Digital innovation and circular economy ecosystems analysis

Interreg Europe

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CEI BOOST – Boosting Circular Economy Innovation through emerging technologies application

The CEI BOOST – Boosting Circular Economy Innovation through emerging technologies application project aims to increase the use of digital innovations to support the circular economy. The goal is to enhance the development and implementation of sustainable digital solutions in the circular economy, especially in relation to new technologies, and to ensure that the solutions are used to accelerate the transition to a sustainable circular economy. The countries participating in the project are Bulgaria, Finland, France, Greece, Lithuania, Portugal, Romania, Spain and Sweden.

Digitalization is a wide spectrum, and most people and companies use digital solutions to some extent. However, the degree of use and purpose varies. Digitalization should be looked at as a whole, when e.g., developing the level of digitalization in the businesses. It would also be beneficial to have a strategic approach.

Common everyday solutions which combine circular economy and digitalization we use are applications and platforms. We have city bikes, online flea markets and apps to purchase surplus lunch. On the bigger scale, our waste goes through a massive waste separation plant, that separates recyclable items from the waste stream with the help of separators, magnets and optical sorters using the state-of-art technology.

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While policymakers are yet to actively link digitalization with wider sustainability efforts when developing policies and financing projects, there is a growing need to align the circular and digital agendas. The Green Deal recognises that circular economy and strong involvement from industry is central to making the EU's economy sustainable.

The CEI Boost project aims at improving policies for easing and speeding up the twin transition to ensure that Green Growth and Digital Transformation go hand in hand to drive regions' recovery and prosperity. The project focuses at enhancing policies conditions in 9 countries for boosting the application of emerging digital innovations to support the growth of circular economy at regional, local or national level, gathering expertise from different regions, different levels' policymakers and leading innovation ecosystems' actors. (CEI Boost 2023)

One of the first activities of the project has been to identify the actors and stakeholders related to both digitalization and the circular economy, and to analyse the current state and maturity of the regions in digitalization and circular economy.

The analyses by the regions highlight potential projects and approaches that have already exploited the potential of digitalization to boost sustainable development and the circular economy in particular.

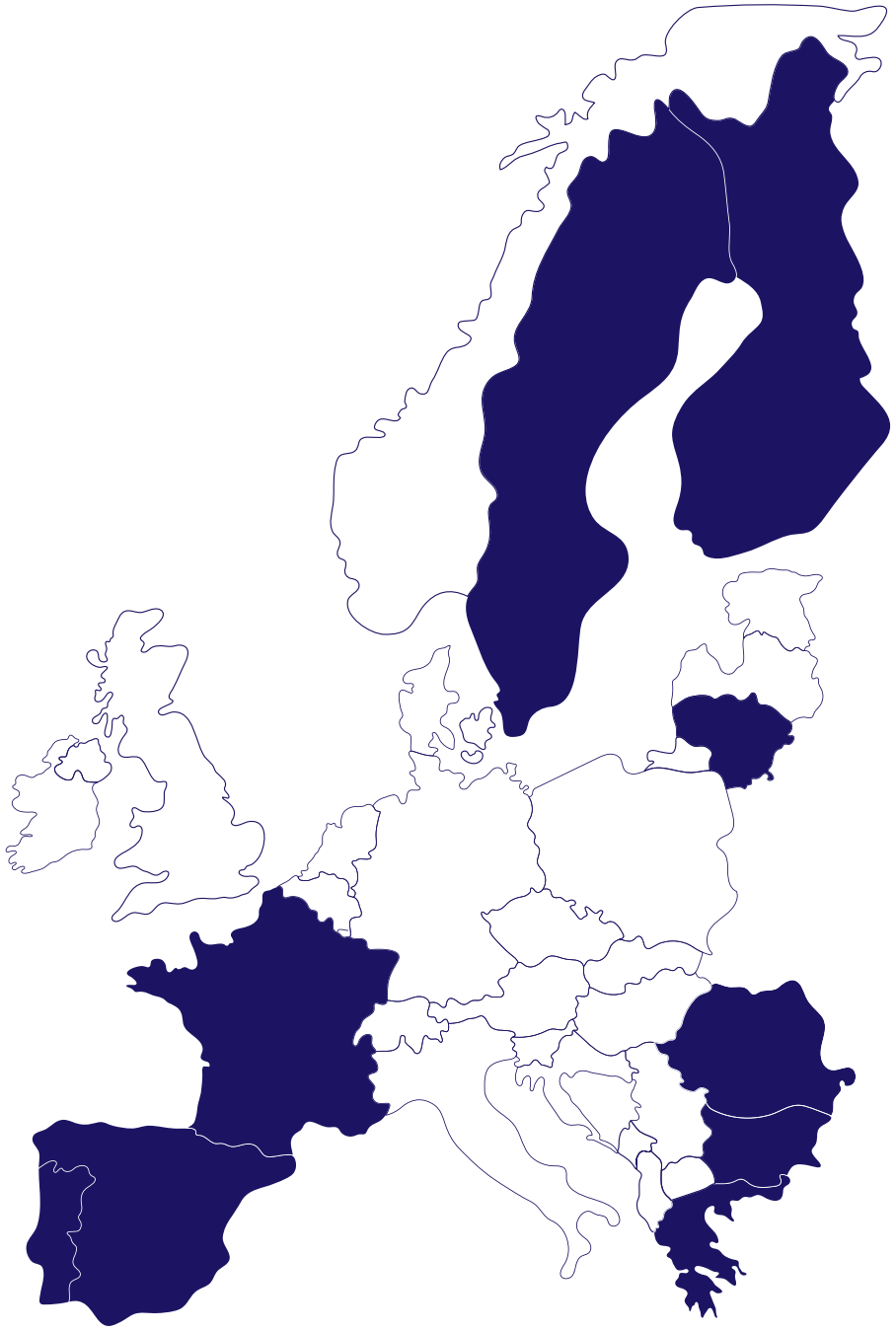
The analysis shows that the level of maturity of the regions in the field of digitalization and circular economy varies, but the general observation is that all the regions included in the analysis have made recent progress and many policies and potential projects are underway and recently initiated. On the other hand, the full potential of digitalization to promote and boost the circular economy has not been exploited.

