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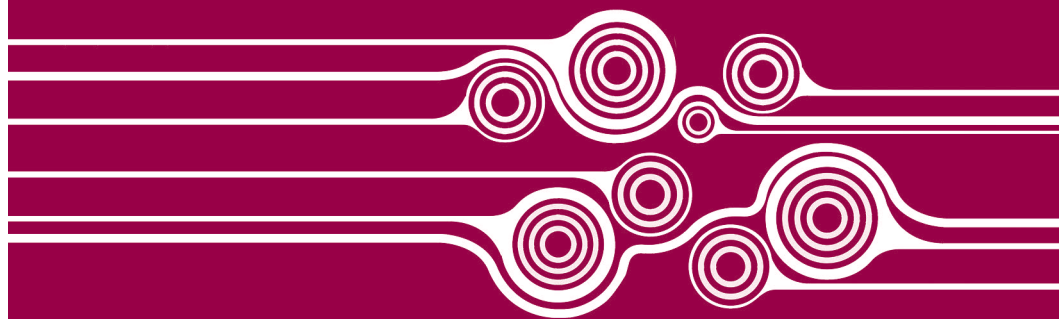


European Union
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Development Fund

Circular Economy in the Agrifood Sector

The SinCE-AFC ebook

Roberta Paltrinieri
Stefano Spillare
Francesco Savoia



Consumo, Comunicazione, Innovazione

Collana diretta da Roberta Paltrinieri e Paola Parmiggiani

La collana ha come obiettivi la documentazione, l'approfondimento e la riflessione sui temi del consumo e della comunicazione nell'ottica dell'innovazione sociale.

Il consumo e la produzione di immagini, contenuti, informazioni, beni, simboli ed esperienze giocano, infatti, un ruolo fondamentale nel processo intersoggettivo di costruzione della realtà sociale. Con un'attenzione al dibattito internazionale, viene privilegiato un approccio culturale ai temi capace di dar conto dei processi di mutamento in atto nella produzione e riproduzione della cultura.

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Introduction

The circular economy is increasingly recognised as a new economic paradigm, industrial, or business model, as opposed to the traditional linear *open-ended* economy model (Millar *et al.* 2019). In the last decade, it gained prominence as it is expected to be instrumental to harmonious and sustainable development, becoming of great interest to scholars, policymakers and entrepreneurs for its social and economic implications (European Commission 2015, 2019b; European Union 2018; Ghisellini *et al.* 2016; WHO 2018).

The current circular economy concept has multidisciplinary roots and no unique definition. Environmental and climate issues related to the outflow of resources, efficiency and, in general, the development of a greener and more sustainable economy rationalise and inspire this new approach to economic development. Generally, there is a joint agreement in recognising it as the result of different approaches to a common problem: the reduction, reuse and recycling of resources. Such aspects are at the core of the European agenda for sustainable growth, as set out by the first Circular Economy Action Plan in 2015 and underlined recently by the 2020 version, which constitutes one of the main blocks of the European Green Deal of the European Commission (2019b)^{1, 2}. In addition, moving toward a circular, less wasteful, efficient and sustainable system is a common objective under different international agreements such as the Paris Agreement, the Convention on Biological Diversity, and the United Nations Convention to Combat Desertification, while ensuring sustainable consumption and production patterns is also part of the current 2030 Agenda for Sustainable Development of United Nations (Goal 12)³.

¹ https://ec.europa.eu/commission/presscorner/detail/en/ip_20_420.

² The European Green Deal sets out how to make Europe the first climate-neutral continent by 2050, boosting the economy, improving people's health and quality of life, caring for nature, and leaving no one behind. https://ec.europa.eu/commission/presscorner/detail/e%20n/ip_19_6691.

³ Refer to the following links for detailed information on Goal 12 and on SDGs Goals <https://sdgs.un.org/goals>; <https://sdgs.un.org/goals/goal12>.

Adopting a circular model implicates an efficient use of resources that would lead to boosting economic growth through different channels as the creation of new employment, enhanced innovation and the reduction of material costs and externalities, with a multiplier effect on the economy (EC 2018; EMF 2013a, 2013b; EMF *et al.* 2015). At the micro level, the gains include, among other things, improved efficiency in the use of resources through savings in net material costs, low volatility in prices of resources, enhanced competitiveness and technological progress and new business opportunities (EMF 2013a, 2013b).

Enhancing the capacity of Small and Medium-sized Enterprises (SMEs) to implement new models of production, and contribute to sustainable growth, is of crucial interest to the European Commission as they represent about 99% of all business sectors in the European Union (EU)⁴. According to recent figures, SMEs contributed to creating around 85% of new jobs and provided two-thirds of the total private sector employment in 2015 in the EU⁵. However, although Europe's economy is grounded on SMEs, the principles of circular economy are already applied by many large industries, while SMEs still remain uninvolved due to a lack of capacity and support (European Commission 2020b, p. 37; KPMG 2019, p.7). In addition, economic and demographic trends brought new challenges concerning the availability of resources and the rising demand for goods. At the same time, the Covid-19 pandemic triggered a severe recession with unprecedented socio-economic repercussions, highlighting the vulnerability of the global economy and the need for global action. Accordingly, such transformations entail a global institutional commitment to reconsider food production, manufacturing, distribution and consumption, enhancing the efficiency of the entire supply chain and combining environmental, economic and social objectives.

Against this background, the improvements of regional policies targeted at SMEs transition to circular economy models are critical to the European Agenda, especially considering their potential role in promoting new employment and mitigating the economic uncertainty of the Covid-19 pandemic. Building on previous *Interreg Europe* experiences, the SinCE-AFC project aims to improve regional innovation strategies and policies by facilitating horizontal mechanisms that support and enhance SMEs entrepreneurship in the agrifood sector by exploiting circular economy opportunities. Furthermore, the project will promote innovation, derive knowledge and develop cooperation.

⁴ A detailed list of the current policy and actions designed by the European Commission is available at the following link: https://ec.europa.eu/growth/smes_en.

⁵ For recent statistics, refer to: <https://ec.europa.eu/eurostat/statistics-explained>.

The main goal of this book is to provide an overview of the circular economy with a focus on the agrifood sector in the European Union. The research aims at outlining the regulatory framework, studying the transition path, and illustrating the collected good practices in the agrifood sector of the regions involved in the project. In particular, the opening section provides a brief description of the Covid-19 background and the current global implications and future challenges. The first section deals with theoretical aspects introducing the concept and its limitations, and the agrifood sector context, while the regulatory framework and the recent developments in the EU are presented in the second section. The third section reviews the recent research to identify and illustrate factors encouraging (or hindering) the transition. It also elaborates on the results of a survey carried out by project partners in seven countries. The fourth section mainly aims at presenting a systematisation of the good practices collected in each country, and the fifth illustrates the Action plans set up by the project partners. Finally, the last section briefly recaps and concludes with policy recommendations.

Covid-19 and the circular economy: the background

Since the first outbreak, Covid-19 has soon revealed its potential disruptive effect. First identified in China in late 2019, the virus rapidly circulated worldwide, generating an unprecedented health crisis with a heavy human toll for several countries. Accordingly, economic and social repercussions of becoming a pandemic soon occurred globally, accentuating the case for a global, rather than an international, development paradigm (Oldekop *et al.* 2020).

While the pandemic is predicted to radically alter the trajectory of global CO2 emissions, about 7% below the 2019 level in 2020 (Le Quéré *et al.* 2021), the global economy faces an equally sharp slowdown. According to the World Bank Global Economic Prospects, the pandemic is expected to trigger the deepest global recession since World War II, with GDP contracting by 5.2% in 2020 (World Bank 2021). Although global output is expected to expand by 4% in 2021 due to ongoing vaccination campaigns and governmental financial support, it remains well below pre-pandemic projections. In addition, Covid-19 further exacerbated economic inequality, with growing concerns for vulnerable countries. Under the latest scenario on global poverty, the pandemic is expected to generate an additional share of 119 million to 124 million people into extreme poverty in 2020, revising upwards October 2020 forecast (World Bank 2021). The previously estimated share of new poor was between 88 and 115 million^{1,2}.

Significant disruptions in Global Value Chains (GVCs) emphasised the fragility of a system built on a high interdependency between leading firms and suppliers, exposing countries to serious supply shortages of intermediate and final goods. Generally, a symmetric shock from both the demand and

¹ The number of COVID-19-induced new poor is calculated as the difference between poverty projected with the pandemic and poverty projected without the pandemic. <https://blogs.worldbank.org/opendata/updated>.

² This is equivalent to living on less than \$1.90 a day.

supply side has characterised the Covid-19 impact. The transmission channel of the impact is a combined result of endogenous changes and government decisions in a global structure of economic spillovers. The demand side has been affected by different aspects, including income losses, lay-offs, unemployment, and quarantine restrictions on mobility. In addition, a generalised uncertainty for the future might have affected individual and household consumption and firms' investments. On the supply side, the spread of the virus reduced labour productivity and the supply and triggered protectionist and nationalist policies. At the same time, different restrictions imposed on mobility and business activities inhibited the supply of goods and services.

Regarding the Agri-Food sector and the related supply chains, the United Nations and FAO agency raised the question of a global food emergency and called for a transformation of food systems, also to continue supporting the transition to a greener and sustainable future. Significant reduction of demand from developed countries, with falling revenues from commodity exports and reduced remittances, together with climate change crises and pandemic restrictions, endanger food security and livelihoods of specific areas in African and Asian countries³.

In general, regardless of the significant increase in demand at the onset of Covid-19 and the initial challenge for easy access to food, Covid impact on food production is about the reduced production and the implications for food availability and prices. However, production and demand largely vary across countries and commodities. In the EU, despite the crisis, the Agri-Food trade slightly increased in 2020 compared to the previous year. In the first semester, the value of agrifood exports reached 90.2 billion euros (about a 3% increase), while the value of imports increased to 62.7 billion euros (a rise of nearly 2.5%) compared to the same period in 2019. Overall, according to the FAO (2020), “food markets will face many more months of uncertainty due to Covid-19, but the agrifood sector is likely to show more resilience to the pandemic crisis than other sectors”.

However, the Covid-19 pandemic is a global problem calling for a global response. To what extent these impacts are damaging food security, nutrition, and the livelihoods of people working along the food supply chain will largely depend on policy responses over the short, medium and long term. In the EU, unprecedented economic and social repercussions of Covid-19 required a proportionate and joint policy initiative for the recovery.

³ On the Covid-19 impact on food and agriculture, see the Q&A online section from FAO www.fao.org/2019-ncov/q-and-a/impact-on-food-and-agriculture/en/.

Despite the different unilateral reactions to the pandemic and the contrasting visions among member states on the future recovery plan, European Council in July 2020 agreed to issue European sovereign bonds (750 billion euros) to support countries hit by the pandemic. This temporary recovery instrument (referred to as “Next Generation EU”) combined with the EU 2021-2027 long-term budget (about 1.074 trillion euro) constitutes the multiannual strategy of the EU to address the crisis and unforeseen needs^{4 5}.

Against this background, as declared by European Commission (2020d), “the twin transitions to a green and digital Europe remain the defining challenges of this generation”. Investments in renewable and clean energies, clean transport, sustainable food and a smart circular economy thus remain a great opportunity to get Europe’s economy growing, and “Next Generation EU will give the EU budget the additional firepower necessary to respond decisively to the most urgent challenges”.

In this context, the geographical dimension will play a crucial role as regions within each country may respond differently to shocks and policy actions depending on their capacity to absorb shocks and institutional structural conditions. Therefore, the challenge for the policymakers is also to understand how regions and territories with relative urban and rural areas are affected by shocks, how they absorb them, and what the response is to the different policy instruments.

⁴ For further details on the financial breakdown of the recovery plan, refer to: https://ec.europa.eu/info/strategy/recovery-plan-europe_en.

⁵ In May 2020, the emergency response of the Commission to support the agriculture and food sectors included issuing practical advice and guidelines on the movement of goods and critical workers; launching exceptional measures directly supporting farmers and rural areas to stabilise agricultural markets; and increasing flexibility and simplification in meeting requirements to access the Common Agricultural Policy (CAP). For the official documents regarding the Coronavirus emergency response to support the agriculture and food sectors, refer to: https://agriculture.ec.europa.eu/common-agricultural-policy/agri-food-supply-chain/coronavirus-response_en#guidelines.

1. Circular economy: general overview and the agrifood perspective

1.1 The need for a circular economy

Since 1970, the annual demand for resources has been exceeding at a growing rate of Earth's biocapacity, going into a global "ecological overshoot". This means that demand exceeds the Earth's regenerative capacity, using more than our planet can produce. According to the latest estimates of the Global Footprint Network, we would require 1.6 planet Earth to meet the current demand for natural resources. In other words, it now takes the Earth one year and eight months to regenerate what we use in a year (slightly less than in previous years due to the Covid-19 pandemic). Currently, more than 80% of the world's population lives in countries that are running ecological deficits¹.

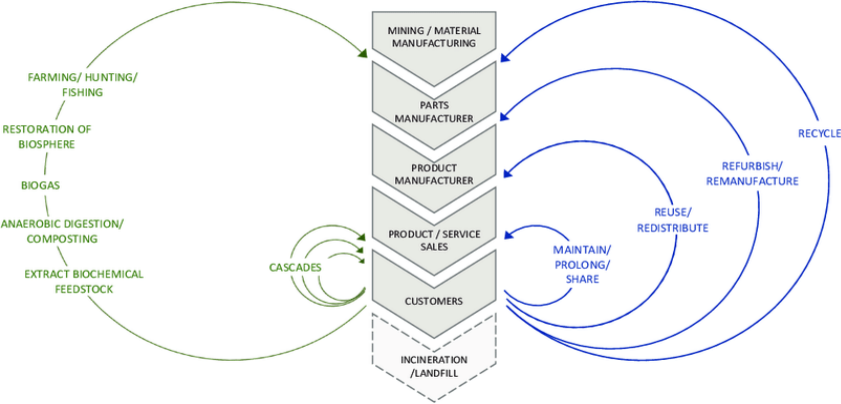
Such evident limitations call for a new global sustainable development model to keep us within the *safe operating space* of our planet without compromising future prosperity: «we need a different economic structure, suitable for a world that must respect its own ecological limits» (Jackson 2016, p.194). According to the ecological economist Daly (1991), «... the necessary change of vision consists in representing macroeconomics as an open subsystem of an unlimited natural ecosystem (the environment), rather than as an isolated circular flow of value and abstract exchange, not bound by mass balances, entropy and exhaustibility» (in Jackson 2016, p.194). This new "ecological macroeconomics" must be «aware of social and ecological demands and put an end to the absurd separation between economy, society and environment dealing with the concrete material flows underlying the financial ones» (Jackson 2016, p. 215). The first step towards the transition is thus to consider the material throughput, reconnecting it to those ecological processes that sustain life from ever. This is the core of the

¹ Cfr. www.footprintnetwork.org/ and www.footprintnetwork.org/our-work/ecological-footprint/.

“circular economy”, a concept gaining increasing relevance within the broad areas of green economy and sustainable development (Loiseau *et al.*, 2016).

The basic underlying concept of circular economy, that is, the creation of a “circular” or “closed-loop” system, is commonly associated in the literature with the seminal work of the ecological economist Boulding (1966), which proposed the idea of Earth as a closed system with «limited assimilative capacity and as such the economy and environment must coexist in equilibrium» (see Millar *et al.* 2019). Pearce and Turner (1989) extended the concept explaining the shift from an open-ended to a circular system building on Boulding’s idea (1966) to integrate environmental, social and economic dimensions.

Fig. 1 - Circular economy system diagram



Source: adapted version based on McDonough & Braungart from Ellen MacArthur Foundation (2012) in Guldmann (2019).

The Ellen MacArthur Foundation defines it as an «industrial system that is restorative or regenerative by intention and design. It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models» (EMF 2013a, p.7). This kind of economy «aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles» (EMF 2015, Introduction). It is a way «to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources and designing waste out of

the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. It is based on three principles: 1) design out waste and pollution; 2) keep products and materials in use; 3) regenerate natural systems»². Figure 1 illustrates a simplified system diagram for circular economy with a continuous flow of both materials, the technical and biological ones, through the “value circle”.

More recently, Korhonen *et al.* (2018a) proposed the following broader definition: «circular economy is an economy constructed from societal production-consumption systems that maximise the service produced from the linear nature-society-nature material and energy throughput flow. This is done by using cyclical materials flows, renewable energy sources and cascading-type energy flows. A successful circular economy contributes to all three dimensions of sustainable development. Circular economy limits the throughput flow to a level that nature tolerates and utilises ecosystem cycles in economic cycles by respecting their natural reproduction rates» (p. 39). However, in a different article, the author admits that circular economy remains a “substantially contested concept” (Korhonen *et al.* 2018b), that is a concept on which «there is agreement on the means and goals [...] but disagreements on how to define it» (p. 545).

Indeed, circular economy is a multidisciplinary concept with deep-rooted origins that can be traced back to different schools of thought from academia and entrepreneurship that contributed to the elaboration of the current one across the decades (see Ghisellini *et al.* 2016; EMF 2013b)³. For the same reason, it may also be considered a “cluster concept” (Korhonen *et al.*, 2018b), shaped or composed by several related concepts, such as, for instance, one of “Industrial ecology”, which suggests replacing the current industrial logic with something more similar to the “ecosystemic logic” of Nature. The term industrial ecology is specifically referred to as a more sustainable industry based on using cascade-type and renewable production cycles. A similar concept is “biobased economy”, in which biobased production and consumption are strictly related to their capacity to be naturally and easily re-embedded into the natural cycle. Despite being often referred to the agrifood sector, it is also related to all kinds of biomasses, such as those getting from woods and forests or non-food aquaculture (such as for instance, aquatic plants or algae productions).

² Cfr. www.ellenmacarthurfoundation.org.

