands, a first national selection of EDIH proposals has taken place and for each region one was selected. These are now being further developed before final submission to the European Commission.

The Covid-19 crisis has hit all sectors in the Netherlands<sup>48</sup>, forcing companies either to speed up their activities or to significantly slow them down. In Topsectors like Agri&Food and ICT, a large boost was observed as companies had to adapt to much higher demand. In Topsectors like Life Sciences & Health but also High-Tech Systems & Materials, the demand for important resources required greater innovation. Demand in the Creative Industry was severely hit, while the Logistics, Energy and Water & Maritime sectors emphasised the need to secure vital functions, infrastructures and transportation. Some companies were forced to use all available resources to get through the crisis, others could leverage their personnel and innovative spirit to prepare for a future where demand increases again.

The Dutch government uses support packages to help companies during the crisis, but this is not strongly linked to the Topsectors. Within the Topsector policy, activities are aimed at collaboration between the parties within the sector in order to deal with the crisis. Specific Topsectors have also invested in Covid-relevant programmes, such as research on the differences between the severity of illness of people hit by the corona virus carried out by the Life Science & Health Topsector<sup>49</sup>.

<sup>43</sup> <https://dutchdigitaldelta.nl/>

<sup>44</sup> <https://smartindustry.nl/roadmaps/smart-industry-implementationagenda-2018-2021>

<sup>45</sup> For ERDF the Netherlands typically has four regions, the West region is often split in the national/regional policy context

<sup>46</sup> <https://www.rijksoverheid.nl/documenten/beleidsnotas/2019/10/08/strategisch-actieplan-voor-artificiele-intelligentie>

<sup>47</sup> <https://digital-strategy.ec.europa.eu/en/activities/edihs>

<sup>48</sup> <https://www.topsectoren.nl/actueel/nieuws/2020/april/14-04-20/topsectoren-coronacrisis>

<sup>49</sup> [https://www.leidschdagblad.nl/cnt/dmf20201217\\_58981065?utm\\_source=google&utm\\_medium=organic](https://www.leidschdagblad.nl/cnt/dmf20201217_58981065?utm_source=google&utm_medium=organic)

For all Topsectors a lot of attention has been given to the effects of the crisis on the labour market. As there are known shortages in the labour market for technical professions, Topsectors like Energy see the crisis as an opportunity.<sup>50</sup> These Topsectors reported an increase of applicants for technical jobs.

Applicants are looking for job security, so Topsectors have seen an increase in applicants that were previously self-employed. The main challenge is that many people will require training before they can take up new positions. For the transition, Topsectors can also use activities set up as part of their Human Capital roadmap initiative<sup>51</sup>, such as promoting life-long learning and learning communities that support the link between working, innovating and learning.

The availability of digitally skilled personnel is a specific concern for many Topsectors due to the Covid-19 crisis<sup>52,53</sup>. The crisis has emphasised the need to work safely from home which places higher demand on digital technology. As the importance of ICT increases, the differences between labour market sectors decreases. This is shown in research addressing the ICT labour market and Topsectors<sup>54</sup>. In it, the importance of so-called 21<sup>st</sup> century skills increases, including complex problem-solving, critical thinking, creativity and soft skills such as people management, teamwork and emotional intelligence.

In the Netherlands, 'Digital SME Workplaces' (*MKB-Werkplaatsen Digitalisering*) were erected to help SMEs with their digitalisation efforts. The workplaces are local initiatives where educational institutes, governments and companies work together and are mostly focused on companies that are not digitalised at all or only very minimally. Companies can go to a workplace looking for online sales and marketing solutions, data support, office/production automation, etc. Based on a knowledge and innovation scan, the company receives tailored support from students. More digitally advanced companies are expected to turn towards the EDIHs for support in the future.

### Reflection for future development

Quite recently, the Topsector policy has transitioned to a mission-oriented approach in order to address major societal challenges. The Topsectors now work on six cross-sectoral Knowledge and Innovation Agendas, with one aimed specifically at technology. This shows a shift

from a sector-oriented towards a more cross-sectoral policy. This is an important transition from the perspective of the uptake of technology as many (digital) technologies will be relevant in more than one sector. At the same time, the number of initiatives has been increasing over the years to support knowledge exchange and collaborative actions from agenda-setting towards more applied support for technology uptake. Overall, the landscape is becoming overly saturated with initiatives, making it harder for companies to recognise and align different initiatives relevant to them. It is reasonable to expect developments in the future that will aim at simplifying the landscape.

Regions are seeking to align all their regional-level initiatives with those at the national and EU levels, and to avoid creating further fragmentation. For instance, the proposals for EDIHs that are currently being written would ideally take into account the Smart Industry Hubs and AI-hubs under development as well as the regional Research & Innovation Strategies (RIS3) and Topsector specialisations. Only time will tell whether all EDIH consortia will manage to align all wishes and needs in their proposals, and if these will in the end be granted by the European Commission.