In conclusion, the analysis carried out confirms the need for policies and development work that uses digitalization in an intelligent, user-driven and justified way to boost the circular economy.

This document analyses the current state of Digital Innovation and Circular Economy in the Region of Tarragona in Spain. The analyses of each partner region and more information of the CEI Boost can be found on the project website: *interregeurope.eu/cei-boost*

CEI Boost Partners

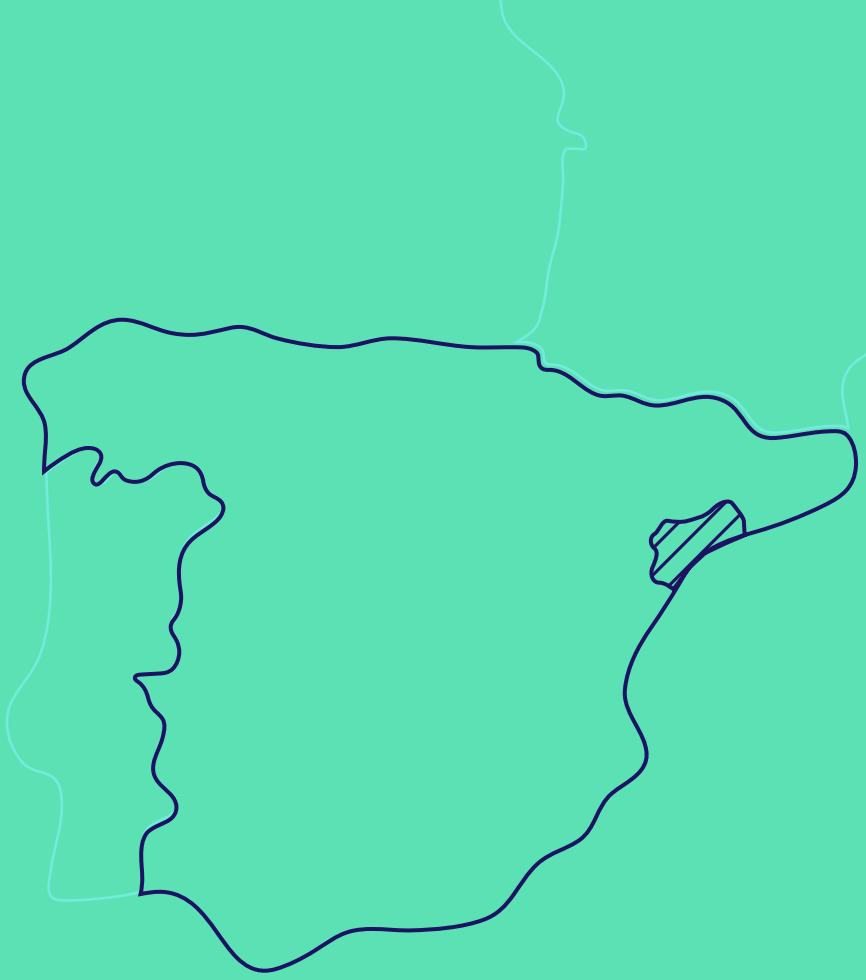
Sweden	Region Västerbotten
Finland	Regional Council of Päijät-Häme LAB University of Applied Sciences
Lithuania	Public Institution Lithuanian Innovation Centre Innovation agency
Bulgaria	Business Agency Association
Romania	Institute for Research in Circular Economy and Environment “Ernest Lupan” West Regional Development Agency
Greece	Industrial Systems Institute
Spain	Tarragona Provincial Council
Portugal	Business Development Institute of the Autonomous Region of Madeira
France	Laval Mayenne Technopole