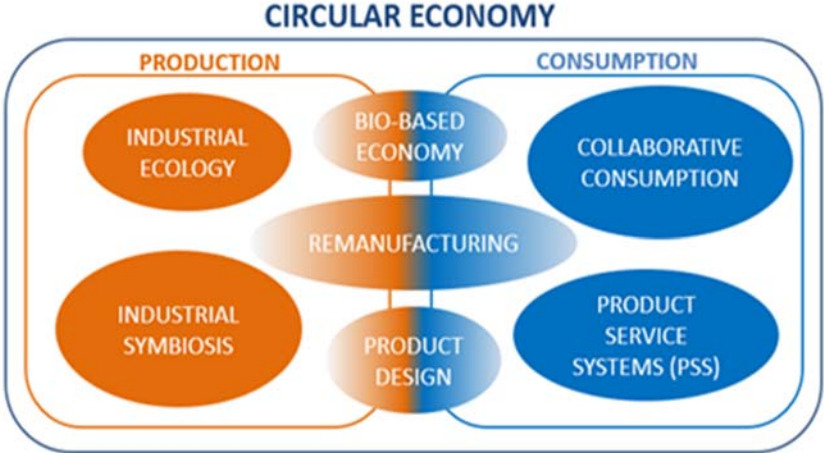
³ The general concept was mainly developed in the 1970s by the following schools of thought: “Regenerative Design” (Lyle 1994), “Performance Economy” (Stahel *et al.* 1981), “Cradle to Cradle” (McDonough and Braungart 2002), “Industrial Ecology” (Graedel and Allenby 1995), and “Biomimicry” (Benyus 2002).

Another important concept related to circular economy is “industrial symbiosis”, which is an increasing need for improving a positive relationship among different economic organisations, to promote collaboration, synergies and productive symbiosis along the same or different production chains (inter-organisational or inter-sectorial networks).

Moreover, in the circular economy, the entire life cycle of a product needs to be considered, from production to consumption and beyond. Therefore, specific attention to the design of products from “cradle-to-cradle” is also required, as well as the need to improve “product-service systems” (PSS). These latter are especially related, for instance, to the implementation of repair services, the availability of substitute elements, and the improvement of “collaborative consumption” patterns (especially improving digital enabling systems).

Figure 2 illustrates the concepts and approaches to circular economy in a simplified production-consumption scheme.

Fig. 2 - Different concepts and approaches to circular economy



Source: authors' elaboration.

Although all the above-mentioned concepts are shown as alternatively related to the production or consumption side (or both), they should not be considered as opposite or separated but rather in terms of a desirable convergence.

1.2 Circular economy in the agrifood chain

Since at least the so-called “Green revolution” occurred during the final decade of the first half of the last century, agriculture is a tremendous and largely mechanised industry, which uses a lot of chemicals, and mechanical and energetic inputs to produce increasing amounts of food. At the same time, the manufacturing food-related industry and a large-scale organised distribution have grown too, as well as places and occasions of food consumption, determining a multiplication of intermediaries and a huge development of food-related economic activities. The whole set of these interrelated activities generally represents what is usually defined as agri-food chain (AFC, hereafter).

As mentioned in the introductory section, the main objective of the SinCE-AFC is to enhance the capacity of the SMEs of this sector to face the turn toward circular economy practices. This is even more necessary because of the trade-off between an increasing world population, foreseeing to reach 9 billion people in 2050 (Brown, 2012), and the heavy ecological footprint of agriculture, accountable for 24% of the GHG emissions (IPCC, 2014).

In this view, there is growing consensus about the fact the transition to a circular economy offers many opportunities for the entire agri-food system to become more resource-efficient, with positive food security implications (Jurgilevich *et al.* 2016; Núñez-Cacho *et al.* 2018). Indeed, the agri-food sector presents a major opportunity for the development of a circular economy (Muscio and Sisto 2020).

However, to provide useful items to its comprehension, a broad definition of agrifood activities is primarily required. Defining the exact boundaries is not an easy task, especially in relation to the circular economy activities potentially involved. Food and Agricultural Organization of the United Nations (FAO) simply defines agrifood chain as «the linked events in the agricultural production of food [...], from production to processing, trading, distribution and consumption. Literally “*from field to fork*”». However, when analysing circular economy practices, it is also necessary to consider pre-production processes, as well as the planning-related ones, and the post-consumption processes, especially those related to food waste.

According to the NACE classification (“nomenclature statistique des activités économiques dans la Communauté européenne”), the industry standard classification system used in the European Union,⁴ a general

⁴ For further details, refer to the NACE Introductory Guidelines available online: <https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF/dd5443f5-b886-40e4-920d-9df03590ff91?t=1414781457000>.

identification of the agrifood chain includes the following two broad Sections:

- “Agriculture, forestry and fishing” (Section A), identifying the primary production sector, which includes “the exploitation of vegetal and animal natural resources, comprising the activities of growing of crops, raising and breeding of animals, harvesting of timber and other plants, animals or animal products from a farm or their natural habitats”;
- “Manufacturing” activities (Section C) related to food transformation, distinguishing between “finished” outputs, ready for utilisation or consumption, and “semi-finished” ones, to be used as inputs for further manufacturing⁵.

In addition, several activities involved in the larger agri-food sector include food marketing, trade and transportation, as well as food preparation, part of the following NACE Sections:

- “Wholesale and retail trade” (Section G), which includes “the usual operations (or manipulations) associated with trade, for example sorting, grading and assembling of goods, mixing (blending) of goods (for example sand), bottling (with or without preceding bottle cleaning), packing, breaking bulk and repacking for distribution in smaller lots, storage (whether or not frozen or chilled)”;
- “Transportation and storage” (Section H), including “the provision of passenger or freight transport, whether scheduled or not, by rail, pipeline, road, water or air and associated activities such as terminal and parking facilities, cargo handling, storage, etc. This section also includes the rental of transport equipment with a driver or operator and the postal and courier activities”;
- “Accommodation and food service activities” (Section I), which includes “the provision of short-stay accommodation for visitors and other travellers and the provision of complete meals and drinks fit for immediate consumption”.

⁵ However, it is worth noting that the recovery of waste, i.e. the processing of waste into secondary raw materials, is not considered part of manufacturing activities. The primary purpose of these activities is considered to be the treatment or processing of waste and they are therefore classified in “Water supply; sewerage, waste management and remediation activities” (Section E). Conversely, the manufacture of new final products (as opposed to secondary raw materials) is classified in manufacturing, even if these processes use waste as an input.

Therefore, in addition to the agricultural sector in the narrow sense, non-farm sectors (such as transformation and packaging) and all economic (and non-economic) food-related activities and services can be included in the definition of the agrifood chain. They should be considered involved in developing circular economy practices related to the production and management of biomasses. Indeed, considering the already discussed concepts and approaches related to the circular economy, we can notice that the agrifood sector especially concerns the “left side” of the Ellen MacArthur “butterfly scheme” (see Fig. 1), which is directly associated with the concept of bioeconomy, namely the part of the economy directly involved in the production and management of the biomasses.

In the EU, the total supply of biomass amounts to more than 1.2 billion tonnes of dry matter (Gurría *et al.* 2020). Agriculture is the most significant supply sector, with approximately 927 million tonnes of dry vegetal biomass equivalents (68% of total biomasses), followed by forestry (with 32% of the dry matter content). The fishery sector is instead rather small (less than 1%). Within the agriculture sector, “Feed and food” represent the most important category (68% of the total agricultural biomass supply and 47-60% of the entire amount of European biomass), while other uses are instead mainly dedicated to biomaterials (18-22%) and bioenergy production (from 18-21%)⁶.

In general, circular economy business models fall into two main groups: those that foster reuse and extend the service life through repair, remanufacture, upgrades and retrofits; and those that turn old goods into as-new resources through recycling the materials (Muscio, Sisto 2020). In the food sector, the short life of edible goods is an avoidable limit for extending their life span. However, it is possible to improve transformation processes of by-products and, for instance, recover edible food from retailers, canteens and restaurants to limit food waste. This issue is crucial and greatly considered in EU policies. Indeed, almost one-third of the biomasses dedicated to food uses - which corresponds to 1.3 billion tons of edible food products - are lost and wasted worldwide throughout the whole agrifood chain (HLPE 2014), with 88 million tons each year only in the EU countries.

Therefore, food losses and waste (FLW) represent an essential part of the circular economy approach to the agrifood chain: improving circular economy in the agrifood chain allows us to reduce the trade-off between the increasing need for food security and the significant part of food lost or wasted worldwide. Indeed, facing increasing world population and social

⁶ Data are underestimated because of the lack of available information. For instance, they do not consider biogas and bioelectricity production (Gurría *et al.* 2020).

inequalities, FLW still remains a critical economic, ethical, social and environmental issue. The economic costs of FLW are equal to the GDP of entire countries such as Switzerland. Moreover, as already argued, agriculture is still accountable for a large part of the GHG emission, and the enormous amount of food daily wasted represents a wastage of additional resources that have been largely used to produce it, such as energy, soil and water. The carbon footprint relating to the phenomenon is huge: close to that of the entire industry of industrialised countries such as the USA or China, and the water footprint is equivalent to the annual flow rate of a river such as Volga (HLPE 2014).

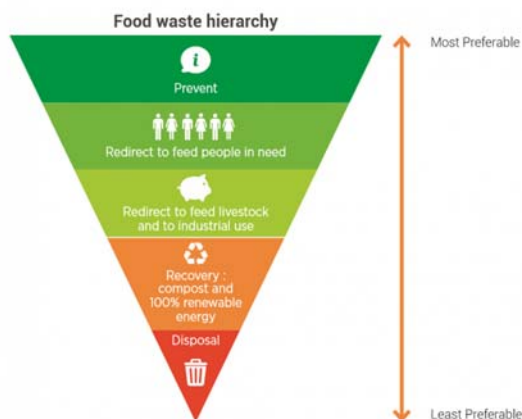
In the EU, FLW mostly occurred at household consumption (53%) and at processing, food services and distribution levels (36%) for structural and cultural reasons. Indeed, throwing away food is often more convenient than preventing waste or reusing it. Still, the lack of knowledge and awareness, wastage habits, and the high aesthetic standards of the current consumption societies is also implied (Stenmarck *et al.*, 2016).

However, it is necessary to highlight that there is no accordance and univocal definition of food waste. Therefore, also the estimation of it may change in different situations or for other countries. Generally speaking, it is possible to define FLW as “a decrease, at all stages of the food chain from harvest to consumption, in mass, of food that was originally intended for human consumption, regardless of the cause” (HLPE 2014, p. 11). The discriminant is thus the early purpose of human feeding, excluding from the count all those crops explicitly produced for other aims, such as animal feeding, biofuel or energy production (even if these uses remain rivals with respect to human feeding).

According to the so-called “food waste hierarchy” (Fig. 3), FLW must be primarily prevented wherever possible throughout the entire agrifood chain, preferring redistribution to people (if still edible), for instance, donating food surplus to charitable organisations or, just as a second option, its transformation in animal feeds. Supplementary uses, such as energy production or composting, must be considered residuals. This residual amount of biomasses available for secondary uses is the most important for implementing circular economy in the agrifood chain⁷. These residual biomasses from the agrifood chain, such as by-products and non-ate food, might be thus valorised in several ways within renewed production cycles.

⁷ An explicit reference to waste hierarchy and the need to implement food donations are included, for instance, in the revised Waste Framework Directive, adopted by the EU on 30 May 2018; while the Communication on Circular Economy calls on the Commission to elaborate a common EU methodology to measure food waste.

Fig. 3 - The food waste pyramid



Source: eurofoodbank.org.

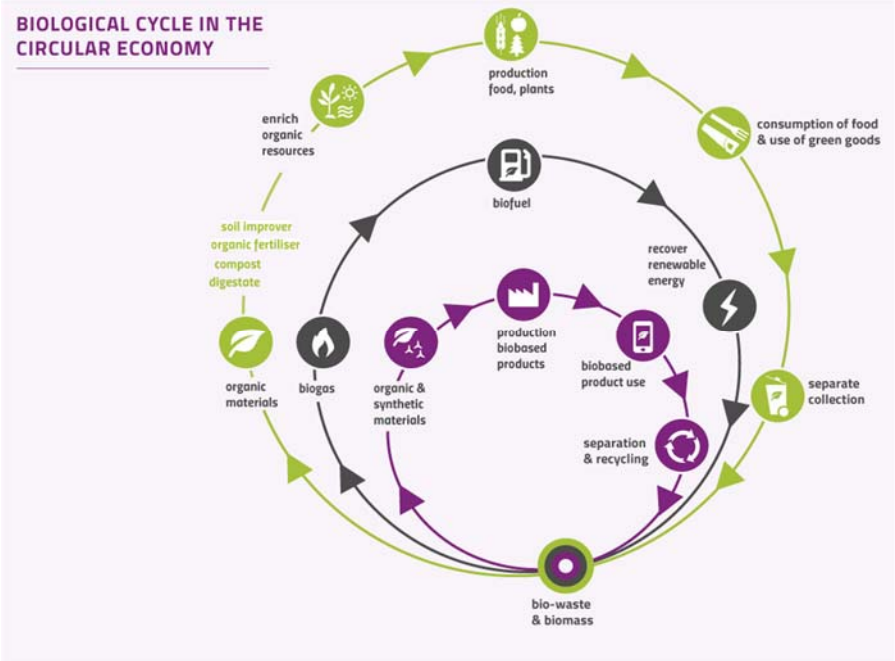
For example, residual food waste and agricultural by-products were used in the past as animal feeding or fertilisers. In contrast, bio-based fertilisers are mainly used in organic farming, primarily based on caring for the natural organic nutrients share of soil (*humus*). However, organic agriculture is rapidly growing, especially in EU countries (Willer *et al.* 2020), driven by pull and push factors such as consumers' demand and institutional incentives. These latter are especially provided in the EU by the Common Agricultural Policy (CAP), which is aimed to promote a turn towards agroecology in all the countries of the Union (see section 2.1.1).

Residual biomasses from the agricultural sector are also used to obtain renewable energy, for instance, by industrial digestion processes or as "secondary raw material" for renewed productions in different industrial sectors (e.g. natural fibres for textile industries obtained by milk or orange peels). These uses are also strongly encouraged by EU policies: currently, the largest share of renewable energy in the EU comes from biomasses (European Commission, 2018), while industrial symbiosis implementation is strongly limited by financial, knowledge-related, organisational and cultural factors, such as, for instance, the limited investment capacity of SME in R&D, difficulties in the replicability of good practices, and inability to improve inter-organisational relationships (see section 3.1).

Moreover, the concept of product design also applies to agrifood chain at different levels: from seeding - e.g. planning to reduce food losses - to food packaging, redesigning it to limit plastics or making recycling easier. A

general scheme of the potential circular processes in the bioeconomy is reported in Fig. 4.

Fig. 4 - The biological cycle in the CE



Source: European Compost Network.

Finally, consumer awareness should be raised, providing them with more information to prevent food waste, improve tools such as sustainable labelling schemes, help them choose better-recycled products or ones designed to be easily recycled, and promote collaborative consumption. Thanks to the development of digital technology, indeed, nowadays, the food supply chain could be “extended” beyond the grocery stores and the mere purchasing moment, allowing us to improve, for instance, the *peer-to-peer* exchange of edible food or to donate it to no-profit organisations (Spillare *et al.* 2019).

Therefore, implementing circular economy in the agrifood chain means planning and improving the efficient use of resources (water, energy, raw materials) in a close loop that considers the use of biomasses and related nutrients from the fields to the fork, even including the need to prevent food losses and wastage at each stage of the agrifood chain, wherever possible.

Tab. 1 illustrates some data on circular economy in European countries, specifically focusing on the SinCE-AFC country partners. In particular, the

table shows: 1) the circular material use rate, that is, the percentage of total material uses (not only biomasses)⁸; 2) the “Private investments, jobs and value-added related to circular economy”⁹; 3) the “Total biomass available” and 4) “Biomass used for food purposes”; 5) the “per capita share of recycled biowaste”¹⁰.

Tab. 1 - Circular economy in EU and in the SinCE-AFC country partners

CE-RELATED DIMENSIONS	EU (27)	Bulgaria BG	Ireland IE	Greece EL	Italy IT	Hungary HU	Poland PL	Romania RO
Circular material use rate* (% per year)	11.9	2.4	1.6	4.2	19.3	6.8	9.8	1.5
Private investments, jobs and gross value added related to circular economy sectors* (mln euro per year)	125.766	636.9	-	644.8	18632.9	1224.8	5199.7	1485.2
Total biomass available** (net trade, import+production: 1000 Tons of dry matter)	1.217.369	27808	16887	25009	121725	34100	94751	76265
Biomasses used for food purposes** (feed & bedding + plant-based food supply: 1000 Tons of dry matter)	-	8906	15010	11432	77331	18095	70092	25495
Recycling of biowaste* (Kg per capita/year)	87	43	50	26	105	36	30	12

*Sources: *Eurostat (Last available data); ** Available in Gurrià et al. 2020.*

⁸ The indicator measures the share of material recovered and fed back into the economy - thus saving extraction of primary raw materials - in overall material use. The circular material use, also known as circularity rate, is defined as the ratio of the circular use of materials to the overall material use (*ec.europa.eu/eurostat*).

⁹ The indicator includes “Gross investment in tangible goods”, “Number of persons employed” and “Value added at factor costs” in the following three sectors: the recycling sector, repair and reuse sector and rental and leasing sector (*ec.europa.eu/eurostat*).

¹⁰ The indicator is indirectly measured as the ratio of composted/methanised municipal waste (in mass unit) over the total population (in number). The ratio is expressed in kg per capita. The underlying assumption is that, by and large, the only reasonable treatment of biowaste is composting or anaerobic digestion (*ec.europa.eu/eurostat*).

A systematic approach to circular economy in the agrifood chain is also proposed by the Ellen MacArthur Foundation, the Post Foundation and the McKinsey Center for Business and Environment (EMF *et al.* 2015). As illustrated in Table 2, it is based on the so-called “ReSOLVE framework”, which highlights six major levers that seem especially promising.