Regarding Covid-19, the work of the Dutch Digital Delta and the Human Capital domain has become imperative in terms of its impact on the labour market. The funds set aside for Europe's Covid Recovery Package, the Next Generation EU, will also become important for the Netherlands to provide a boost to the economy.<sup>55</sup>

For the other main instrument, REACT-EU, the Netherlands is among the first two EU Member States to receive an approval of their submissions.<sup>56</sup> Through REACT-EU, the Netherlands is able to increase its share of funds for Operational Programmes covering three out of four regions represented by the European Regional Development Fund. Across these regions, the funds will go towards innovation activities mainly related to digitalisation, sustainability and health.

<sup>50</sup> <https://www.topsectorenergie.nl/nieuws/coronacrisis-biedt-kansen-voor-krapteberoepen-de-energiesector>

<sup>51</sup> <https://www.wijzjnkataapult.nl/corona/>

<sup>52</sup> <https://www.wijzjnkataapult.nl/corona-grote-vraag-naar-ict/>

<sup>53</sup> <https://www.wijzjnkataapult.nl/corona/transitiemogelijkheden-arbeidsmarkt/>

<sup>54</sup> <https://www.caict.nl/onderzoek/>

<sup>55</sup> [https://ec.europa.eu/info/strategy/recovery-plan-europe\\_en](https://ec.europa.eu/info/strategy/recovery-plan-europe_en)

<sup>56</sup> [https://ec.europa.eu/regional\\_policy/nl/newsroom/news/2021/04/04-06-2021-eu-cohesion-policy-first-react-eu-support-measures-for-recovery-and-transition-approved-for-the-netherlands-and-austria](https://ec.europa.eu/regional_policy/nl/newsroom/news/2021/04/04-06-2021-eu-cohesion-policy-first-react-eu-support-measures-for-recovery-and-transition-approved-for-the-netherlands-and-austria)

## Section 4

### 4 Policy considerations

Cluster-based economic development policies have been challenged not only by the need to adapt to the changed economic context, skills flows and supplier relationships, but now they also have to play a stronger role in the recovery and underpin local resilience.

The European Expert Group on Clusters<sup>57</sup> stressed the role of clusters in accelerating the twin green and digital transition, building resilience and boosting recovery.

Nevertheless, it is important to keep in mind the difference between cluster organisations that can be critical to improve the business environment and clusters as the real economic phenomenon of concentrations of related economic activities. Renewed industrial policies at all levels should aim at improving all key framework conditions that can nurture 'wild' clusters, critical mass and the innovation milieu.

The following reflections can be drawn based on the short overview of challenges and policy examples presented in the previous sections:

- As a result of reconfigurations happening within the local and global industrial landscape, cluster policies will play a key role in monitoring cluster transformation trends and actively promote the re-connection of industrial activities that can help clusters to reinvent themselves. They will need to focus on the creation of new types of linkages and strengthening local and international relationships for the benefit of local businesses.
- In light of the challenges of the Covid-19 pandemic, cluster policies will need to help cluster stakeholders find the new 'adjacent possible', more specifically to identify new uses for existing expertise embodied in the

current industries. Connection to new technologies will help discover unrealised applications and strengthen clusters.

- Many industrial clusters need to renew themselves through impetus for new types of entrepreneurship. Startups and scaleups will need special policy attention to unlock the potential in local economies. To maintain and boost entrepreneurial activity, venture capital and other forms of capital investment need to be considered as part of cluster policymaking.
- Covid-19 has accelerated the digital transformation and highlighted gaps in skills and knowledge capacities that industrial clusters need to fill to retain and retrain talented staff. Reskilling and upskilling will need to be tightly embedded into the cluster policy agendas.
- Cluster policymakers need to rethink the purpose of their cluster portfolio and need to strengthen related activities that address a specific societal challenge. Such mission-oriented thinking is expected to better protect the local economy and society in which clusters operate.
- Cluster policies will need to embed new business support packages delivered through cluster organisations that are future-oriented and support the research institutes, companies and others with innovative and collaborative new ideas for the post-Covid era.
- Cluster organisations will need to play a stronger role not just in supporting the renewal of supplier-customer interactions but also in helping cluster members on their technological/digital transformation path.

<sup>57</sup> [https://ec.europa.eu/growth/content/european-expert-group-clusters-meeting-contributing-industrial-policy\\_en](https://ec.europa.eu/growth/content/european-expert-group-clusters-meeting-contributing-industrial-policy_en)

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## About the 'Advanced Technologies for Industry' project

The EU's industrial policy strategy promotes the creation of a competitive European industry. In order to properly support the implementation of policies and initiatives, systematic monitoring of technological trends and reliable, up-to-date data on advanced technologies is needed. To this end, the Advanced Technologies for Industry (ATI) project has been set up. The project provides policymakers, industry representatives and academia with:

- Statistical data on the production and use of advanced technologies including enabling conditions such as skills, investment or entrepreneurship;
- Analytical reports such as on technological trends, sectoral insights and products;
- Analyses of policy measures and policy tools related to the uptake of advanced technologies;
- Analysis of technological trends in competing economies such as in the US, China or Japan;
- Access to technology centres and innovation hubs across EU countries.

You may find more information about the 16 technologies here: <https://ati.ec.europa.eu>.

The project is undertaken on behalf of the European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs and the European Innovation Council and SMEs Executive Agency (EISMEA) by IDC, Technopolis Group, Capgemini, Fraunhofer, IDEA Consult and NESTA.