Tarragona region (Southern Catalonia)

The Tarragona region (NUTS3) is the second most populated area of Catalonia. It has 830.075 inhabitants, distributed in 184 municipalities. Tarragona and Reus are the main cities. It combines a densely populated coast, (less than 15 municipalities concentrate 40% of total population and companies) and a rural interior.

Tarragona region (or Southern Catalonia) is service-oriented, with strong specialization in tourism, mostly in coastal areas (20% of service companies work in the tourist sector). The region concentrates half of the chemical activity in Catalonia, and a relevant the agri-food sector, mainly in the rural municipalities, with grape and olive as relevant crops. Other economic sectors are furniture and ICT.



Digital innovations and digitalization in the Tarragona region

The Tarragona Provincial Council (DIPTA from now on) has an active role in the digital transformation of the Southern Catalonia Region, a territory that covers the Tarragona province, the second most populated province of Catalonia, with almost 1M inhabitants and an important capillarity in terms of population and economic activity (about 30% of its population concentrated in 2 of the 181 municipalities).

The digital transformation is key to make the territory a pole of attraction for business, cultural and tourist activities that promote a balanced and sustainable economic growth. This strategic statement translates in a strong process of digitalisation of the provincial administration itself, the support to municipalities in the territory in this field and the lead and support to several initiatives in this topic, that come from other local agents such as the university, the business sector, or other administrative levels (Spanish and Catalan). The DIPTA digital strategy is aligned with the Spanish Recovery, Transformation and Resilience Plan for the Spanish Economy *Spanish Recovery, Transformation and Resilience Plan*, financed by the EU Recovery and Resilience Plan – Next Generation and with the different *digitalisation strategies of the Catalan government* (Smart Catalonia Strategy, 5G strategy or the Catalonia Digital Innovation Hub). Citizens, companies and entrepreneur5s of Tarragona can benefit from these strategies and policies.

Based on its policy competencies, DIPTA promotes digitalisation through:

- A project to bring optical fiber to the municipalities of the territory, affecting almost 100 km of roads owned by the Provincial Council. This will help to increase access to internet to most remote and less populated municipalities, which are a majority.
- Support to a project of the Catalan Government to deploy 5G in the territory, with the participation of the regional university (Universitat Rovira I Virgili) and the biggest municipalities Reus and Tarragona.
- Leading two projects, financed with the Catalan ERDF OP 2014-2020, that contribute to the digitalisation of rural areas and to the development of smart and sustainable roads.
- Through the Southern Catalonia Region of Knowledge Strategy, DIPTA promotes the identification of challenges related with digitalisation together with representatives

of the academy and the business sector of the territory, developing joint projects to answer them.
- The Entrepreneurship Unit of DIPTA counts and give its support to specialised training programs oriented to companies and entrepreneurs in the field of digitalisation, as the “Start up acceleration program”.
- DIPTA participates and supports different initiatives in the territory oriented to promote digitalitzation of the most relevant economic sectors such as tourism, chemical industry or the agrifood, in collaboration with other agents, public and private.