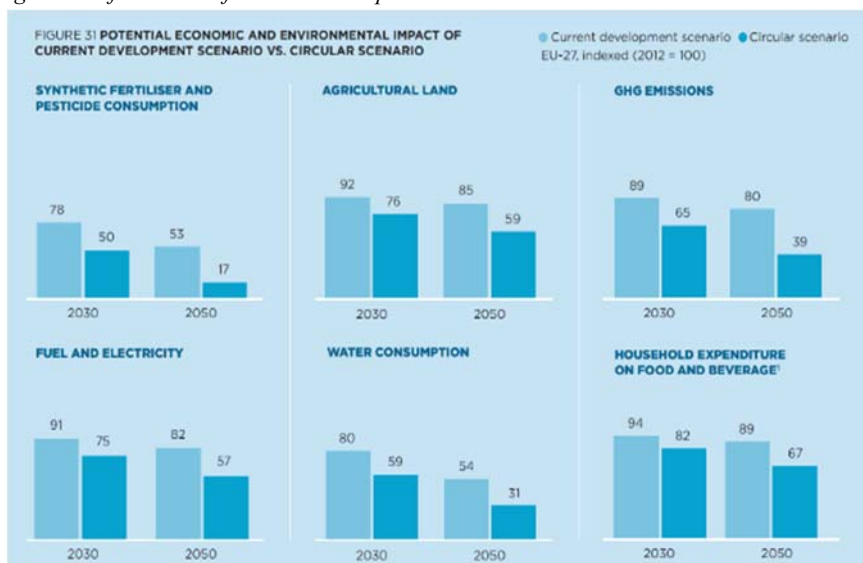
Tab. 2 - ReSOLVE scheme for circular economy in the agrifood chain

<i>ReSOLVE</i>	<i>Levers for the food sector</i>	<i>Short description</i>
REGENERATE - Regenerate and restore natural capital	more resource-efficient agricultural practices.	IT and automation are positively disrupting farming practices by enabling precision agriculture – a whole-farm management approach that leverages IT, big data, remote sensing, and satellite positioning data. These technologies optimise returns on inputs while reducing environmental impact.
SHARE - Keep product loop speed low and maximise product utilisation	regenerative farming practices.	Various sustainable and regenerative agricultural practices to preserve natural capital and optimise long-term yields are seeing growth. Organic farming is one of these examples. Other examples are agroforestry, holistic-planned grazing, silvopastoral systems, and pasture-based dairy systems with no/minimal fertiliser use.
OPTIMISE - Optimise system performance	closed loops of nutrients and other materials.	The potential to extract valuable bio-chemicals or recover energy and nutrients from various waste streams is significant. For example, phosphorus recovered from sewage sludge, meat and bone meal, and biodegradable solid waste in the EU-27 amounts to almost 30% of today’s use of synthetic phosphorus fertiliser. Recovery of energy and nutrients through digestion and composting is happening at a larger scale.
LOOP - Keep components and materials in closed loops and prioritise inner loops	restoration and preservation of natural capital.	Restoration of large, damaged ecosystems is commercially viable. The most famous example is probably the Loess plateau in China, where 1.5 million hectares of degraded land have been restored. This project lifted more than 2.5 million people out of poverty, almost tripling their income, by replacing low-value agricultural commodities with high-value products.
VIRTUALISE - Deliver utility virtually	peri-urban and urban farming.	Interest in peri-urban and urban farming to meet the increasing demand for local, fresh, relatively unprocessed food is growing. Organising short supply chains between local farms and retailers or consumers in nearby cities reduces so-called food miles and related food transport waste.
EXCHANGE - Select resource input wisely	digital supply chains.	Digital supply chains could reduce food waste. To address the 20% of food wasted from farm to retail, players are leveraging big data and IT to take inventory management to the next level. Digital solutions, such as smart refrigerators, on-demand e-commerce delivery, and wearable monitors, also address the food waste caused by consumers.

Source: authors' elaboration from EMF et al. 2015.

Given these six scopes, the same report proposes a specific scenario in which «A development path predicated on circular principles and a system-based approach would create a regenerative, resilient, non-wasteful, and healthy food system» (see Fig. 5).

Fig. 5 - Confrontation of current development scenario and the circular one



Source: EMF *et al.* 2015.

In this scenario, «consumers would have ready access to fresh, high-quality food that would encourage healthier dietary choices», and «the nutrient loops would be closed» and natural capital preserved «by applying regenerative agricultural practices, minimising the need for synthetic fertilizers and pesticides». This kind of system would create a market for rehabilitating degraded land and fish stocks and the development of local-based «peri-urban farming and digital solutions would match supply and demand in an on-demand and less-wasteful supply chain» in which «consumers would have ready access to fresh, high-quality food that would encourage healthier dietary choice» (EMF *et al.* 2015, p. 75).

2. The Regulatory Policy Framework in EU

The magnitude of the environmental, economic, and social effects of the traditional industrial production system entailed a global political and institutional commitment. Since 2015, European Union (EU) has been fully involved with such systemic change and set up a range of initiatives and significant financial resources (more than 10 billion euros) under a unique and comprehensive strategy for 2016-2020.

2.1 The EU Green Deal and the circular economy transition

The first EU circular economy package was launched by European Commission in December 2015 with the aim of moving toward a circular economy model, covering the whole lifecycle: production, consumption, waste management and secondary raw materials. The package includes four legislative proposals on waste revising part of the previous related EU legislation: Waste Framework Directive; Landfill Directive; Packaging Directive; Directives on end-of-life vehicles, batteries and accumulators, and waste electrical and electronic equipment (WEEE)¹.

In addition, the package includes the first *Action Plan for the Circular Economy* (European Commission, 2015), aiming to “close the loop” by complementing the measures enclosed in the legislative proposals and to contribute to meeting Goal 12 on sustainable consumption and production of the Sustainable Development Goals (SDGs) adopted in 2015 by United

¹ Revised legislation includes the following legislative acts: Directive 2008/98/EC on waste; Council Directive 1999/31/EC on the landfill of waste; European Parliament and Council Directive 94/62/EC on packaging and packaging waste; Directive 2000/53/EC on end-of-life vehicles; Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EE; Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).

Nations. Such initiatives are complemented by each member state with national action plans for a circular economy.

The action plan supports circular economy targets in each step of the value chain with 54 key actions that operate from production to consumption, repair and remanufacturing, waste management, and secondary raw materials. On the production side, measures to promote the reparability, durability and recyclability of products, in addition to energy efficiency, are included in the *Ecodesign working plan* for 2015-2017, as well as the development of guidance on best waste management and resource efficiency practices in industrial sectors in *Best available techniques Reference documents* (BREFs). On the consumption side, the aim is to provide better reliability, accuracy and clarity of information for consumers, ensure better enforcement of the rules in place, encourage reuse activities, and support higher uptake of Green Public Procurement (GPP). In addition, the Commission aims at boosting the market for the use of secondary raw materials, developing new quality standards, revising previous Regulations, and proposing new actions to facilitate this process.

Finally, the plan indicates a number of priority areas that include sectors facing specific challenges “because of the specificities of their products or value-chains, their environmental footprint or dependency on material from outside Europe”, to be addressed in a targeted way. To this aim, initiatives include the adoption of a strategy on plastics, addressing issues of recyclability, biodegradability, and the presence of dangerous substances in plastics; actions to reduce food waste, including a common EU measurement methodology, improved date marking, and tools to meet the SDG targets; guidance and dissemination of best practices and support for innovation in the bio-economy.

The 54 actions under the first plan have been delivered, and recently, in March 2020, the Commission adopted the new Circular Economy Action Plan “for a cleaner and more competitive Europe” with the aim of accelerating the changes required by the European Green Deal, building on the results achieved with the actions of the first plan. Presented by the EU Commission in December 2019, the Green Deal is indeed the prominent road map to drive “the Union into a modern, resource-efficient and competitive economy” with the declared aim of transforming the whole of Europe into the first “zero-emission continent” by 2050. The plan forecasts an upcoming European Climate Law to turn this political commitment into a legal obligation and a so-called “Just Transition Mechanism” to leave “no one and no places behind”, thus stressing the need for a fair transition (see the targets illustrated in Figure 6).

Fig. 6 - The European Green Deal



Source: European Commission, 2019b.

Within this frame, the renewed Circular Economy Action Plan puts emphasis on the preventive actions to undertake in waste prevention and management, identifying food, water and nutrients as the main key product value chains in the promotion of circularity. In addition, the Plan stresses the importance of the food value chain in the resource and environmental issues, remarking how 20% of the total food produced in the EU is lost or wasted (European Commission, 2020a).

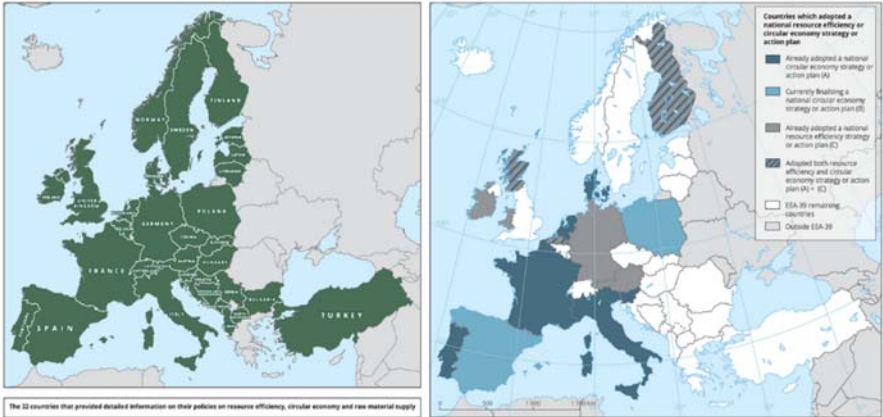
However, the overarching objective of moving toward a circular, less wasteful, efficient and sustainable system is a key contribution to the 2030 Agenda for Sustainable Development and other commonly agreed international targets under, e.g., the Paris Agreement (within the United Nations Framework Convention on Climate Change), the Convention on Biological Diversity, and the United Nations Convention to Combat Desertification. In the new Action Plan, in order to identify knowledge and governance gaps in advancing a global strategy for circular economy and take forward partnership initiatives, the Commission proposes a “Global Circular Economy Alliance”². Indeed, on this point, the document emphasises also that «the EU cannot deliver alone the ambition of the

² To deepen the (potential) specific tasks of the Global Alliance, refer to point 3.2 of the Staff Working Document of the European Commission (2020b).

European Green Deal for a climate-neutral, resource-efficient and circular economy», thus confirming that «the EU will continue to lead the way to a circular economy at the global level and use its influence, expertise and financial resources to implement the 2030 Agenda for Sustainable Development and its Sustainable Development Goals, in the EU and beyond» (European Commission, 2020b).

Figure 7 shows a graphical illustration of the countries’ commitment to the EU legislation on circular economy (European Environment Agency, 2019).

Fig. 7 - Countries that adopt measures and/or detailed information about CE



Source: EEA, 2019 (www.eea.europa.eu/data-and-maps).

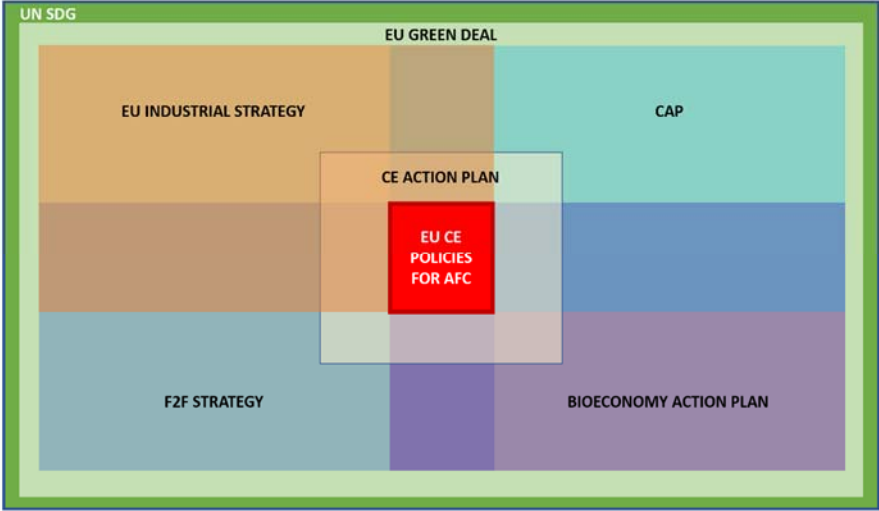
The left panel indicates almost full involvement in providing data on their respective policies on resource efficiency, circular economy, and raw material supply. On the other side, the right panel suggests that the implementation process of national strategy targeted to the circular economy (or national action plan) evolves at different speeds across countries.

2.2 A synergic and harmonised policy framework for the agrifood chain

The complexity of the Circular Economy Action Plan needs harmonisation with several different EU policy instruments in different economic sectors and activities. The scheme below summarises the

framework of the most relevant EU policies related to the circular economy in the agrifood chain (Fig. 8).

Fig. 8 - A scheme about the most relevant EU policies about circular economy in the agrifood chain



Source: authors' elaboration.

According to the *EU Industrial Strategy*, the EU Commission thus encourages and will enable greater circularity in industry, reviewing the Industrial Emission Directive, «including the integration of circular economy practices in upcoming Best Available Techniques reference documents» (European Commission 2020a, p. 6). It facilitates industrial symbiosis by developing an industry-led reporting and certification system, also promoting the use of digital technologies for tracking, tracing and mapping resources, and adopting a system of solid verification by registering the EU Environmental Technology Verification scheme as an EU certification mark.

More in general, the EU Commission recognises the central role of SMEs, announcing that the new SME Strategy «will foster circular industrial collaboration among SMEs building on training, advice under the Enterprise Europe Network on cluster collaboration, and on knowledge transfer via the European Resource Efficiency Knowledge Centre» (*ivi*). This effort has a direct impact on all industrial sectors, even including those related to food processing and packaging. In the latter, already included in the Circular Economy Action Plan, «the Commission will review the Directive 94/62/EC

to reinforce the mandatory essential requirements for packaging» (*ibidem*, p. 8). This will ensure that all packaging on the EU market will be reusable or recyclable in an economically viable way by 2030. This objective considers the reduction of (over)packaging and packaging waste, and the implementation of design for reuse and recyclability, reducing at the same time the complexity of packaging materials. It encourages the “use of biodegradable or compostable plastics”, in line with the new Directive on Single-Use Plastic Products, will assess the feasibility of EU-wide labelling that facilitates the correct separation of packaging waste at source, rules for the safe recycling into food contact materials.

More specifically focused on agriculture and biomass management are instead the Common Agricultural Policy (CAP), the Bioeconomy Strategy and the EU Farm-to-Fork (F2F) Strategy, which are in synergies with the Circular Economy Action Plan. The CAP is the main regulatory framework for the primary sector in European countries, ensuring the EU objectives of food security and food safety, recently sustaining small and medium-sized farmers toward an agroecology approach. The Bioeconomy and the F2F Strategies are instead most directly related to circular economy and food waste reduction, also providing, especially the F2F strategy, a whole set of actions and initiatives to promote a different approach to food consumption and food habits (see also the next paragraphs herein).

In this respect, the circular economy Action Plan is specifically focused on food and water waste, proposing to harmonise separate waste collection systems and the review of Directive 2008/98/EC on food waste reduction and the new Water Reuse Regulation, which will encourage circular approaches to water reuse in agriculture, as well as implementing the Drinking Water Directive, making drinkable tap water accessible in public spaces.

Regarding consumers’ empowerment, the circular economy Action Plan framework foresees a revision of EU consumer law, which is going to ensure consumers receive trustworthy and relevant information on products at the point of sale, contrasting the greenwashing as well as the environmental claims of products. From this point of view, the EU commission intends to enhance the “Product” and “Organisation Environmental Footprint” methods (PEF and OEF) as a support to existing environmental reporting tools such as the EU Ecolabel system and the EMAS certifications. These aims will also be reached through mobilising the potential of digitalisation of product information, including solutions such as digital passports, tagging, and watermarks.

As already noticed, reinforcing the role of the Public buyer is another fundamental aspect of the framework: the Commission will propose a minimum mandatory Green Public Procurement (GPP).

2.2.1 The Common Agricultural Policy

A starting point for the identification of the EU policy frame for the agrifood sector is the Common Agricultural Policy (CAP), launched in 1962 with the aim of securing citizens with food at affordable prices and providing a fair standard of living for farmers.

The policy has been revised several times over time, evolving with the economic development and the environmental consciousness of the society (since 1992, in coincidence with the Rio Earth Summit, CAP supported farmers with direct payments encouraging them to be more environmentally friendly). From 2003 onward, farmers received income support conditioned to the fulfilment of food safety, environmental, animal health and welfare standards.

In order to support jobs and growth in rural areas, the CAP of the programming period 2014-2020 boosted competitiveness, sustainable farming and innovation. As reported in the document overview on CAP reform 2014-2020, «European agriculture needs to produce more safety and quality food while preserving the natural resources on which agricultural productivity itself depends» (European Commission, 2013). In particular, in order to reach these goals, the European Commission introduced in 2015 the “green payment”, a specific type of direct payment to reward virtuous farmers. These kinds of payments represent 30% of the national funds. On 1 June 2018, the European Commission presented the legislative proposals on the future of the CAP for the period after 2020.

The CAP for the period 2021-2027 will play a pivotal role in sustainable development within the framework of the European Green Deal³. The Policy will influence all significant ecological assets directly, having a wide influence on spatial development on various levels, contributing as one of the main drivers of economic growth and jobs and playing a crucial role in healthy cultural landscapes and social development.

³ See, for instance, the European Commission web page dedicated to the “Future of the common agricultural policy”: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_en#a-new-way-of-working.

2.2.2 The Bioeconomy Strategy and Action Plan

As declared in the EU Bioeconomy Strategy document, bio-economy «covers all sectors and systems that rely on biological resources (animal, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services» (European Commission 2018, p. 4).

This part of economic products and processes are thus strictly related to the agrifood chain and, if they consider it in circular terms, they have a prominent role in achieving EU sustainable goals, as well as in the innovation and relaunch of the entire EU economic system. More specifically: “A sustainable bio-economy is the renewable segment of the circular economy” (*ibidem*, p. 8). Therefore, it can, for instance, “turn bio-waste, residues and discards into valuable resources and can create the innovations and incentives to help retailers and consumers cut food waste by 50% by 2030” (*ibidem*, p. 6). Moreover, a sustainable bio-economy is essential, for instance, to the reduction of GHGs emissions in the energy sector. Bioenergy is currently the EU’s largest renewable energy source, and it is expected to remain a key component of the energy mix to encounter the EU 2030 renewable energy goals.

At the same time, bioeconomy also represents a great support to the modernisation and the strengthening of the EU industrial base through the creation of a new value chain and greener, more cost-effective industrial processes: «with a turnover value of 2.3 trillion euros and accounting for 8.2% of the EU’s workforce, the bioeconomy is a central element to the functioning and success of the EU economy. [...]. The strong and fast-growing start-up ecosystem in the biotechnology sector will play a leading role in realizing this potential» (*ibidem*, p. 5).

However, as declared in the same EU document: «realising this potential will not happen on its own» (*ivi*). Therefore, maximising the impact of EU Research and Innovation is a key factor in this respect, so it is essential to stress the Renewed European Agenda for Research and Innovation, but also traditional funding lines such as Horizon Europe or the European Regional Development Fund. These policies and financial instruments also crosscut other instruments and policies such as the Smart Specialisation Strategy and Platform, the Common Agricultural Policy, the Common Fisheries Policy,

the renewed Industrial Policy, the circular economy Action Plan, the Clean Energy for All Europeans Package, Cohesion Policy, and the financial instruments under the InvestEU Programme.

The bio-economy strategy is articulated in five main objectives:

- ensuring food and nutrition security;
- managing natural resources sustainably;
- reducing dependence on non-renewable, unsustainable resources, whether sourced domestically or from abroad;
- mitigating and adapting to climate change;
- strengthening European competitiveness and creating jobs.

In accordance with these objectives, the main lead actions to improve a sustainable and circular bioeconomy are the following:

- strengthen and scale up the bio-based sectors, unlock investments and markets;
- deploy local bio-economies rapidly across Europe;
- understand the ecological boundaries of the bio-economy.

2.2.3 The Farm-to-Fork Strategy

As we can read in the EU Commission document about the F2F strategy, it is considered a fundamental part of the EU Green Deal: it is “at the heart” of the sustainability strategy and policy of the EU. The F2F strategy, indeed, goes beyond the agroecology approach: “It addresses comprehensively the challenges of sustainable food systems and recognises the inextricable links between healthy people, healthy societies and a healthy planet” (European Commission 2020c, p. 2).

The F2F strategy is a holistic approach that tries to bring together consumers’ health - changing peoples’ habits and diet - with an ecological approach to food production and consumption and more responsible towards the environment. This is because “If European diets were in line with dietary recommendations, the environmental footprint of food systems would be significantly reduced” (*ibidem*, p. 4).

European Commission will make a legislative proposal for a framework for a sustainable food system before the end of 2023. This will promote policy coherence at the EU and national level, also providing common definitions and general principles and requirements for sustainable food systems and food, as well as certification and labelling on sustainability performances of food products. Furthermore, the framework will address the

responsibilities of all actors in the food chain and offer specific incentives, allowing operators to benefit from sustainable practices and contributing to the rise of sustainability as the norm for all food products placed on the EU market.

The F2F strategy is closely related to the other EU sustainability strategies, such as the circular economy Action Plan and the bio-economy strategy.

2.3 EU main programmes: financial and non-financial instruments for SMEs

Europe's economy is grounded on SMEs, representing 99% of all businesses and two-thirds of the private workforce composition in the EU. However, the principles of circular economy are already applied by many large industries, while SMEs still remain uninvolved with different concurring explanations. On this point, the European Commission (Directorate General for Environment) has implemented a pilot project with the objective of exploring what route is most effective and efficient to boost the transition towards a circular economy among SMEs⁴. Results revealed a generally increased uptake by firms to adopt resource efficiency, eco-innovation and/or circular economy strategies and practices, with evident hurdles for SMEs due to their limited organisational, technological and financial capacity, as well as limited access to skilled workers and financing (KPMG, 2019; European Commission, 2020b). In addition, such enabling/hindering factors may drive the transition to circular economy also according to local conditions (see the next section on drivers and barriers).

European Commission and other EU institutions, such as the European Investment Bank (EIB), implemented different programmes that incorporate various financial instruments to help SMEs adopting circular strategies and practices. In particular, the Commission set up the Executive Agency for Small and Medium-sized Enterprises (EASME) with the purpose of managing on its behalf several EU programmes specifically (or partially) targeted to SMEs. The main programmes are listed as follows⁵:

⁴ For further details about the pilot project “Boosting the circular economy among SMEs” (previously named: Fostering a green and circular economy in Europe - Through Capacity Building, Networking And Exchanges Of Innovative Solutions Bridging The Green Innovations Gap), refer to the following link: https://ec.europa.eu/environment/sme/circular_economy_boost_en.htm.

⁵ For other instruments, services, or initiatives supporting SMEs activities, refer to <https://ec.europa.eu/easme/en>.

- *Horizon 2020* is the largest EU Research and Innovation programme that implements the flagship initiative *Innovation Union* of the strategy “Europe 2020” aimed at guaranteeing the competitiveness of the Union;
- under the programme Horizon 2020, there is also the *InnovFin-EU Finance for Innovators*, a joint initiative by the EIB Group and the European Commission that aims at facilitating and accelerating access to finance for innovative businesses with multiple financing instruments⁶;
- the *LIFE* programme is a specific funding instrument with the general objective of contributing to the implementation, updating and development of EU environmental and climate policy and legislation⁷;
- *COSME* is the EU programme targeted at the Competitiveness of Enterprises and Small and Medium-sized Enterprises, with the aim to provide easier access to guarantees, loans and equity capital⁸;
- the *European Fund for Strategic Investments* (EFSI), the central pillar of the “Investment Plan for Europe”, is a joint initiative launched by the EIB Group and European Commission to help overcome current investment gaps in the EU, supporting strategic investments in key areas⁹;
- finally, the *European Structural and Investment Funds* (ESIF) have the purpose of investing in job creation and a sustainable and healthy European economy and environment, focussing mainly on five strategic areas: research and innovation, digital technologies, supporting the low-carbon economy, sustainable management of natural resources, small businesses.¹⁰ In particular, with respect to the agrifood chain, sustainability and competitiveness are ensured through the European agricultural fund for rural development (EAFRD), the funding instrument of the EU CAP.

The above-mentioned programmes include different financial instruments, among these: equity funds, grants, and loans. However, since the introduction of the circular economy package, the Commission has also adopted non-financial instruments to help firms transition to circular

⁶ Cfr. www.eib.org/en/products/blending/innovfin/index.htm.

⁷ Cfr. <https://ec.europa.eu/easme/en/life>.

⁸ Cfr. https://ec.europa.eu/growth/smes/cosme_en.

⁹ Cfr. https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/investment-plan-europe-juncker-plan/european-fund-strategic-investments-efsi_en.

¹⁰ Cfr. https://ec.europa.eu/info/funding-tenders/funding-opportunities/funding-programmes/overview-funding-programmes/european-structural-and-investment-funds_en.

economy models. In particular, looking at the food sector, the Commission offers further non-financial instruments with targeted actions¹¹.

In general, to help businesses of SMEs, the following programmes have been launched:

- the EU Eco-Management and Audit Scheme (EMAS) is an environmental management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance;
- the Product Environmental Footprint (PEF) and the Organisational Environmental Footprint (OEF) are harmonised methods to measure and communicate the life cycle environmental performance of products and organisations;
- the EU Ecolabel is a third-party certified Type-I ISO 14024 aimed to promote products and services that have a reduced environmental impact;
- Environmental Technology Verification programme (ETV) allows new environmental technologies that do not fall under existing labels or certification to obtain a statement verifying claims regarding their performance;
- in addition to the above-mentioned instruments, there is one major EU-level programme to help SME support organisations with the implementation of a circular economy amongst SMEs: the European Resource Efficiency Knowledge Centre (EREK), a platform to enable and reinforce businesses and especially SMEs to take action for Resource Efficiency in Europe and beyond.

Looking at the evolution over time of European Policy, one can notice that it is characterised by a number of programmes and instruments with significant financial commitments and cross-cutting objectives of innovation, development, and climate change mitigation. It is worth noting that along with the European policy, member states and regional governments have also implemented further specific measures in this common framework, and private and public actors further contributed to the research and develop new technologies in this direction.

¹¹ On this point, refer to the following link for actions and good practices: https://ec.europa.eu/food/safety/food_waste/eu_actions_en.

3. The transition to circular economy: drivers and barriers

The current economic system seems, for a large part, stuck in an open-ended model of production and consumption. Yet, several disruptive trends stimulate and encourage the transition to a “circular” system, weakening the existing linear framework and mindsets. The global economic and demographic transformations bring about important challenges concerning the availability of resources and the rising demand for goods. These trends imposed reconsidering to move from the traditional dominant take-make-disposal economy model to an alternative model with a built-in tendency to recycle. In addition, significant advances in information technology further facilitated the transition along different phases, from the tracking of materials to the dissemination of information on new products and services, to the mobilisation of customers through social media platforms. Finally, an increased awareness seems to drive a general shift in consumers’ behaviour towards more sustainable choices (EMF, 2013a).

3.1 Drivers and barriers

At this stage, the identification of the determinants revealed to be challenging as circular economy is an umbrella concept covering different and wide areas and is still undefined for the conceptual definition. However, progress towards the transition has been investigated by many scholars in developed and emerging economies, at the sector and firm level, with promising results.

Looking at the specific factors that can foster or hinder the transition to a circular economy, the recent research provided new interesting evidence to understand and systematise this issue. In general, limited progress in circular economy implementation is associated with a variety of barriers concerning economic and technological factors, the market structure, and institutional and socio-cultural aspects.

Analysing the results of the recent years, common specific aspects include the high initial costs, complex supply-chains, resource-intensive

infrastructure lock-ins, limited dissemination of innovation and insufficient investment in technology, failures in company cooperation, lack of awareness and information (of consumers and firms), and limited (or inappropriate) sustainable public incentives.

De Jesus and Mendonça (2018) analysed the evidence applying the conceptualisation based on the “hard-soft” dichotomy, contributing to advancing the research agenda on the circular economy transition. They separated “harder” technical and economic factors from “softer” regulatory and cultural issues to organise the extensive literature. Table 3 below reviews the findings and indicates factors facilitating and constraining the transition towards a CE, as in the original article.

Tab. 3 - Factors facilitating and constraining the transition towards a CE

FACTORS	DRIVERS	BARRIERS
“HARDER” FACTORS	Technical	Availability of technologies that facilitate resource optimisation, re-manufacturing and re-generation of by-products as input to other processes, development of sharing solutions with superior consumer experience and convenience.
	Economic/ Financial/ Market	Related to demand-side trends (rising resource demand and consequent pressures resource depletion) and supply-side trends (resource cost increases and volatility, leading to incentives towards solutions for cost reduction and stability).
“SOFTER” FACTORS	Institutional/ Regulatory	Associated with increasing environmental legislation, environmental standards and waste management directives
	Social/Cultural	Connected to social awareness, environmental literacy and shifting consumer preferences (e.g. from ownership of assets to services models).

Source: de Jesus and Mendonça (2018).

The macro categories illustrated in the table are, of course, not mutually exclusive. Generally, there is a joint contribution of different factors that enable and encourage (impede and hinder) the transition to circular economy according also to local conditions. In particular, this can be noticed in the case of large integration areas such as the European Union, where the disparity in economic development, research and innovation, and level of institutional quality is wide across and within countries. Such heterogeneity may explain different trajectories, with strong differences across firms and sectors. It should be taken into account in designing and implementing policies, especially at the local level, as well as in interpreting their results.

Kircherr *et al.* (2018) provide further insights on circular economy barriers in the EU. Building on 208 survey respondents (among businesses and policymakers) and 47 expert interviews, they find that cultural factors are considered the main barriers that derail or slow down the transition towards a circular economy in European countries. Table 4 below illustrates the coding framework used to run the survey and the semi-structured interviews. In the survey, respondents were asked to indicate the five most pressing circular economy barriers out of the fifteen identified and included in the coding framework. Results from the study underline how “Lacking consumer interest and awareness”, as well as “Hesitant company culture” are ranked among the most pressing barriers, contrasting with the common idea that identifies technological factors as core barriers.

Tab. 4 - Coding framework of circular economy barriers

BARRIERS		EXAMPLE SOURCE
		Hesitant company culture. “No sense of urgency, company culture” Pheifer (2017, p.12).
CULTURAL	Lacking awareness and/or willingness to engage with circular economy	Limited willingness to collaborate in the value chain. “Difficult to collaborate with other companies” Mont <i>et al.</i> (2017, p.29).
		Lacking consumer awareness and interest. “Lack of consumer awareness” Mont <i>et al.</i> (2017, p.30).
		Operating in a linear system. “Current linear system in place” Pheifer (2017, p.15).

REGULATORY	Lacking policies in support of a circular economy transition	Limited circular procurement.	<p>“We need people who do not only look at costs when doing procurement, but also at other things” Manager (incumbent).</p> <p>“Current governmental legislations and ruling” Pheifer (2017, p.15).</p> <p>“There are a lot of different countries, so you need a high level of consensus, and that is not easy” Director (research institute).</p>
		Obstructing laws and regulations.	
		Lacking global consensus.	
MARKET	Lacking economic viability of circular business models	Low virgin material prices.	<p>“Low prices of many virgin materials” Mont <i>et al.</i> (2017, p.28).</p> <p>“There is a lack of standards” Scholar (university).</p> <p>“High upfront investment costs” Mont <i>et al.</i> (2017, p.29).</p> <p>“Financing of circular business propositions” Pheifer (2017, p.11).</p>
		Lacking standardization.	
		High upfront investment costs.	
		Limited funding for circular business models.	
TECHNOLOGICAL	Lacking (proven) technologies to implement CE	Lacking ability to deliver high-quality remanufactured products.	<p>“Limited availability and quality of recycled materials” IMSA (2013, p.4).</p> <p>“Products are not designed for circular business models” Mont <i>et al.</i> (2017, p.30).</p> <p>“Limited application of new business models” IMSA (2013, p.4).</p> <p>“Lack of data” Pheifer (2017, p.14).</p>
		Limited circular designs.	
		Too few large-scale demonstration projects.	
		Lack of data, e.g. on impacts.	

Source: Kircherr *et al.* 2018.

When looking at the circular economy in SMEs, the core issue of the e-book, the evidence seems to not diverge much from previous results. Rizo *et al.* (2015), for example, reviewed the literature identifying the following main barriers: environmental culture, limited government support, lack of effective legislation, information deficits, administrative burdens, low technical skills, and financial barriers. In particular, they stressed how “finance has frequently been highlighted as a barrier in the analysis carried out” and underlined how access to suitable sources of finance reveals crucial for SMEs involved in circular economy activities.

It should be noted that financial aspects are generally recognised as a key element for the innovation path of SMEs. Indeed, there is conclusive evidence, for example, on the differential impact of innovation support depending on firm size and the kind and intensity of support (for a review, see Mouquè, 2012). In the case of innovation incentives, first hints are in favour of loans and soft financial engineering (although grants are widely delivered), with greater effectiveness for SMEs (that commonly face problems in terms of credit constraints for their innovative projects due to the lack of guarantees they provide to financial operators if compared to Large firms). In addition, there is positive evidence in favour of non-financial support (as business advice) and subsidies and innovation consortia in the form of grants plus networking (Mouquè, 2012; Rizos *et al.*, 2015)¹.

Results from the 2016 Eurobarometer survey highlighted concerns about circular economy implementation in EU SMEs². The questionnaire faces several CE-related issues, such as R&D and innovation investments, implementing practices and activities, knowledge about financial opportunities, and financial availability and strategy, among other things.

Regarding R&D and CE-related innovation, results indicate that 71% of SMEs invest less than 5% in R&D, while only 4% of firms invest more than 20%. Countries involved in the SinCE-AFC project have higher average value, with Romania scoring the highest percentage (9% of Romanian SMEs invest more than 20% in R&D).

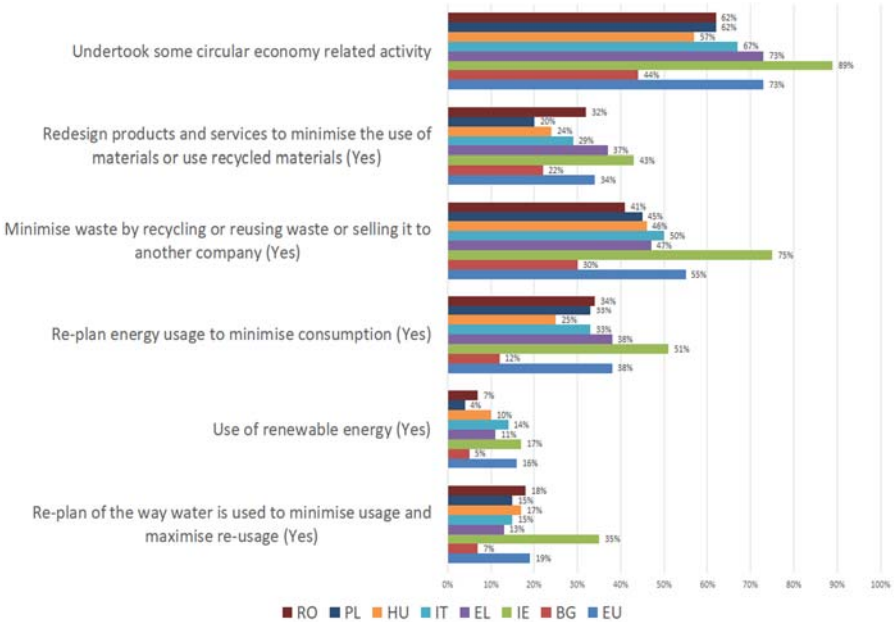
Figure 9 shows results concerning the implementation of CE-related practice for countries involved in the SinCE-AFC project. During the previous three years, 73% of interviewed SMEs declared to have undertaken some CE-related activity, with an average value for the SinCE-AFC partners of 65% (73% for Greece and 89% for Ireland. In particular, 19% declared to have re-planned water use to minimise usage and maximise re-usage (Ireland is over this value, with 35% of positive answers), 38% have declared to had re-planned also energy use (Greece reached the same percentage, while Ireland is over, with 51%), while 16% declared to use renewable energy (only Ireland is over, with 17%). Interviewed who stated to have minimised waste by recycling or reusing waste or selling it to another company are 55%

¹ On this point, see the case of the thematic “Clust-ER Associations”, “Clust-ER Agri-food” and “Clust-ER Green-tech”, in Emilia-Romagna region in Italy: a public-private partnerships and networks created as a mechanism to promote and to support the competitiveness of the value chains through the share of skills, ideas and resources (www.retealtatecnologia.it/en/clust-er).

² Detailed data are available online at the following link: https://data.europa.eu/euodp/en/data/dataset/S2110_441_ENG.

(Ireland is over with 75%). Finally, a redesign of products and services to minimise the use of materials or to implement the use of recycled ones has been undertaken by 34% of the EU SMEs. Among SinCE-AFC partners, Greece (37%) and Ireland (43%) reached higher values.