The maturity of digitalization in the Tarragona region can be considered slightly below the Catalan average: only 1% out of the 25.000 companies located in Tarragona are ICT related companies. Main categories include software development companies, IT services, virtual reality, digital consulting, e-safety. Digital transformation of companies in the Tarragona province is low, according to experts, even if at Catalan level is above the EU average.

However, the Region has experienced a relevant increase in the ICT domain, driven by several factors:
- A relevant industrial trajectory, with relevant companies and occupation in the chemical sector, tourism, agrifood and services, which have generated opportunities for the creation of companies and the generation of jobs in the ICT field.
- Connections with the metropolitan area of Barcelona: The province of Tarragona has a strategic location, near the city of Barcelona, the most relevant technological HUB in Catalonia. This proximity brings benefits to the region in terms of influence and synergies generated by Barcelona's technological activity.
- The optimization of the infrastructures of communication, such as the improvement of bandwidth and the establishment of networks of optical fiber and 5G technology.
- The presence of universities and institutions educational institutions in the area, such as Rovira i Virgili University (URV), has been revealed as a key factor in fostering talent and instruction in the ICT field.
- The existence of the South Catalonia TIC Cluster, an important strong point for the technological environment of the region, which brings together companies, institutions, and agents of the ICT sector, promoting knowledge sharing and the generation of synergies.

Some of the key challenges that need to be addressed through future policy instruments are:

- Increase of supply and retention of digital talent: In our territory, the demand of technological talent higher that the available local supply. The proximity to Barcelona, which is an opportunity in some respects, also creates a “brain drain” effect, and specialized graduates leave Tarragona to work in the Catalan capital. Specially companies in rural or smaller cities, with a peripheral location have trouble in attracting young digital talent. To cope with this growing demand, action has been taken to strengthen educational

supply: the university Rovira I Virgili and the main vocational training schools have increased the educational offer in the engineering and ICT degrees. Without this talent both digital companies and traditional ones will find difficulties in accelerating their growth.

- Digital transformation of traditional companies (in special SMEs): More than half of industrial and service companies admit not having reached a medium-high or high level of digital transformation. This circumstance presents itself as an opportunity substantial for ICT companies, since the demand for services, digital solutions and technologies continues an upward course, accompanied by record figures in turnover. Promotion of digital transformation of SMES and in general multiagent collaboration.

- The retention and attraction of ICT companies that are more innovative intensive. We need to drive the creation and attraction of technological companies that provide the highest added value in terms of type of activities, jobs and economic impact.

Digital solutions have contributed mostly and have more opportunities of intersection with the following economic sectors, in which the Tarragona province presents high specialization:

- The chemical sector (ICT can be used to improve the management of the production, product quality, worker safety and environmental sustainability). Key companies of this sector in the territory (Repsol and BASF) count with initiatives such as an accelerator for technological startups focused on the triple impact or awards for circular economy initiatives.

- Tourism (improvement of the customers experience by integrating technologies such as virtual reality, artificial intelligence and Big data). Here it is worth mentioning two EU funded projects: *TurisTIC*, lead by Dipta and financed by the ERDF Catalonia OP 2014-2020, that has promoted the provision of new touristic services for families using technology, and *RESETTING*, (Cosme program), that promotes the training and digital transformation of tourism SMEs, and which counts with the participation of local agents such as Cluster TICSUD, the technological centre Eurecat and the Association of tourist companies of Tarragona, with the support of DIPTA.

- Agrifood (improve production management, product quality, worker safety and environmental sustainability). In this field a relevant initiative is the creation of the Foodtech Hub & Nutrition, promoted by the economic promotion agency of Reus municipality and the collaboration the regional university, technological parks and DIPTA. This Hub aims to promote innovation and digitization in the region's agri-food sector.

The status of circular economy in Tarragona region

The mandate Plan of DIPTA has sustainability as one of its strategic lines, and in this sense, it is aligned with the strategies at European, Spanish and Catalan level.

Specific initiatives of the provincial government in circular economy focus on establishing municipal heat network fuelled by forest biomass, reducing waste generation from business activities, promoting the circular economy in tourism, helping SMEs to define their circular economy roadmaps, adding value to by-products, reducing the use of plastic and cardboard, promoting recycling, decreasing the CO_2 footprint, and efficiently managing and reusing water, among others.

In June 2023, the Tarragona Provincial Council opened the period for non-profit organisations, integration companies, and special work centres to apply for aid aimed at protecting, conserving, and improving the environment.