Fig. 9 - Implementation of CE-related practice and activities



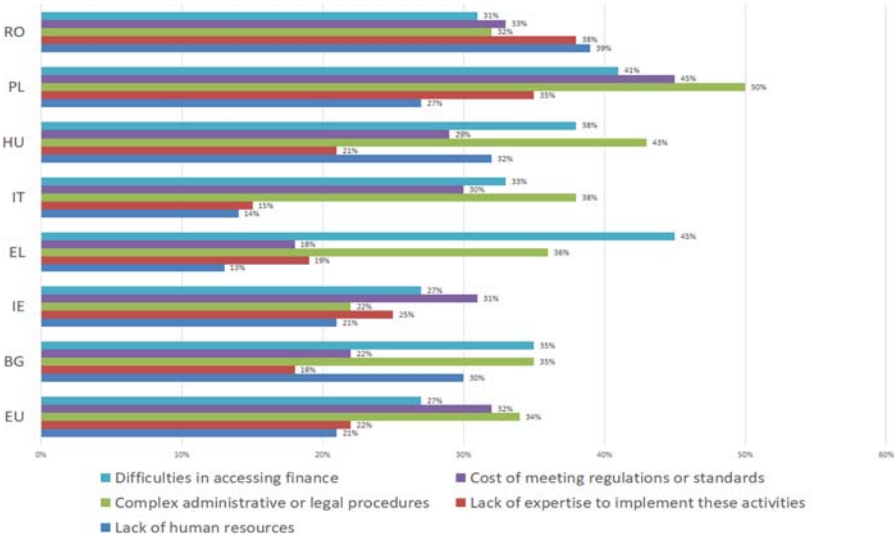
Source: authors' elaboration from Eurobarometer data 2016.

The graph in Fig. 10 shows instead results with respect to the main difficulties faced by entrepreneurs in implementing circular economy initiatives. Respondents indicated bureaucratic complexity (complex administrative or legal procedures, 34%) and related costs (cost of meeting regulations or standards, 32%), and difficulties in accessing finance (27%) as the most pressing barriers. In the selected countries, the average values are generally higher (except for “costs of meeting regulations or standards”, which is limited to 30%).

Moreover, a “no clear idea about cost benefits or improved work processes” (EU=27%) and about the “required investments” (EU=27%) are also the most cited reasons that discourage entrepreneurs from undertaking circular economy initiatives. The majority of the EU respondents highlighted that “the company did not use external sources to finance the activities” (EU

equal to 63%, SinCE-AFC partners equal to 63%), and this percentage grew to 70% considering specific CE-related investments. The 18% still consider access to finance “difficult” (fairly difficult + very difficult) (23% of SinCE-AFC partners), and only 1% of interviewers had access to “EU related funds” (a percentage that reached the average value of 4% in SinCE-AFC partners).

Fig. 10 - Main difficulties in implementing CE-related practices and activities



Source: authors' elaboration from Eurobarometer data 2016.

Even if the larger part of the respondents admitted having “no searched for such information” (respectively 48% for EU and 45% for SinCE-AFC partners), 30% also stated there is “little or no information” readily available (32% of SinCE-AFC partners). Finally, “lack of human resources” (21% for EU and 25% for SinCE-AFC partners) and “expertise” (22% for EU and 24% for SinCE-AFC partners) are other important limiting factors.

3.2 Evidence from the SinCE-AFC consultation processes

The activities of the SinCE-AFC project included developing and conducting two surveys targeted to the project partners and local stakeholders. In 2020, the first survey was developed and distributed to project partners concerning regional policies supporting agrifood SMEs and the development of the action plan. The main goal was to assess the levels

of awareness, knowledge, engagement, and development needs of the project partners and their local stakeholders. In 2021, a second survey followed. The main goal was to assess the views and needs of local stakeholders within the project partner regions regarding the initial set-up, development, and evaluation of the project partners' action plans.

3.2.1 First stakeholders' consultation process

The first round of the survey involved forty stakeholders in the agrifood sector from seven European regions³. The pool of respondents includes representatives from research bodies, co-operatives, local authorities, local development authorities, waste management bodies, businesses and food producers.

Looking at the experiences of the actors involved, preliminary results from the first set of questions revealed a high heterogeneity in the level of knowledge and understanding of circular economy concepts, policies and practices. Respondents with a general knowledge of circular economy varied from 3% with no knowledge, 35% with fair knowledge, 40% with good knowledge, and 22% with excellent knowledge of the CE. Only 54% of the respondents stated that they were aware of current policies or strategies in their region (country). In line with the previous question, 57% of respondents were aware of existing policies or strategies supporting the food/agrifood sectors in their respective regions (countries). About 60% did not know (or did not reply) what specific reference those policies or strategies make to the CE, while 40% knew some information. Accordingly, a similar share of respondents gave details about any particular circular economy model or project currently operating in their region.

The second set of specific questions related to the drivers or enabling forces supporting the circular economy confirmed a generalised lack of knowledge and awareness, receiving a high rate of no replies and fragmented responses. However, questionnaire respondents also provided interesting evidence, in line with the results found in the literature. In particular, regarding the inhibitors limiting the development of CE, 80% outlined different critical issues, mainly dealing with cultural and institutional factors: lack of knowledge, information and awareness, lack of cooperation with other companies and difficulty networking, lack of specific

³ Regions belong to the following countries: Bulgaria, Greece, Hungary, Ireland, Italy, Poland, and Romania.

policy/legislation, strategy and political will, unwillingness to make changes to processes, bureaucracy, lack of support. Concerning driving forces, respondents (73%) outlined a broad set of factors partly in line with cultural and institutional issues that emerged in the literature. Replies dealt with knowledge and awareness of circular economy advantages, political initiatives for the transition to CE, funding motivation, technical help and support, sharing of experiences, regional and municipal action plans/policies/strategies or initiatives, promotion of EU policy, funding support tools, and environmental protection. In addition, some technical factors emerged concerning reducing landfill waste, energy production from residues, and the need to stabilise local production systems. Regarding the support to encourage and drive circular economy in the agrifood sector, respondents (88%) indicated, among other things, the need for information/promotion, funding as well as targeted implementation of investment policies in agrifood businesses, national strategies in the CE, actions related to the limitation of problems, financial and tax incentives, coordination of public funding, joint branding/promotion and training/research/education. Finally, the lack of awareness is confirmed by the replies given with respect to policies and strategies to implement in support of the transition and the good practices to apply in their region: no specific issue emerged from the respondents in the first case. At the same time, 70% were unaware of any good practices to replicate.

To sum up, the level of knowledge about the circular economy and the related policies/strategies varies greatly, even among representatives from the same regions. It would appear to lack solid and meaningful policies and measures to support the circular economy within most partner regions. The responses seem to indicate that while there is an awareness (about 55-60%) of the concept and policies relating to the circular economy among project regions, there is also limited knowledge. This is not surprising as many of the partners are not directly involved in the circular economy and its broad implementation is still in its relative infancy in most of them.

These responses would indicate that while there is an understanding of the concept of circular economy among participating partners and regions, there is very limited knowledge or experience of the practices involved in the CE. This would indicate a significant gap between policy and practice within the partner regions, with the consequent challenge of translating the policies and associated opportunities with the needs of businesses. The lack of awareness and understanding within the partner regions points to the need for this fundamental challenge to be addressed at an early stage, becoming an essential part of partner action plans. It is also suggested that the project

partners and public agencies need a much better knowledge of the real market opportunities within the circular economy and the commercial models that can be applied to the sector.

The responses concerning good practices, particularly the significant lack of knowledge of good practices in the sector, indicate a prospect for projects such as SinCE-AFC to identify and raise awareness of good practices in the CE, and to use these as means of creating awareness, improving understanding and affecting future policies.

3.2.2 *Second stakeholders' consultation process*

The second stakeholders' consultation process was developed and conducted by the Donegal County Council staff (PP6) in May 2021. The main goal was to assess the views and needs of stakeholders within the project partner regions regarding the initial set-up, development, and evaluation of the project partners' action plans.

The sample included each country partner, and 47 stakeholders from 7 regions submitted replies to the questionnaire. The questionnaire included ten questions aggregated into three main domains or sections: 1) *identity*; 2) *knowledge review*; 3) *Action Plan development*. For what concern identity, feedback was received from different subjects, such as representatives of Government bodies - Local Authorities, Development Agencies, etc. (11), Social Enterprises (3), Not for Profit organizations (9), Research & Educational Institutes (5), and Businesses (19). Regarding the knowledge review about the CE, the questionnaire asked how the SinCE-AFC project has improved the understanding and knowledge of the circular economy (Question 3) and what lessons they have learned from it (Question 4).

Almost the total respondents (94%) are aware that there is a range of opportunities available, and the main lessons they learned are especially related to “the valorisation of waste streams”, “the need to conserve resources”, “the need to reduce Green House Gases”, “the need for knowledge and awareness about the circular economy and its benefits”, “the need for better cooperation between local and regional authorities”, the importance of the “co-design” and of “investor capital”.

Moreover, questions insisted on the more fruitful context or occasion to gain this knowledge (Question 5): thanks to the identified good practices, during the discussion at the Local Stakeholders Group meetings or attending the project study visits. More than 80% of the respondent have indicated the good practices and the local meeting as the most significant occasions to

acquire information and increase their knowledge and capabilities about circular economy and related topics. Unfortunately, the impossibility of having face-to-face meetings due to the Covid-19 pandemic has affected the opportunity to travel for the study visit (often offered online) and for direct confrontation. In accordance with these results, 79% of respondents stated that the good practices were insightful (17% did not respond). In particular, within the positive replies, 15 stakeholders named 24 specific good practices (see Tab. 5).

Tab. 5 - The 24 most cited good practices as insightful

<i>Good Practice*</i>	<i>No. of References</i>
Olive Clima	1
Kafsimo	1
Social Plate	1
ICESP/Italian Circular Economy Platform	3
Staramaki	2
Koukoutsi Eco Material	1
Tsakiris Family	3
SECVENT	2
ECO Partner	2
Zero Waste Dinner	1
Symbio Beer	1
Biogas at Baciù Farm	1
Foodsì App	1
Hungarian Dairy	2
SLAMka	2

** For further information on the good practices, see section 4. While a complete database of them is consultable on the Internet at the following webpage: <https://projects2014-2020.interregeurope.eu/since-afc/good-practices/>.*

As already explained above, the last section of the survey was dedicated to investigating the action plan development. From this point of view, respondents were called to give a ranking, from 1 (least) to 8 (most important), to a series of items considered key components of the action plan (Question 7). These were the following: a) Awareness Raising; b) Marketing; c) Stakeholder Commitment; d) Case Studies/Good Practices; e) Strategic Alliances; f) Dedicated Funding; g) Measurable Outputs; h) Other.

All the items reached a high score from the majority of respondents: indeed, at least 60% gave the answers a value higher than five. Especially, the item “Awareness raising” and “Strategic Alliance” resulted the most chosen, with 83% of respondents that gave them a score higher than five. Follow “Measurable Outputs” (80%), “Stakeholder Commitment” (78%),

“Dedicated Funding” (76%), “Marketing” (65%), and “Case Studies/Good Practices” (64%). This suggests that “Awareness Raising” and “Strategic Alliance” are considered key components of the project partners’ action plans, as well as the need for “Measurable Outputs”. While a little bit less central seems to be “Dedicated Funding” or “Marketing” strategies, even they still remain very important. Finally, “Education”, “Regulation and self-regulation of relevant markets”, and “climate change” are also topics cited as other key components of action plans.

Another battery of items was dedicated to evaluating to which extent the actions cited in the respective draft action plans will lead to policy changes and at which level. The rank was here based on a scale from 1 (least likely) to 5 (most likely). Respondents emphasized a focus or a more likely impact at the “Regional/local level” (73% ranked this topic at 4 or 5) instead of the “National level” (44%). Moreover, the SinCE-AFC stakeholders appear confident that their action plans could lead to “Enhanced business opportunity within the CE” (58% ranked it either 4 or 5). Indeed, they consider it could lead to “Enhanced awareness of circular economy at the local level” (73%), and they are quite ambitious that it will lead to “Increased circular economy projects in the CE” (45%).

A further question asked to express an opinion on how the actions in the draft action plan could benefit the business in the agrifood sector. The majority of the 41 Stakeholders who replied were positive, with a high number of respondents detailing more than one benefit. Nearly 20% cited waste valorisation/reduction/management as a benefit to agrifood businesses. Other benefits mentioned by 14,5% of the stakeholders were funds/finance programmes which would be made available to help transform and enable innovation in the CE. Just over 12% referred to the possible networks created under their action plans, envisaging them as collaborative, participatory, and as alliances. Awareness was cited by about 10% as an important benefit of their actions, equally to “knowledge” and “good practices” dissemination (indicated with the same percentage of about 10%). A further 7% of respondents referenced the exchange of experiences and good practices as beneficial to the agrifood sector. One stakeholder specifically cited the elimination of obstacles such as bureaucracy, complicated guidelines, and long evaluation and selection processes as a benefit of their actions. Another Stakeholder suggested that the symbiosis of the agrifood chain will create new products and services. Others cited improved products generally arising from better environmental awareness and improved/developed actions in the CE. Interestingly, one respondent mentioned that circular economy applications should influence regional

policy, and another suggested that the action plan's objectives should follow the circular economy monitoring indicators.

The last battery of items was dedicated to evaluating what difficulties were anticipated in the set-up, development, and initial implementation of the partner's action plans. In this case, the rank was based on a scale from 1 (least likely) to 6 (most likely).

"Inability to effect funding streams" has been considered the major difficulty (71% ranked this topic at 4 or higher), followed by "Inability to affect policy change" (69%), the "Lack of business engagement" (51%), the "Lack of Stakeholder engagement" and the "Identification of business opportunity" (both 45%). Six stakeholders (13%) gave specific replies under this heading, including recently enacted legal and institutional frameworks, the inaction of the local economy, emerged by the dominant established business system, and the lack of common languages. Someone stated that domestic companies are not used to collaborating, therefore considering the prevalence of a competitive attitude rather than a collaborative one as a barrier for them.

Summing up, by the survey, it is clear that the primary source of learning for the stakeholders is the sharing of case studies/good practices, which have been researched and shared by the partners from the seven partner regions during the Local Stakeholders Group meetings, project meetings and online import workshops. The SinCE-AFC project has been a valuable tool to raise awareness of the Good Practices in the circular economy and improve stakeholder understanding of the concept. Concerning the preparation of action plans, the survey identifies very clearly the key areas that the partners should include in their plans:

- awareness raising and marketing of the circular economy;
- the development of strong local stakeholder engagement and the need for strategic alliances;
- the identification and use of case studies and good practices as key tools to educate and inspire;
- the development of a dedicated funding measure/stream to support the circular economy at the local/regional level.

In general, the partners have a positive perception of the potential of their actions plans, in particular at the local level:

- over 70% believe they can affect change in policies at the local or regional level, with only 50% seeing a potential change at the national level;

- the majority believe that the action plans will have the potential to enhance awareness of the circular economy at the local level;
- the majority believe that the action plans will have the potential to enhance business opportunities at the local level;
- almost 50% of the partner regions believe that the action plans will lead to an increase in the number of circular economy projects at the local level.

Finally, concerning the perceived challenges envisaged by the partner regions in implementing their action plans, the challenges mirror the areas of opportunity and can be summarised as follows:

- gaining stakeholder and business engagement – this would point to the need to make the circular economy action plan relevant and practical at both local and regional levels;
- the identification of business opportunities – this reflects the belief among partner regions that the active engagement of businesses is essential to the further development of the circular economy sector but that businesses may need to be “lead”;
- a lack of confidence/belief that the partners and their action plans will be able to effect significant policy change other than at the local level, i.e. what is required is strong national policies and measures to support the circular economy sector;
- the difficulty of identifying or developing a dedicated funding stream to support the sector in their regions.

4. The collected good practices

4.1 Good practices and relevant features

One of the main objectives of the SinCE-AFC project is to return a certain well-documented number of “good practices” related to the implementation of circular economy in the agrifood domain.

Defining what a “good practice” is or should be, is difficult. Often the term “good practice” is used as synonymous with “best practice”. It is defined as «a procedure that has been shown by research and experience to produce optimal results and is established as a standard suitable for widespread adoption»¹.

However, nowadays, the term “good practice” is usually preferred because of the difficulties in defining the “optimal” in a specific domain or different contexts. Indeed, what is considered the “best way” in a specific context could not be the same in a different one, and it could need an adaptation to work at the highest level.

Within Interreg Europe, a good practice is «an initiative carried out under one of the programme’s topics [that] can be, for example, a methodology, project, process or technique which has some evidence of success in reaching its objectives». Already tangible and measurable results of the initiative are also required, as well as «the potential to be transferred to other geographic areas»².

Specifically, in the agrifood sector, a qualified definition of “good practice” is that adopted by the FAO, which considers it «not only a practice that is good but a practice that has been proven to work well and produce good results and is thus recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, which

¹ See, for example, Merriam&Webster Dictionary: www.merriam-webster.com/dictionary/best%20practice (27/07/2022).

² See, for instance, the Interreg Europe website at the following link: www.interregeurope.eu/help/project-implementation.

has been repeated and deserves to be shared so that a greater number of people can adopt it»³.

On the basis of this definition, FAO also identifies five criteria as useful to recognize and describe a good practice:

- *effective and successful*: a “good practice” has proven its strategic relevance as the most effective way of achieving a specific objective; it has been successfully adopted and has had a positive impact on individuals and/or communities;
- *environmentally, economically and socially sustainable*: a “good practice” meets current needs, particularly the essential needs of the world’s poorest, without compromising the ability to address future needs;
- *gender sensitive*: a description of the practice must show how actors, men and women involved in the process, were able to improve their livelihoods;
- *technically feasible*: technical feasibility is the basis of a “good practice”. It is easy to learn and implement;
- *inherently participatory*: participatory approaches are essential as they support a joint sense of ownership of decisions and actions;
- *replicable and adaptable*: a “good practice” should have the potential for replication and be adaptable to similar objectives in varying situations;
- *reducing disaster/crisis risks, if applicable*: a “good practice” contributes to disaster/crisis risk reduction for resilience.

This kind of definition and criteria especially highlight the good results reached by the practice, its sustainability, and the opportunity to share and repeat it in different contexts.

However, importation needs adaptation. Therefore, within SinCE-AFC, confrontation among stakeholders was considered one of the best ways to mobilize horizontal support mechanisms to engage SMEs in resource efficiency initiatives and investments, including those related to the circular economy. The exchange of experience ensures capacity building for professionals enabling them to propose methods of promoting a circular economy in SMEs.

During the project, stakeholders and external experts – including the *Interreg Europe Policy Learning Platform* or the *EU Circular Economy Platform* – have had the opportunity to meet regularly to ensure interregional

³ See: <https://tinyurl.com/2p8k8t8b> (27/07/2022).

learning, dissemination of practices, and effective influence on policy instruments. Indeed, at least one Import Workshop per each partner's region was carried out as a one-day intense knowledge transfer lab. During import workshops, each region has had the chance to invite the representatives of the good practices which the partners have selected as best examples for interventions to the regional policies.

Moreover, during the project period, six study visits were realized. Each of them usually had a one-day duration, and they were dedicated to the visibility of the region's good practices. This opportunity gave the participants an in-depth view of the demonstration examples and assessed the potential of exploiting those good practices to improve their regional policies.

Partners collected a whole set of 40 good practices (approximately six per participating region)⁴ has been identified and documented on the basis of a set of criteria.

In general, within an EU project, a good practice should fulfil at least two of the following criteria to be considered as such:

- to be related to the topic under consideration;
- demonstrate added value for the project partnership/partners;
- be proven to be successful and able to demonstrate tangible results;
- have the potential for learning and inspiration: a good practice should explain why it is key for local or regional learning and development;
- should ideally have led to a policy adoption or policy changes in the Region;
- be replicable in different areas or regions.

In the specific case of the SinCE-AFC project, the collected good practices should have been related to both the circular economy and SMEs supporting mechanisms in the agrifood sector. Thus, the identified good practices needed also to fulfil the following additional criteria:

- lead to new horizontal mechanisms supporting SMEs in becoming more circular;
- mobilize horizontal support mechanisms to engage SMEs in resource-efficient initiatives and investments (also such ones limiting food loss);
- act as a new stimulus helpful for policymakers to support the circular economy in the agrifood sector being more efficient;

⁴ The complete catalogue of the good practices is available at the following link: <https://tinyurl.com/bd6p7udw> (27/07/2022).

- assist SMEs in entering the circular economy;
- boost innovation and competitiveness of SMEs involved in the whole agrifood chain from farming to processing, packaging, distribution, storage and consumption;
- refer to green growth in all market sectors;
- improve relevant policy instruments to assist SMEs entering the circular economy.

Finally, the EU projects reporting method for good practice especially requested the following information:

- title of the good practice;
- the specific objectives of the practice;
- identify the institutions/agencies involved;
- location of the practice;
- a detailed description of the practice;
- resources, both human and financial, that were required to deliver the practice;
- the timescale of the project;
- evidence of success;
- the potential for learning and/or transfer;
- demonstrate a model for sustainability.

4.2 The SinCE-AFC good practices catalogue

As already argued, based on the criteria mentioned above, a whole set of 40 good practices have been finally collected. They may be consulted on the SinCE-AFC project website, where a web catalogue is available. Each good practice is described with a brief introduction, a few notes about the evidence of their success, as well as the potentiality for learning and transfer.

All the selected good practices are reported In Tab. 6. For each of them are specified features, such as country, the circular economy-related concept that is more fitted with them, and their prominent positioning along the supply chain. Significantly, the circular economy-related concepts are all those already cited in the first chapter, which allows us to consider circular economy not just as a unique and well-defined concept but rather as a “cluster concept”. They are the following:

- Industrial ecology;
- Industrial symbiosis;
- Biobased economy;

- Remanufacturing;
- Product design;
- Collaborative consumption;
- Product Service Systems (PSSs).

Moreover, to these, it is possible to add at least two other categories, mostly related to less material aspects or services:

- Innovation/consulting services & funds;
- Information, education, and awareness.

More than one concept may usually be identified per practice. Indeed, different concepts could often overlap and be interrelated within a singular practice. Similarly, it is possible to identify more than one singular possible position concerning the supply chain. Multifunctional activities, cascading cycles and synergies among different steps within the same industry are normal in the circular economy approach.

In this last case, the adopted categories are those of NACE classification, plus a “Transversal” one mostly used in the case of categories such as “Innovation/consulting services & funds” and “Information, education, and awareness”.

Tab. 6 - Good practices, CE-related concepts and supply chain position

<i>Good practice</i>	<i>Country</i>	<i>CE-related concept</i>	<i>Supply chain portion</i>
<i>Station Zero - A little step towards sustainability - a store for goods without packaging</i>	Bulgaria	Product Service System	Wholesale and retail trade (section G)
<i>SLAMka - ecological wheat straws made with love for the nature</i>	Bulgaria	Biobased economy	Manufacturing activities (section C)
<i>Devnya Cement JSC - Committed to environmental sustainability</i>	Bulgaria	Biobased economy	Manufacturing activities (section C)
<i>Production of straw bales and pellets</i>	Bulgaria	Biobased economy	Manufacturing activities (section C)
<i>Recovery of phosphates by acid decomposition of Flyash</i>	Bulgaria	Industrial symbiosis	Manufacturing activities (section C)

<i>Reuse of food waste in new food products and utilize livestock waste for energy production (TSAKIRIS FAMILY)</i>	Greece	Industrial ecology	Agriculture, forestry and fishing (section A)
<i>Bread and Pizza from wine lees (Domaine Agrovision Winery)</i>	Greece	Industrial symbiosis	Agriculture, forestry and fishing (section A)
<i>Use of coffee waste to produce biofuels (InCommon)</i>	Greece	Biobased economy	Manufacturing activities (section C)
<i>Circular model of wheat straws production</i>	Greece	Biobased economy	Agriculture, forestry and fishing (section A)
<i>Wood and expired food recycling (Eldia)</i>	Greece	Industrial symbiosis	Manufacturing activities (section C)
<i>Reuse of agricultural waste (oikotexniagropalis)</i>	Greece	Industrial ecology	Agriculture, forestry and fishing (section A)
<i>Reuse of wood waste and food dissemination (Bios coop)</i>	Greece	Industrial ecology	Wholesale and retail trade (section G)
<hr/>			
<i>ALFÖLDI TEJ - Dairy producing factory utilizing the total volume of by-product of cheese production</i>	Hungary	Biobased economy	Manufacturing activities (section C)
<i>Bold Agro kft - Integrated approach of an agrifood business</i>	Hungary	Industrial ecology	Agriculture, forestry and fishing (section A)
<i>Béke - Using agricultural by-products for energy production</i>	Hungary	Biobased economy	Agriculture, forestry and fishing (section A)
<i>Biotrans - “Not a Drop” – coordinated collection of used cooking oil</i>	Hungary	Biobased economy	Manufacturing activities (section C)
<i>“Cekker/String Bag” – a new way of shopping in a Specialty Grocery Store</i>	Hungary	Product Service Systems	Wholesale and retail trade (section G)
<i>Development and market introduction of poultry organic fertilizer pellet production technology (Bio.Fer - Baromfi Coop Kft)</i>	Hungary	Biobased economy	Agriculture, forestry and fishing
<hr/>			
<i>Recycling & repurposing of Gypsum waste for use in agricultural and horticultural sectors.</i>	Ireland	Industrial symbiosis	Manufacturing activities (section C)
<i>Hexafly - Alternative protein production</i>	Ireland	Biobased economy	Agriculture, forestry and fishing (section A)

<i>Frylite solutions - Re-use of used cooking oils as bio-diesel</i>	Ireland	Industrial symbiosis	Manufacturing activities (section C)
<i>Re-use/reduction of food waste - Waste bread from bakery utilised as a grain substitute to produce beer while spent grains from brewery are used as an added ingredient in bread production.</i>	Ireland	Industrial symbiosis	Manufacturing activities (section C)
<i>Reprocessing of household, agricultural and commercial waste (Envirogrind)</i>	Ireland	Biobased economy	Wholesale and retail trade (section G)
<i>Manufacture of potato starch from surplus potatoes (Meadepotato)</i>	Ireland	Industrial ecology	Agriculture, forestry and fishing (section A)
<i>Agrofood BIC</i>	Italy	Innovation/consulting services & Funds	Transversal
<i>Mercato ritrovato - Farmers' market</i>	Italy	Product Service Systems	Wholesale and retail trade (section G)
<i>Agrifood Circular Systems: the Future Food Institute Ecosystem. Education, Community, Innovation.</i>	Italy	Innovation/consulting services & Funds	Transversal
<i>ICESP Italian Circular Economy Stakeholder Platform (ENEA-National Agency for New technologies, energy and sustainable economic development)</i>	Italy	Innovation/consulting services & Funds	Transversal
<i>Local Food Waste Hub</i>	Italy	Product Service Systems	Wholesale and retail trade (section G)
<i>Biological District of the Bolognese Apennines</i>	Italy	Industrial ecology	Agriculture, forestry and fishing (section A)
<i>NEWbiogasDIMENSION: utilization of food organic waste in a highly efficient biogas plant (Dynamic Biogas)</i>	Poland	Biobased economy	Manufacturing activities (section C)
<i>SemCo company – traditional, unrefined, cold-pressed oil production</i>	Poland	Biobased economy	Manufacturing activities (section C)
<i>FOODSI app - reducing food waste in restaurants, bakeries, pastry shops and supermarkets</i>	Poland	Product Service Systems	Wholesale and retail trade (section G)

<i>#niemarnu_jemy Zero waste dinner - how to bite it? - Reducing food waste, reusing potentially kitchen waste products, a promotion tool, a tool for exchanging knowledge and experience - that's how it works.</i>	Poland	Information, education and awareness	Accommodations and food service activities (section I)
<i>CNPCD - ECOPartner - Public-private partnership for eco-innovation in promoting the circular economy</i>	Romania	Innovation/consulting services & Funds	Transversal
<i>Zero Waste Store</i>	Romania	Product Service Systems	Wholesale and retail trade (section G)
<i>Renewable Energy on Farm</i>	Romania	Industrial ecology	Agriculture, forestry and fishing (section A)
<i>National Program for Rural Development</i>	Romania	Innovation/consulting services & Funds	Transversal
<i>SECVENT- Sequential processes for closing the side flows in the bioeconomy</i>	Romania	Biobased economy	Transversal
<i>Tubular Bioreactor with the Liquid Effluent Partial Recirculation (National Institute for Research and Development in Electrical Engineering ICPE-CA Bucharest)</i>	Romania	Biobased economy	Manufacturing activities (section C)

Source: authors' elaboration from the SinCE-AFC good practices web catalogue.

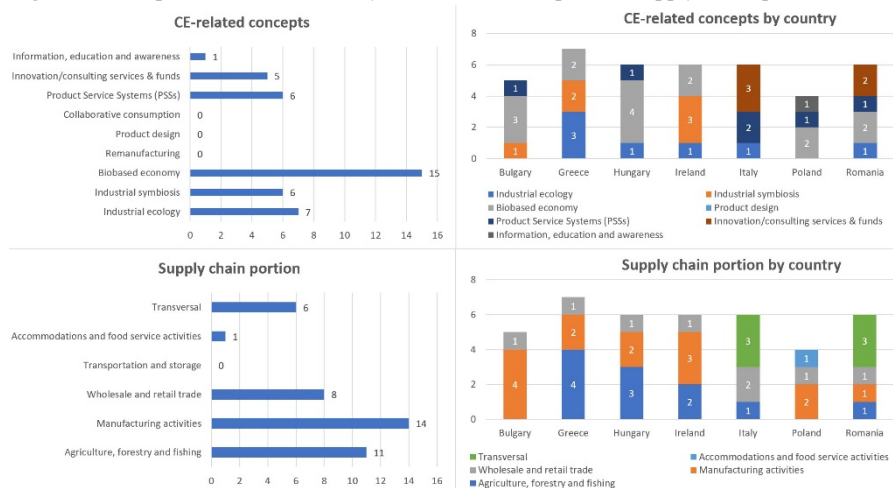
The charts from Tab. 11 summarise the distribution of the good practices on the bases of the categories mentioned above (see Tab. 6). Especially, it is possible to notice that “biobased economy”, “industrial symbiosis”, and “industrial ecology” are the most widely classified concepts or scopes.

These are mostly related to production activities (primary sector and/or industrial ones), often associated with reusing by-products and valorisation. As already explained within this volume, the term biobased economy represents a broad concept, which includes a range of activities that primarily concerns biobased products. To include a good practice within this category, we have considered just those good practices in which the final product is obtained by biomasses and/or in which biomasses represent valuable by-products in renewed productive cycles. In this sense, in the agrifood domain, industrial symbiosis and ecology processes are almost always included within the concept of the biobased economy.

In this case, Greece, Ireland and Hungary are the most involved countries. The first two have mainly signalled examples of “industrial symbiosis”, highlighting forms of collaboration among industries. In contrast, Hungary has highlighted cascading processes related to the valorisation of biobased products and by-products within the same industry.

Differently, in the domain of services and consumption, it is possible to face mainly “Product-Service Systems” (such as those related to the digital platforms) or services related to the categories of “Innovation/Consulting service & Funds” and “Information, Education and Awareness”. In this case, Italy and Romania have furnished the most relevant examples.

Fig. 11 - Good practice distribution by CE-related concepts and Supply chain portion



Source: authors' elaboration.

Considering the position of the practices concerning the supply chain it is possible to notice that “Manufacturing activities” and “Agriculture, forestry, and fishing” are the most recurring categories. This fact is in line with the most recurring categories of “Industrial symbiosis”, “Industrial ecology”, and “Bio-based economy” mentioned above.

More often, the selected good practices are indeed related to agriculture production and/or industrial processing of agriculture by-products.

The so-called “Product-Service Systems” are instead mostly related to the “Wholesale and retail trade” sector. In contrast, the “Transversal” category is mostly related to categories such as “Innovation/Consulting service & Funds” and “Information, Education and Awareness”.

In accordance with the distribution of these last categories, also the “Transversal” one is most recurrent in countries such as Italy and Romania. The remaining categories are more equally distributed amongst the other countries.

5. The action plans

5.1 What is an action plan, and what are its contents?

An “action plan” provides details on how project partners have planned to apply knowledge, skills and practices learned during the SinCE-AFC project to improve their respective policy instruments. The document specifies the nature of the actions to be implemented, their time frame, the players involved, the costs, and funding sources.

The action plans describe some of the main outputs of the SinCE-AFC project because there are condensed actions that the partners will carry out to implement their policies in the field of the circular economy.

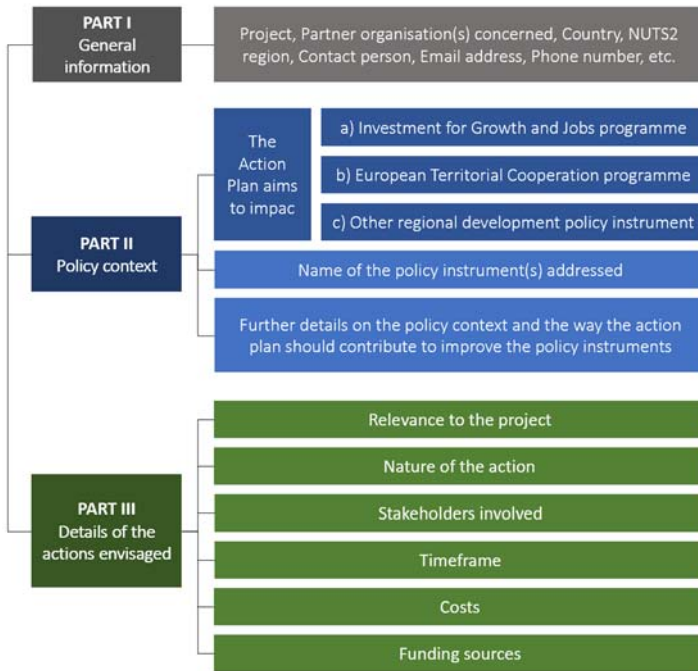
These actions result from project activities, such as Local Stakeholders Groups meetings, interregional seminars, study visits, coordination meetings, good practices collection, import/export workshops, etc.

The expected impact is an improvement of the policy instruments addressed by the partners at the regional and local levels, thus enhancing the governance for circular economy measures in the agrifood sector.

The planning of measures and activities will lead to improved cooperation between all actors in the agrifood sector involved in production, processing, packaging, distribution and final consumption, to work in a coordinated way to better adapt to the circular economy.

SMEs face several challenges in implementing various measures and innovations to implement circular economy models to enhance their competitiveness, especially in rural areas. Local and regional policies should accordingly support the dissemination of new and innovative solutions and business models that lead to the desired results facilitating SMEs access to new markets while protecting the environment.

Fig. 12 - A simple “action plan” scheme



Source: authors' elaboration.

The fulfilled document by each partner Region included a brief description of the policy context, the primary sectors or axes to which it aims to impact, the specific policy instrument(s) addressed, and some details about how the action plan should contribute to improving the policy instruments.

Furthermore, the action plans included all the specific actions to develop it. Within this part, partners have had to specify: 1) the relevance to the project, describing how the action derives from the project (and especially from the interregional exchanges); 2) the nature of the action, that is, the specific activities that need to be implemented; 3) the stakeholder involvement, indicating which specific stakeholder/s is/are involved in, and its/their specific role; 4) the timeframe; 5) the expected costs; 6) and which funds will be provided.

The following paragraphs shortly describe the action plans developed by each partner, especially highlighting the policy context and the envisaged actions¹.

5.2 The action plans of the SinCE-AFC partners

5.2.1 Anatoliki/Central Macedonia Region (Greece)

Policy context

The action plan provided by the Anatoliki S.A. for the Central Macedonia Region (CMR) in Greece primarily aims to impact job investment and growth program and was initially referred to the Operational Program (OP) of the RCM 2014-2020. However, due to the end of the programming period, the available resources of this policy instrument have been fully committed and/or reallocated to actions to address the effects of the COVID-19 pandemic.

Consequently, RCM has proceeded in changing the policy instrument, i.e. to the new OP 2021-27, which is in the stage of approval.

The new programming period concerns the new Multiannual Financial Framework 2021-2027 announced by the European Commission in 2018. While at the national level, the planning for the period 2021-2027 has followed the first circular by the Ministry of Development in June 2019, which also presents the starting point of the consultation with the competent bodies and social and economic partners for the formulation of strategy proposals and priorities. About the current programming period, the eleven thematic objectives of the “Europe 2020” strategy are grouped into five policy objectives. The second one, titled “A greener, carbon-free Europe”, is the most centred on implementing the circular economy. Specific “Investment Priorities” are:

1. promoting energy efficiency measures;
2. promotion of renewable energy sources;
3. development of smart energy systems, networks and storage equipment at the local level;
4. promoting climate change adaptation, risk prevention and disaster resilience;
5. promoting sustainable water management;

¹ For further and more detailed description of each AP you can see the project website at the following link: <https://projects2014-2020.interregeurope.eu/since-afc/>.

6. promoting the transition to a circular economy;
7. enhancing biodiversity, green infrastructure in the urban environment and reducing pollution.

The specific contribution that emerged by the SinCE-AFC project is thus implemented within these objectives, especially including stakeholders' confrontation within the work of the Program Planning Teams, which are expressly set up for each Program of Financial Framework Period 2021-2027.