A relevant project in the topic is the Catalan OP funded project *Sustainable and safe roads*, that supports research to use more sustainable materials in the construction of roads. DIPTA is the project coordinator, which counts with the participation of the Rovira I Virgili University and Eurecat technological centre. Eurecat selected a total of 20 SMEs in the Tarragona area to define their circular economy roadmaps. The aim was to help them assess their current situation and propose strategies and initiatives for new circular models.

DIPTA also participates or gives its support to other circular economy initiatives developed by agents of the territory, two being of special interest:

- The *Hub Foodtech & Nutrition initiative* , to give added value to by-products, the production of packaging with 100% biodegradable materials, the reduction of the use of plastic and cardboard and their subsequent recycling, the reduction of the CO2 footprint and the efficient management and reuse of water.

- The *Hydrogen Valley of Catalonia* a public private initiative, bringing together all the agents that make up the value chain of green hydrogen and driving forward the understanding, production and implementation of this alternative source of energy. It comprises over seventy companies, over half a hundred public institutions, fourteen associations and clusters, four chambers of commerce and fourteen centres of knowledge and research. It foresees projects related to circular economy: one by the public water company, to install and demonstrate molten carbonate cell technology in reforming and electrolysis mode to generate hydrogen from biogas sourced from the wastewater, for use as a vehicle fuel, and SIRUSA, the waste management company for Camp de Tarragona, is committed to promoting hydrogen production through the energy recovery of municipal solid waste.

In Catalonia, the Roadmap for the Circular Economy is currently being developed. In Tarragona, some future actions are:

- valorising the by-products
- development of packaging with biodegradable materials.
- increasing the amount of industrial water that is recycled.
- helping companies with funds.

Regarding the status of CE in Tarragona region, is still in its initial phase. According to the certification company AENOR, only two companies have a circular economy certification. Then, there are 23 companies which count with the more general AENOR certifications in the Environmental Management category and 24 companies have obtained EMAS certification.

Specifically, certificates are most prominent among service companies (36%), followed by the manufacturing industry and the transportation and storage, both with 18% each. To a lesser extent, commerce (9%), and the primary sector and construction, both with 2% each.

The Catalan observatory for Circular Economy has published 8 initiatives carried out by companies in the province, such as:

Gomà-Camps: production of recycled tissue with compostable packaging.
Aitasa: use of urban wastewater for the petrochemical industry.
Santos Jorge: recycling and recovery of glass with zero waste generation.

Digitalization & Circular economy

The sectors in which digitalisation can have a higher impact in boosting circular economy solutions in Tarragona are the agrifood sector and tourism. Traditional companies in these and other sectors are using technologies to implement CE solutions but is not yet a widespread situation.

In general terms, together with local stakeholders we have identified several examples of digital companies that have boosted circular economy in these and other sectors:

- BASF company used its VR for marketing purposes to show their CE solutions to clients and to disseminate and carry out training without the provision of pollutants and the reduction of waste materials.
- Filarte 3D. 3D manufacturing company that has designed a machine (FILAMACHINE) so that people can turn plastic bottles into filament for 3D printers, driving a path towards the circular economy.
- Smart Biohome, development of a Smart-Meter (Intelligent·Intelligent meter) with IoT connectivity and a digital management platform will allow automating the use of biomass. The management of biomass deliveries is automated according to the levels of existing pellets in the buildings.
- Hotel Blaumar used VR to disseminate how they have applied the circular economy to save water and reduce electricity consumption.

Proacit is an engineering and consulting company expert in Industry 4.0 and SmartCities concepts. They use technologies such as IoT, Big Data or IoT Edge to help companies to develop CE solutions. They work for sectors such as water (control of leaks in the network), agrifood (air quality and temperatures to maintain agri-food ecosystems).

Etenic, an electric mobility company that uses vehicle batteries, which have been at full performance in their life cycle (8 years or 150,000 km), turning them into 2nd life batteries and extend their useful life +25 years.

Hub Tech Food and Nutrition has identified the following areas in which technology can boost CE in the agrifood sector: inverse logistics, blockchain or big data applied to control the production process (control of temperature, use of water, sanitary controls...).