Action(s)

The Anatoliki/CMR action plan has provided a single specific action, named “*Horizontal support mechanism for entrepreneurship in the circular economy*”, assigns to the renewed OP 2021-2027 (which is under configuration).

Especially, it provides a specific objective 3, titled “*Enhancing sustainable growth and competitiveness of SMEs and job creation in SMEs, including by productive investments*”. Within this objective, the fourth (and last) category of interventions is aimed at “Strengthening of the horizontal character of structures of support of innovation and entrepreneurship in the Region”.

In this context, indicative actions are proposed, such as the “Creation/utilization of structures to support innovative business activity in the Region of Central Macedonia”. This incorporates the plans for creating a structure (either independent or through the “One Stop Liaison Office”) to promote circular economy actions.

This is the result of the exchange of experiences between the regions participating in the project in combination with the needs highlighted by the active participation of the local stakeholder group in the working meetings. They took place during the SinCE-AFC project, as well as on other similar occasions, such as the so-called “Business Discovery workshops” organized under the “Research and Innovation Strategies for Smart Specialization Strategy” (RIS3).

To inspire this action specifically contributed some specific good practices, such as the Romanian ECOPartner, the Local Food Waste Hub project of the Municipality of Milan in Italy, the Re-use project in Ireland, and the Foodsi App developed in Poland.

The action concerns the development of an entrepreneurship support mechanism in the circular economy, which will empower the businesses of the region in order for them to adopt circular economy practices and to create

business collaborations and/or cooperative formations of a closed supply chain.

The key services provided by the entrepreneurship support mechanism in the circular economy will include:

- informing and raising awareness of companies and entrepreneurs about the dimensions of circularity and business benefits;
- consulting support and good practices for the utilization of the by-products of their production process;
- digital tools for interconnecting and capturing productive inputs and outputs in individual sectors, such as agrifood.

It will be implemented as a web-service platform with the stakeholders already involved within the Local Stakeholders Group and completed by 2023. The approximate cost will be 10.000 euros.

5.2.2 Metropolitan City of Bologna (Italy)

Policy context

The action plan developed by the Metropolitan City of Bologna (MCBO) addresses a local policy, that is the “Metropolitan Strategic Plan 2.0” (MSP 2.0). It is especially considered for what concerns objective 2: “Urban and environmental regeneration”, and objective 4: “Manufacturing, new industry and training”.

The MSP 2.0 represents the key instrument for the protection and enhancement of the environment and rural local territory and landscape.

It is inspired and coherent with regional and national policies. At a regional level, Emilia-Romagna Region was among the first Italian regions to address policies for the circular economy. The regional law n. 16/2015 put ambitious objectives for waste treatment and reduction for 2020 (currently, they have been partially reached, and the law has been revisited with a longer time horizon and wider objectives).

Moreover, “Providing healthy and safe food (agrifood)” is one of the five Emilia-Romagna “Smart Specialization Strategy” priority sectors, and in particular, producing healthy and safe food products with minimized environmental impact and with enhanced ecosystem services, zero waste and adequate societal value.

On the other hand, at the national level, guidelines for the “National Strategy for the Circular Economy” were adopted by the Italian government at the end of June 2022 (receiving a boost thanks to the National Recovery

and Resilience Plan, which represents the Italian pathway for the European funds derived from Next Generation EU). The goal of the National Strategy is to give a unique and coherent path to the different national measures for a circular economy, making them more effective.

The MSP is actually at its second version (2.0), covering the period 2018-2020 and should be soon revised. It currently focuses on seven fundamental principles. However, the most fitted with regard to the SinCE-AFC project are the second one: “Urban and Environmental Regeneration”, especially subsection 2.5: “Protection and enhancement of the environment, of the rural territory and of the landscape”, and the fourth: “Manufactured, New Industries and Training”, especially at the subsection 4.1: “Manufacture and Innovation”, which is particularly addressed to SMEs support, even including a specific focus on the hilly and mountain areas where SMEs are more devoted to the agrifood sector and quality and sustainable productions.

Action(s)

With its action plan, the MCBO intends to support new entrepreneurship and innovation processes in the field of CE, focusing on two priority target sectors of the Metropolitan territory, identified as important potentials for the development of new entrepreneurship within the principles of the circular economy: the “Apennini biodistrict” and the “local food markets”.

The main involved stakeholders are local municipalities of the Apennines and their associations (e.g. LAG Bolognese Apennines, tourism organizations), selected farmers market associations (e.g. Mercato Ritrovato), farmers (e.g. producers of the biodistrict), as well as other technicians (e.g. Ambiente Italia, Eco&Eco consulting) in order of providing their expert advice and knowledge in the domain of circular economy and agrifood.

Including the two priorities of local bioproduction and local market, the MCBO ideally “close the loop” between sustainable production and local responsible consumption, improving the sustainability of its local agrifood system.

The MCBO action plan provides one integrated and synergic action aimed at developing “Guidelines setting for the circular management of Local Markets”, which primarily responds to three main needs: 1) supporting agricultural and agrifood companies towards a circular economy transition; 2) facilitating and encouraging the development and dissemination of circular economy practices; 3) enhancing knowledge and awareness about the circular economy.

The action aims at enhancing the MSP implementation of both the already cited subsections 2.5 and 4.1, by improving the governance of local public entities on circular economy practices.

Especially, through the creation of guidelines, the MCBO intends to improve the public commitment of the Municipalities and Union of Municipalities of the Metropolitan territory in the management of local markets, in accordance with circular economy principles.

MCBO will operate on two levels and targets, complementary to each other. The first one addresses the target of local markets, and it focuses on the introduction of circular economy practices within the sales processes. The second level has a transversal target, aiming both at the Biodistrict and the local market, with the promotion of awareness and knowledge on circular economy issues at the general level, even impacting the final beneficiaries' habits, as well as producers.

Indeed, in the vision of the action plan, local markets have a demonstrative role in circular economy promotion, producing zero environmental impact, not using plastic packaging, and promoting a short-supply chain. The idea is to act on the system of production and consumption of food through a holistic approach, regenerative, which goes in the direction of circularity. A value, distributive, proximity economy.

The two actions will be completed by 2023, and their cost will be completely covered by the MCBO resources.

5.2.3 Hajdú-Bihar County Government (Hungary)

Policy context

The policy addresses by the Hajdú-Bihar County Government (HBCG) concerns its Regional Development Programme (RDP) for 2014-2020. This policy served (and serves) as the underlying regional strategic document for the definition of the national Territorial and Settlement Development Operational Programme (TSDOP) that provides the necessary funding for implementing strategic directions and measures defined in the RDP. This latter was valid for the period 2014-2020, therefore, in order to ensure the smooth continuation of the development directions started in this period, the RDP has been modified and amended for the period 2021-2027 (this process was completed in 2021).

The program integrated the strategic goals of the county at both sectoral and territorial levels, and its objectives included eight priorities; however, within the SinCE-AFC project, HBCG planned to address especially

“Priority 1 - Sustainable environment”, focusing on “Measure 1.3 - Complex waste management”.

As one of the main results of the SinCE-AFC cooperation, the circular economy has been identified and integrated into the RDP of Hajdú-Bihar County 2021-2027 as a key theme for regional development. Indeed, within “Priority 1 – Sustainable environment”, a separate measure (measure 1.8) is explicitly dedicated to the circular economy, and it is titled “Strengthening the transition towards circular economy, reducing material use”. Moreover, within “Priority 3 – Complex development of the county’s economy”, there is a special focus on agriculture, especially “measure 3.8”, which is defined as “Competitive, innovative and sustainable agriculture”. In this document has been clearly defined that “in terms of sustainability, the use of raw materials, the optimisation of production processes and the recovery of agricultural by-products are important elements, and actions to support these activities should be a priority for development”.

Action(s)

HBCG intends to carry out the implementation of its action plan through a detailed action titled “*Formulation of a policy guide establishing a new county database of agrifood by-products and integrating e-guideline*”.

It is dedicated to creating and establishing a totally new policy guide that will be directly integrated into the policy instrument.

The policy guide provides completely new indicators and significantly enhances the currently existing ones. This is going to support better decisions in short as well as in the long term. The guide includes two main sections, and it is planned to be officially approved by the General assembly of HBC until 30 April 2023 as an integrated part of the policy instrument.

Section 1 – County database of agrifood by-products

In order to bridge the information gap about the material use and by-product volume generated by business actors, the HBCG has decided to establish a database on what type of material input is available at the county level with special regard to agrifood SMEs and entrepreneurs. This pool of information will serve the future enhancement of the value chain as well.

In this case, inspiration came from SinCE-AFC good practices, especially those who use ICT devices and services to support local businesses in creating circular value chains, strengthening information and motivation to easily exchange waste as byproducts. Thanks to this database, companies can offer their wastes as by-products for other companies, thus implementing synergies and industrial symbiosis.

The main benefits include the following:

- easier circulation of waste, with a less administrative burden;
- lower management costs and cheaper “raw” materials;
- implication of authorised transporters and waste managers (both treatment and transport are usually needed);
- exchange of information between companies at a regional level.

Section 2 – e-guideline strengthened by focus group

Considering the outcomes of several stakeholder discussions, and informal meetings with the representatives of companies, chambers and university faculties, the HBCG agreed that there is a strong need to provide the agrifood sector with some clear, well-based and simple guidance on the necessity and methods of circular solutions that are easy to understand.

Inspired by similar initiatives shown by the partners (such as the “Italian circular economy stakeholder platform”), the guidelines aim to promote a circular economy in Hungary, implementing a permanent operational instrument to facilitate inter-sectoral dialogue and synergies between the actors of the food supply chain.

Especially, this work will be strongly supported by focus groups involving all relevant actors, such as representatives of SMEs, chambers, practitioners, entrepreneurs, farmers and producers, waste management experts, university professionals and policy-makers. It will act as a regular platform to identify needs and provide support for agrifood businesses.

The guidelines will be published in Hungarian with free accessibility online and drawn up also thanks to the suggestions and indications learnt during the SinCE-AFC project, as well as using the great pool of solutions within the frames of the Policy Learning Platform.

Specifically, the different steps and activities to complete the action are structured as follows:

- formulating the structure and content of the policy guide;
- organisation of a brainstorming workshop involving all parties concerned via the “circular economy agrifood focus team” to complete the draft version of the policy guide;
- collection of data and information to create the county database of agrifood by-products;
- development of the content of the e-guideline;
- compilation of the policy guide integrating both sections;
- approval of the policy guide by the General assembly.

All the above-mentioned activities are expected to be concluded by 2023, and their costs will be covered by regional public funding through their own institutional funding and/or potential new region-related and theme-related calls of the National Operational Programme (thus using governmental sources).

5.2.4 Donegal County Council (Ireland)

Policy context

The action plan developed by the Local Enterprise Office of the Donegal County Council (DCC) is fitted on the Border Midland and Western Regional Operational Programm (BMWROP). It is especially related to the thematic objective 3: “Enhancing the competitiveness of small and medium-sized enterprises in the agricultural, fisheries and aquaculture sectors”. Which consists of two key policy instruments: 3a – “Promoting entrepreneurship, the exploitation of new ideas and fostering the creation of new firms, including those through business incubators”, and 3d – “Supporting the capacity of SMEs to grow in regional, national and international markets and to engage in innovation processes”.

The key objectives of this policy instrument were to enhance the competitiveness of small and medium enterprises through in-company innovation and investment, to accelerate the start-up and expansion of new start-up firms, and to create new employment opportunities.

For these reasons, the action plan developed by the DCC has a strong focus on enabling small and micro businesses to gain a competitive advantage through the adoption of circular economy principles, and it is also focused on the promotion of new start-ups based on identified opportunities related to the circular economy.

In general, these objectives are included in and in line with some of the main pro-environment policies at the National and supranational levels. These imply, for instance, “The Irish Government’s Waste Action Plan for a CE” (2020), which aims to cut off 50% of food waste by 2030 and the “DAFM Food Waste 2025 Strategy”; “The Irish Government’s Climate Action Plan” (2019), which provides several measures related to agriculture and bio-masses management; the “Teagasc’ CROP 2030 Strategy”, that further emphasised the creation of circular agriculture; the “The Irish Government’s Circular Economy Bill 2021”, which made provision to establish a circular economy fund; “The National Statement on Bioeconomy” (2018), that provided a number of actions to foster the

development of circular economy opportunities; etc. These national policies are aligned with the recent European policy, such as “The EU Farm to Fork Strategy” (2020), which aims to cover the entire supply chain reducing its environmental and health impact.

Action(s)

Recognizing a lack of awareness about the circular economy among the surveyed stakeholders (see chapter 3), the DCC highlighted the need for greater innovation and involvement of stakeholders, as well as the need to promote opportunities and create new business start-ups and jobs. Going toward this direction, DCC envisages a primary action titled “Develop strong local circular economy framework to foster ideation and opportunity identification”. This action is composed of three sub-actions or activities:

- 1) “Implementation of a circular economy coordination group for Donegal”: some evidence has shown how a strong coordination is a key element in the success of projects. Therefore, the first activity should establish a circular economy coordination group which will support the embedding of circular economy within the county’s decision-making and drive the development of circular economy at the local level.
- 2) “Development and communication of a Donegal circular registry and portal for businesses”: set up an industrial symbiosis registry for the agrifood sector (which may later be expanded to other sectors). The registry should include the various agrifood businesses operating in Donegal and highlight the types of resources used and wasted, as well as by-product streams generated by each business, including - where possible - the estimated volumes generated.
- 3) “Facilitate the collaboration between business, entrepreneurship, and research to enable pilot testing and development of circular opportunities”: set-up and pilot an “innovation voucher scheme” for circular economy, which should have the function to contribute to developing research and testing opportunities thanks to the collaboration with the Atlantic Technological University or other local technology hubs. The voucher fund would be similar to the existing national innovation voucher scheme. It would offer entrepreneurs grants for research, development, and testing new opportunities - offering access to expertise, knowledge and technological facilities.

All the activities are envisaged to be ended by 2023 and costs will be mainly covered from existing revenue stream or, as the case of the circular

economy innovation vouchers, they would be funded by the “Central government circular economy fund” or directly from the existing national “innovation voucher scheme”.

5.2.5 Wielkopolska Region (Poland)

Policy context

The action plan of the Wielkopolska Region (WR) is specifically addressed to the “European Funds for Wielkopolska 2021-2027” (FEW 2021+).

The initial policy instrument was changed due to the end of the previous financial period and the start of a new one (the FEW 2021+). Indeed, as already argued about similar circumstances, there is no way to improve the management of the already closed programme, but there is room for improvements to the new one.

Currently, the main development challenges of Wielkopolska, taking into account the spatial differences, have been documented in the “Development Strategy of the Wielkopolska Region until 2030”. Within this strategy, one of the main detailed targets is 2.1.2.5, specific objective (vi), which concerns supporting the transformation towards a circular and resource-efficient economy. The intervention will allow for systemic and strategic actions towards a circular economy, assuming that all elements of the production chain, such as products, materials and raw materials, remain in circulation as long as possible, thus reducing the environmental footprint.

Action(s)

WR has provided two specific and well-distinct actions or activities. The first concerns a series of recommendations for the FEW 2021+ calls; the second has an operative dimension focused on implementing a circular economy marketplace.

Action 1 - Recommendations for the FEW 2021+ calls

In order to prepare adequate calls within the new FEW 2021+, WR considers as useful to properly recognise the scale of needs and demands on the regional market. This will allow to precisely determine the eligible costs and activities for the grant from EU funds.

Therefore, its recommendations will be based on the analyses concerning, among others:

- the level of awareness of SMEs about circular economy and the assessment of their own company in this regard;
- needs related to the withdrawal of plastic straws and utensils;
- the need for cooperation within local markets with food products;
- statistics on the number of restaurants, caterers, etc., before the covid-19 pandemic and during/after the pandemic;
- the need for innovation in agrifood processing in relation to circular economy;
- opportunities for cooperation between members of the “Wielkopolska culinary heritage network” and other food producers in Wielkopolska in order to limit food waste;
- analysis of the potential of the social economy for the management of green-derived biomass from the care of urban and road greenery, in plant production.

Action 2 - Targ Goz (CE Marketplace)

Action 2 is based on the good practice of “*Mercato Ritrovato*” from Bologna (Italy). This latter is a farmer market that aims to realise a local and short food supply chain for food urban needs, improving consumer awareness, and ensuring fair prices for producers, reducing, at the same time, food waste and other negative environmental externalities.

WR intends to improve an existing marketplace by upgrading it to the *Mercato Ritrovato* formula and adopting rules and procedures in accordance with its procedural guidelines (just partially modified and adapted to the specific context). These are:

- excellent (organoleptic quality, as the result of farmers’ competencies, selection of raw materials and production methods);
- clean (environmentally friendly production and respect for the environment along the entire production chain);
- fair (social justice - appropriate working conditions and remuneration);
- traditional (met regional criteria of traditional food; the only parameter that determines tradition is time; therefore, the products and production processes deriving from historically determined technologies are traditional);
- typical (it is a product that has constant features related to a given model or recipe);
- local (farmers and producers within 40 km).

Moreover, as part of the educational activity and solution for food surpluses on the marketplace, WR is considering establishing a foodsharing point called in Polish “*jadłodzielnia*” (something similar to a common fridge and/or larder).

Both actions will be completed by 2023, and their cost will be covered by the WR’s own resources (Action 1) and/or national funding sources available in different programs/EU funding sources, if available. Their total costs are estimated at less than 20.000 euros.

5.2.6 South Muntenia Regional Development Agency (Romania)

Policy context

The South Muntenia Regional Development Agency (SMRDA) has also changed the policy instrument initially addressed because of the end of the previous programming period (2014-2020). SMRDA has thus decided to improve their action with reference to the new Regional Operative Programme for 2021-2027 (ROP 2021-2027). This is therefore the new policy instrument addressed.

Differently to the previous program, in this case SMRDA has assumed a new role as Managing authority, with the aim to support SMEs to access funding within the South Muntenia ROP 2021-2027, specifically with reference to the Priority 1: “*A competitive region through innovation, digitalisation and dynamic enterprises*”, specific objective *a(iii)*: “*Boosting sustainable growth and the competitiveness of SMEs and creating jobs for SMEs, including through productive investment*” and *a(iv)*: “*Developing skills for smart specialization, industrial transition and entrepreneurship*”.

As far as the circular economy is concerned, this is considered an integral part of sustainable development. Therefore, it is explicitly implemented within the above-mentioned specific objectives.

Especially, in order to support the future beneficiaries in accessing the funds, SMRDA has developed a specific support measure to develop the circular economy at the local and regional level, representing the strategic foundation for regional development within the next programming period (2021-2027 + 2 years).

This measure ensures the implementation of the strategic vision for sustainable and balanced development of the South Muntenia Region, contributing to the development of pillars, actions and priorities from the South Muntenia Regional Development Plan 2021-2027, Smart

Specialization Strategy 2021-2027 and the South Muntenia Region Integrated Territorial Development Strategy 2021-2027.

Therefore, starting from some fixed points, such as the European and national policies and programs, the socio-economic development priorities inside the South Muntenia Region strategic documents already mentioned, and the lessons learned by SinCE-AFC activities during 2014-2020, the strategic measure of South Muntenia ROP 2021-2027 is articulated in six specific strategic objectives.

Especially, the first one, named “Stimulating the smart and sustainable development of the region, based on innovation, digitalization and the development of the entrepreneurial ecosystem”, matches with the EU priorities for the same period and has inspired the actions included within the SMRDA action plan, also taking into account the Priority Axis 2: “Improving the Competitiveness of Small and Medium Sized Enterprises” of the ROP 2014-2020.

Action(s)

The action proposed by SMRDA aims at supporting SMEs to develop their skills in project development and implementation to ensure higher absorption of the funds available within the ROP 2021-2027.

Especially, the action plan aims to further develop the circular economy sector in the South Muntenia Region by creating the “South Muntenia Circular Economy Stakeholder Platform”. The platform - inspired by two Italian good practices, such as “Italian Circular Economy Stakeholder Platform” and the start-up incubator “Agrofood BIC” - is developed within the framework of the DigiPrime (Digital Platform for Circular Economy in Cross-sectorial Sustainable Value Networks) project, funded within EU Research and Innovation Programme Horizon 2020.

This project aims to develop a digital platform that will allow European regions to identify cross-regional and cross-sectoral value chains, monitor material flows, and identify barriers and existing legislation for the regional implementation of a circular economy model.

As widely explained in the action plan, the platform provides: i) a complete mapping of the value chains within the Region and the current or potential tools to close the loops; ii) identify synergies between sectors and regions, and iii) provide support to decision-makers and institutions in the scope of the circular economy.

The result should be a dashboard with a complete overview of the regional situation and the existing and potential circular value chains. Moreover, the companies can be supported through “Circular innovation

Hubs”, e.g., support to specific companies for specific projects by connecting them to different hubs of service providers.

The specific activities envisaged are:

- 1) South Muntenia Region Stakeholders structure analysis (in order to define the structure of the South Muntenia Region Key Stakeholders Community);
- 2) South Muntenia Region Key Stakeholders Community in Circular Economy Area (adoption of an agreement that provides a common vision for 2021-2027 amongst the stakeholders’ community and implementation of an inventory of success stories);
- 3) registering the South Muntenia profile in the DigiPrime project and testing the platform as a pilot user (Creating the regional profile of the SM region in terms of circular economy data, and supporting quadruple helix actors in the region to register in the DigiPrime project);
- 4) launching a Media Package with information about the Since-AFC project (it is essential to promote the results of the project and to ensure access to information to the general public).

Actions are expected to be concluded by 2023, and their costs will be covered by the project and the SMRDA’s own budget.

The Digi Prime project will not provide any type of funding (staff costs or other funding) for these activities that will be performed by SMRDA experts, except for technical support and training free of charge.

5.2.7 Municipality of Devnya (Bulgary)

Policy context

The action plan of the Municipality of Devnya (MD) in Bulgaria is titled “Action Plan with measures to stimulate the implementation of the Circular Economy in the Agro-industrial and Food Technology Sector”.

This plan is framed within the national Operational Programme “Innovation and Competitiveness” (OPIC), which is the main instrument of the operational programmes in Bulgaria. It provides companies in the country with the opportunity to implement and develop different types of innovations, aiming to improve the competitiveness of SMEs from all sectors - except primary production of agricultural products and marketing of such - at the local, regional and national levels.

On the other hand, the Rural Development Programme is another programme that would benefit SMEs in implementing different models and practices, as it focuses entirely on the agricultural sector and could provide a set of means to finance the implementation of the desired models and practices.

The plan dwells on the main economic characteristics and environmental management of the territory, highlighting strengths and weaknesses, concluding on how the MD and the project expert team prepared a package of measures that aim to increase the knowledge about the circular economy of the SME representatives, to showcase methods for the implementation of different models and processes, to encourage the introduction of innovations in the field by SMEs and to achieve a circular economy in the sector covering the different stages of cultivation, processing and utilization.

Action(s)

MD identifies two main activities that complete the action plan.

Activity 1 - “Development and adoption of a strategy for promotion and development of the circular economy on the territory of Devnya municipality”

In the action plan, the MD states that circular economy is placed as a long-term priority of its development policy. The circular economy transition strategy is the first and important step in this direction, and Bulgaria is aware of the challenges ahead, as well as the duration of such a transformation of societal attitudes, economic processes and institutional priorities. The transition to a circular economy will provide the country with economic growth and a better environment. Therefore, the necessary institutional, financial and human resources will be mobilised for this purpose.

Currently, there is no policy in place at the municipal level to stimulate, develop and support SMEs to implement a circular economy. Therefore, through the development and implementation of a municipal strategy, it will be possible to help achieve the transformation of the economy, increase resource efficiency and increase the added value of industrial production. Consumption of some products will be replaced by services, and others will become fit for longer use.

The “Municipal Development Strategy” of MD - explicitly inspired by the food policy presented by the Milan City Council during the first interregional project meeting of SinCE-AFC - is a program that aims to outline the main priorities and directions for development in the medium

term - covering the period 2021-2027 in different perspectives - administrative, private and public. It is the basis that shows the expectations of business, population and administration, as well as the methods of influencing/achieving them. It is developed by the municipality and adopted by the City Council after a public discussion for a specified period of time.

So, on the one hand, the objectives of the municipality should be defined and directed towards the introduction of a circular economy at the local level. On the other hand, companies operating in the territory of Devnya should be able to use these tools to reorganise their production activities and/or processes, having access to calls and grants that support them.

In particular, the identified steps for the implementation of this local strategy are:

- establish a working group and initiate meetings with stakeholders to discuss possible measures, problems and potential solutions;
- study the legislative framework for the introduction of such activity;
- identify funding sources for the implementation of the activity;
- detailing the modalities for setting up measures;
- conduct a survey of potential applicants to discuss similar measures and opportunities, potential problems and obstacles, complementing the proposed solutions.

Activity 2 – Creating a digital portal to share waste and raw materials, and to improve connectivity between companies and the science sector to implement circular economy processes

As explained in the action plan, the transition from a linear to a circular economy model is in an early phase of development in Bulgaria. The recycling rate is two times below the European average, and the trade in recycled materials resulting from reuse and remanufacturing is more than seven times smaller in volume.

As emphasized in the action plan, one of the problems that producers and processors face is the lack of sufficient experience and knowledge, as well as time to become familiar with the vast amount of information on development opportunities, new technologies, cooperation and partnership, projects, and international networking opportunities.

Conversely, many ready-made solutions to problems sit developed in scientific organisations or in companies with development activities.

In this regard, it is also necessary to promote the exchange of experiences with international organizations and the creation of partnerships from

different countries to facilitate and accelerate the transition, as well as reduce the negative consequences of the transformation of the economy.

In order to overcome these gaps, offering concrete opportunities for enterprises, the main objective of this activity is to bring together in one place and in an easily accessible version, information in two main areas:

- 1) waste products, leftover or unusable raw materials/materials, old appliances, machinery, etc. related to production, searching for potential user for them;
- 2) waste/raw materials that are not interested in being re-consumed in order to search for new technological solutions, models, developments, ideas, and innovations to introduce circular economy in the sectors by linking them with different scientific experts and organisations that could propose concrete solutions, partnerships, technologies, etc. that could lead to new solutions for their recovery.

Through the creation of an online portal, MD aims to encourage SMEs to adapt their processes, create plans and design company solutions in this area.

Moreover, linking with scientific organisations will also improve the cohesion between the scientific and practical sectors to more quickly transfer solutions from science to practice, keeping the scientific staff in close touch with the practical and real problems of the sectors.

In the intention of MD, this should create the conditions to close the circle for a faster transfer of knowledge and skills and the implementation of processes to achieve a circular economy.

The proposal and next steps for the implementation of the activity are briefly the following:

- establish a working group and initiate meetings with stakeholders to discuss a possible framework and scheme for establishing intermediate units;
- study the legislative framework for the introduction of such activity;
- identify funding sources for the implementation of the activity;
- detailing the modalities for organising and implementing such a workshop;
- involving interested organisations from different countries;
- conducting a test/pilot measure of the activity with potential applicants.

Concluding, actions 1 and 2 are very strictly related because the implementation of the portal will allow DM to adapt the municipal strategy for the implementation of circular economy measures and its subsequent

development. At the same time, a detailed strategy and concrete opportunities will support the shift towards a circular economy.

The two actions will be completed by 2023, and their cost corresponds approximately to 13000 euros - 3500 euros (6800 BGN) for action 1 and 9500 euros (18 500 BGN) for action 2 – which will be completely covered by the MD.

Conclusions

The SinCE-AFC e-book is focused on defining a conceptual framework of circular economy in the agrifood sector. The need to implement circular economy in this sector is generally related to different perspectives at different levels.

The same concept of circular economy is not clearly defined. It is instead more similar to a “cluster concept”, consisting of several differentiated ideas, usually applied to different aspects (by-product uses, industrial relations, services, technological or social innovations, etc.) and/or referred to different moments of the supply chain (production, distribution services, transformation, consumption, etc.).

However, despite this fragmentation, it is pretty clear what the main aim is: gradually decoupling economic activity from the consumption of finite resources, limiting the throughput flow to a level that nature tolerates.

At the macro level, we need to theoretically delineate and concretely improve a “new ecological macroeconomy” that keeps in count both aspects, monetary and material flows, trying to reconnect human activities with the limits of earth’s resources.

Bringing this main objective back to the agrifood sector, we immediately face a new challenge, probably one of the more significant challenges of our age: to feed an increasing world human population forecasted to grow to over 9 billion people by 2050; and we have to do it by limiting, at the same time, negative externalities of food production. To face these challenges, we must act at different levels and in a coordinated way, along the entire food supply chain, from farm to table.

The current EU pro-environmental policies have accepted this challenge, launching the so-called Green New Deal and, more recently, to face the pandemic crisis, also the Next Generation EU packet, which should turn a further great threat into an opportunity, accelerating the sustainable transition.

At the heart of the EU circular economy-related policy, we can find the EU Circular Economy Action Plan. This plan is not entirely dedicated to the food system but provides several initiatives explicitly dedicated to food, primarily focused on reducing food waste and food losses. As the e-book highlight, these strategies transversely match with other policies, directly and indirectly, related to food, such as the Common Agricultural Policy, the Farm to Fork strategy, the bioeconomy plan, and the industrial strategy.

The intersection and synergies among these strategies may ensure a great jump towards circular economy implementation in the agrifood sector.

Probably the core part of the e-book is represented by the section dedicated to “drivers and barriers” to a circular economy implementation (regulatory, market, technological, and cultural ones). Evidence from a Eurobarometer survey on circular economy-related activities implemented by European SMEs and their main difficulties are also reported, specifically for each partner’s country involved in SinCE-AFC.

According to these data, among the partners’ countries persist some significant differences in the implementation of a circular economy, thus confirming the importance of projects such as SinCE-AFC, which are based on stimulating confrontation and aim to elaborate a plan for the improvement of policies and actions.

Most of the stakeholders directly involved in the SinCE-AFC projects highlighted different critical issues, mainly dealing with cultural (information, awareness, etc.) and institutional factors (difficulties in networking, lack of specific policy/legislation, bureaucracy, etc.). Complementarily, they declared how increasing awareness and information, as well as bureaucracy reduction, financial and technical support, sharing of experiences and expertise, etc., could be some of the main drivers for a circular economy implementation.

To increase awareness, several good practices are finally collected. The most recurring are mainly related to agriculture production and/or industrial processing of agriculture by-products. However, also some residual practices that could be collected within “transversal” categories, such as “Innovation/Consulting service & Funds” and “Information, Education and Awareness”, were very appreciated and often cited as examples in the implementation of the action plans.

Policies improved in the action plans were mainly addressed to national or regional operational programs that cover the next period, 2021-2027.

Within these policy instruments, the axis related to improving the circular economy in the agrifood sector were thus identified. These were usually related to wide aspects such as entrepreneurship development, agrifood

sector sustainability and innovation, as well as more specific ones dedicated, for instance, to food waste reduction.

Activities envisaged are often oriented to fill the information gap among SMEs, facilitating the exchange of expertise and good practices, as well as signalling available by-products to use as resources for other firms.

To this purpose, is also often planned to create a structure dedicated to the circular economy (a circular economy coordination group, a working group, or similar). This structure provides information and consultancy, also using digital tools.

The opportunities offered by digital technologies are seen as essential opportunities for the exchange of knowledge and experiences. However, innovation development also needs close cooperation between institutions dedicated to knowledge and research (Universities, laboratories, etc.) and companies. Developing specific “voucher innovation schemes” could facilitate synergies between these important subjects of the so-called “quadruple helix”.

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Authors

Roberta Paltrinieri, Full Professor in “Sociology of Cultural and Communicative Processes” at the Department of Arts of the University of Bologna. She is the Scientific Director of the DAMSLab and a member of the Scientific Committee of CRICC (*Research Center for Interaction with the Cultural and Creative Industries*) of the University of Bologna. She teaches “Sociology of Culture” and directs the Advanced Training Course “Cultural Innovators”.

Her research topics are mostly related to social and cultural innovation, cultural welfare, participation, and the study of audiences. She is the author of books such as “Felicità responsabile” (*Responsible Happiness*, FrancoAngeli, 2012; transl. Sp. *Felicidad responsable*, Waldhuter, 2019) and “Cultural welfare. The dimension of culture in community welfare processes” (with G. Manzoli, FrancoAngeli, 2021).

Stefano Spillare, Associate Professor at the Department of Sociology and Business Law of the University of Bologna. He is a member of the Ces.Co.Com. (*Center for Advanced Studies on Consumption and Communication*) and member of the Scientific Council of the section “Cultural Processes and Institutions” of the AIS (*Italian Association of Sociology*). His main research topics are communication, social responsibility, food research, and consumption. He has published various contributions in scientific journals and books during his career. On this topic, he edited the book “Metropolitan Agriculture and Nature-Based Solution” (FrancoAngeli, 2018).

Francesco Savoia, Research Fellow at the University of Bologna (Department of Management). He is an applied economist with a background in Economics (PhD-MSc) and Politics (Degree). His research and professional experience focused mainly on theoretical and empirical issues of European economic integration, regional development, the economics of

inequality, and policy evaluation. Before joining the University of Bologna, he was a research fellow at the University of Modena and Reggio Emilia and the University of Naples Federico II. He was a visiting research fellow at the Joint Research Centre of the European Commission and worked as a policy analyst at the Italian Ministry of Economic Development.

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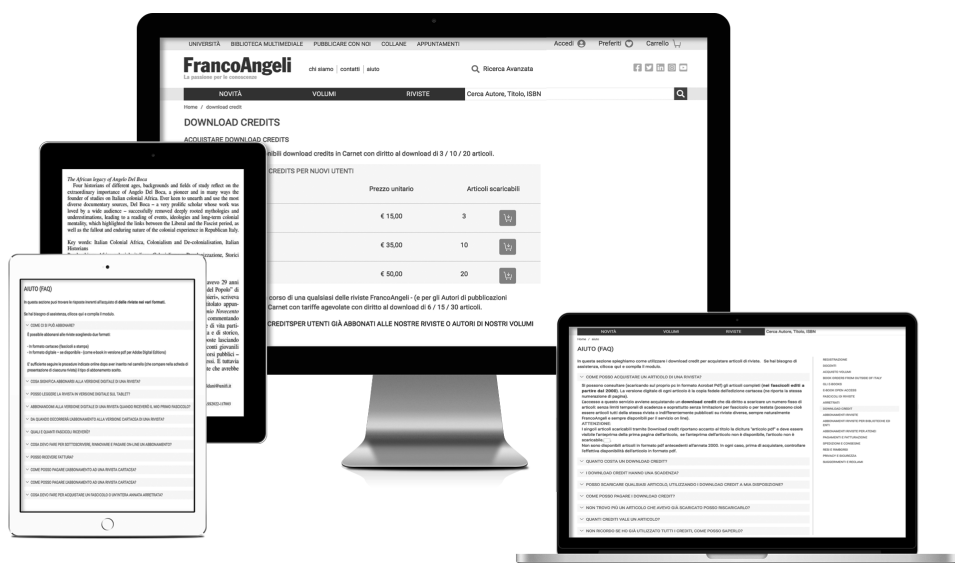


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La passione per le conoscenze

The circular economy is recognised as a new economic paradigm as opposed to the traditional linear *open-ended* economy model based on endless exploitation of resources and prioritising profit over sustainability. Aligning global production and consumption systems with sustainability is one of the major challenges of our time. Investments in renewable and clean energies, clean transport, sustainable food, and a smart circular economy remain great opportunities for future economic growth prospects.

This book results from the project *Interreg Europe SinCE-AFC*, which aims to provide horizontal mechanisms to enhance the capacity of Small and Medium-sized Enterprises to implement new production models and contribute to sustainable growth in the agrifood sector in the European Union.

The main goal is to elaborate on theoretical and practical aspects of the circular economy in this sector, introducing the concept and its limitations, outlining the regulatory framework and the recent policy developments, and illustrating factors encouraging (or hindering) the transition. The book presents the main outcomes of the *SinCE-AFC* project, elaborating on the results of two surveys aimed at assessing the level of awareness, knowledge, engagement and needs of the project partners and local stakeholders. It also provides a systematisation of the collected good practices covering the entire supply chain, from the recovery of agricultural by-products to the digital app for food waste prevention. A summary of project partners' action plans concludes, highlighting policies and actions implemented to improve the replicability of practices and shift the agrifood sector towards a more resilient and sustainable path.

Roberta Paltrinieri, Full Professor in Sociology of Cultural and Communicative Processes at the Department of Arts of the University of Bologna.

Stefano Spillare, Associate Professor in Sociology of Cultural and Communicative Processes at the Department of Sociology and Business Law of the University of Bologna.

Francesco Savoia, Research Fellow at the Department of Management of the University of Bologna.