Regarding the obstacles that prevent the use of IT for CE solutions, the agents consulted have identified the following:

- Lack of knowledge of companies regarding the advantages that digital technologies offer to implement CE, and lack of information about the economic advantages that sustainability can bring to them, not only being an issue of green washing. More dissemination and awareness raising are needed in this respect. VR can be a digital tool to do so.
- Need for more data and methodologies to identified existing initiatives linking technology and circular economy.
- Strategic innovations and multiagent cooperation: sharing of knowledge regarding opportunities and challenges between IT companies and traditional business needs to be promoted so that innovations can emerge. Public support can enhance this collaboration.
- Lack or insufficient initiatives to promote entrepreneurship in CE.

Stakeholders of digitalizition

Companies

(up to 250 companies working in the information and communication technologies sector). Main categories include software development companies, IT services, virtual reality, digital consulting, e-safety. Some examples:

- T-Systems
- Studiogenesis
- Qbed
- Grupo Castilla
- eHelath AI
- Epic Informàtica
- Proacit
- Etenic

Policy makers

- Department of Digital Policies, Catalan Government
- Tarragona Provincial Council
- Tarragona municipality
- Reus municipality

Academics

- University Rovira I Virgili: degrees in engineering, IT, biotech...
- Eurecat: Catalan Technological center with branches in Tarragona promoting digitalisation of the economy
- I2CAT (it manages a social and digital innovation multiagent laboratory in the Southern Catalonia Region)

Associations

- Cluster TICSUD
- Hub Tech Food and Nutrition
- Ambit Living Spaces Cluster

Stakeholders of circular economy

Companies

- Etileno transformer: reuse of low density vapor.
- Goman-Camps: production of recycled tissue with compostable packaging.
- Flip: didactic and training activity focused on waste and recycling.
- Cemex: Energy recovery of meat meal.
- Aitasa: urban wastewater use for the Petro-Química industry.
- NOAH Ecoliving: sustainable mushroom growing kit created with your own coffee.
- CitySens: surplus fabrics of outdoor furniture to be manufactured with automatic irrigation wall tests.
- Bekarme
- Filarte
- Xerfer
- BioHome
- Santos Jorge: recycling and recovery glass with waste generation 0.
- Port Aventura: Amusement park with a relevant CE strategy: food waste reuse (use of Halloween pumpkins for animal feeding; compos); reduction of one use plastics, environmental education

Policy makers

- Department of Climate Action of the Catalan Government
- Observatory for the Circular Economy of Catalonia
- Diputació de Tarragona; Environment Unit, Employment and Entrepreneurship Unit

Academics

- University Rovira I Virgili (URV)

Associations

- Ambit, Living Spaces Cluster

Stakeholders boosting circular economy with digitalization

Companies (some examples so far)

- Reiot smart property condition monitoring service
- Merops 360º
- Proacit
- Etenic
- Hotel BlauMar

Policy makers

- DIPTA (through some of the above-mentioned projects as “Sustainable and safe roads”)

Academics

- University Rovira I Virgili (degrees and research in biotechnology, sustainable chemistry
- Institute of Health research Pere I Virgili (research for food valorisation) (IISPV)
- Institute of Energy Research of Catalonia (IREC)
- Institute of Chemical research (ICIQ)

Associations

- Hydrogen Valley of Catalonia
- Clúster ChemMed Tarragona and the Chemical Buinsess Association of Tarragona (AEQT)
- Hub Tech Food and Nutrition

Summary

The conclusions of this study reveal that in the Southern Catalonia region (Tarragona province), awareness on the importance of the green economy and sustainability is on the rise. There is a trend of new SMEs in the technological and digital sector that work on technological and digital solutions that promote the integration of efficiency and control measures to encourage the sustainability and prevent misuse of resources. Issues of digital talent retention and attraction and a relatively low degree of business digitalisation are some of the identified obstacles that might prevent further expansion of the digital sector in Tarragona.

Regarding circular economy, existing data shows that few companies count with circular economy official certifications in Tarragona, even though some initiatives have been recognised as good practices. More awareness is needed among traditional companies to help them adopt CE solutions and how digitalisation can help in the process.

Agrifood, tourism, wood and furniture and the chemical sector are some of the key sectors in which more opportunities can arise.

There are also relevant examples of public-private and multiagent collaboration in the field of circular economy and digitalisation (the EU funded projects leaded by DIPTA as TurisTIC or Safer and Connected Roads); the Hub Tech Food and Nutrition or the Hydrogen Valley of Catalonia, that can be examples to other activities and sectors.

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