

BIO CIRCULAR CITIES

Exploring the circular bioeconomy potential in cities

Policy framework and Good Practices on circular bioeconomy and biowaste management Deliverable D3.1 of WP3





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EXECUTIVE SUMMARY



The circular bioeconomy is a main issue in Europe and several programs and regulations promote its implementation across all sectors. The waste management hierarchy leads to the reintroduction of waste, included biowaste, in the production cycles, through a circular approach.

To study how policies and good practices can interact regarding the Biocircularcities (BCC) project, an extensive revision of the policy framework and a representative collection of good practices have been considered. The scope included the three pilot areas (the Metropolitan Area of Barcelona (MAB), the Metropolitan City of Naples (MCN), and the Province of Pazardzhik (PP)) at local, regional, national and European level. More than 120 documents about circular bioeconomy policies and more than 30 good practices (GPs) were collected. These elements were introduced as a database register in MSExcel files to be analysed according to classification parameters as type of waste, topics or year of publication for policy documents and type of waste and type of action for the good practices.

The policy framework documents were analysed by period, area and topics. The first decade of the century produced a high quantity of documents, mainly due to Directive 98/2008 on waste that proposes goals to achieve which are conveyed

through both regulations and plans. The main subjects were waste management and environment protection while some other more specific were represented by a lower number of documents. Apart from the EU level, at local level the area of Barcelona (MAB, Catalonia, Spain) is the one producing more documents, while Bulgaria accounts for the lowest. Regarding good practices, as the aim was not to be as extensive as for the policy framework overview, the collection of GPs was more specific concentrating on actions that could have significant interest for the pilots, including examples from available database as good practices from the European Union, as well as other countries. Separate collection of biowaste is still a main concern in biowaste management because it affects the possibilities of recycling. Even though separate collection of biowaste and



other waste is implemented in most of the EU, the quality of biowaste still needs to be improved to take more advantage from its treatment and increase the quality of the outputs. Because of this, most of the GPs collected are addressed to improve the quality of biowaste through different tools such as technological innovation which include identification systems and the Know-As-You-Throw (KAYT) approach.

Both databases have been produced with the aim to be updated along the life of the project, particularly regarding the collection of regulations and plans because new documents can appear.



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List of acronyms

ACRONYM	Description
BAT	Best Available Technique
BCC	Biocircularcities project
BWM	Biowaste management
CBE	Circular BioEconomy
DBPF	DataBase on Policy Framework
DBGP	DataBase on Good Practices
EC	European Community
GA	Grant Agreement
GP	Good practice
КАҮТ	Know As You Throw
МАВ	Metropolitan Area of Barcelona
MCN	Metropolitan City of Naples
MSW	Municipal Solid Waste
PAYT	Pay As You Throw
PP	Pazardzhik Province
SC	Separate Collection
SDG	Sustainable Development Goals of the United Nations
TL	Task leader
WP	Work Package
WPL	Work Package Leader



PREFACE

This report (D3.1) is the first deliverable foreseen in work package 3 "Circular bioeconomy regulatory framework analysis and set of policy recommendations for the selected urban areas" of the BIOCIRCULARCITIES (BCC) project. The scope of this deliverable is to give an overview of the current policy framework and good practices concerning circular bioeconomy (CBE) and biowaste management at European level and in the pilot territories (Task 3.1). The results of the policy framework analysis and the collection of best practices across the EU will support the development of the D3.2 where both insufficiencies limiting the use of bio-based waste and regulatory opportunities fostering the use of bio-based products and processes will be investigated and validated from the different actors engaged in the project. Moreover, the collection of good practices will be useful to assess the room for improvement in the priority sectors identified in the selected urban contexts. The results will be considered for the development of D3.3 where a set of policy recommendations for implementing a circular bioeconomy in the pilot areas will be formulated.

AIM OF THE DELIVERABLE

The main objective of this report is to collect the policy framework on circular bioeconomy and biowaste management both in the EU and in the three pilot areas, and to identify Good Practices (GPs) related to biowaste which are useful for the project.

The specific objectives of the present deliverable are:

- To collect regulations relevant to the project at the different levels of administration (European, national, regional, local).
- To identify main subjects (waste, circular economy, separate collection, landfill....) and topics (biowaste, separate collection, food waste, end of waste...) related to biocircular economy issues to classify the regulations.
- To identify plans and strategies related to a biocircular economy.
- To identify biocircular economy GPs across Europe and the countries of the 3 pilot areas.

The collection and analysis of the regulations and GPs should be focused on the final aim of the WP3 and more in general of the project, which is supporting the development of innovative and comprehensive regulatory frameworks and roadmaps aligned with circular bioeconomy principles, centred on 'bio-based waste' and based on feedback from multi-actor participatory processes.

The overview obtained in this deliverable will be then useful in a second phase of the project to identify barriers and opportunities respectively limiting and promoting the circular use of bio-based products and processes. Based on gaps and opportunities analysis it will be possible to develop proposals for new regulations/measures in the selected urban contexts that could help to valorise biowaste following the existing international, national and local best practises in line with circular bioeconomy principles.



Structure of the deliverable

This deliverable provides an overview of the policy framework and the good practices related to circular bioeconomy and biowaste management both at European and local level in the selected areas of study. The administrative levels considered are National, Regional and Local. In the Spanish case study, these levels correspond, respectively, to Spain, Catalonia, and Metropolitan Area of Barcelona (MAB), for the Italian case to Italy, Campania region and the Metropolitan City of Naples (MCN) and for the Bulgarian case to Bulgaria, South central region and the Pazardzhik Province (PP).

The first part of the deliverable analyses the background related to the project, introducing i) the concept of a circular bioeconomy and the related organisations in Europe and the areas of influence of the project, (ii) synergic projects across Europe that can provide useful information for the BCC project, and iii) a section of definitions about the concepts collected from the analysed regulations that are relevant to the project.

The methodology followed to gather the relevant documents that are part of the policy framework on circular bioeconomy and biowaste management and the selected good practices is described in detail. Data are collected through databases in Excel format to simplify their classification and consultation.

The collection of policy documents (regulations, plans, programs procedures and guidelines) are ranged by level (Europe, national, regional, and local) for the areas of the selected pilots. After there is the analysis of the results both per area and jointly. The collection of good practices has been ranged per pilot area and listed also considering the type of action of the GP regarding a circular bioeconomy.

A discussion is developed about the most significant topics which emerged from the overview of the current CBE policy framework and the inputs coming from the participatory processes on challenges and potential solutions in the local biowaste management systems. This information will be then used to identify later in the project which good practices can inspire the development of new policies to accelerate the transition towards CBE in the pilots.

Conclusions are ranged regarding the policy framework and the good practices as they are the main issues of the deliverable.



1. Introduction

1.1. Background

1.1.1. European context in circular bioeconomy

The circular economy has gained interest over the years to achieve sustainability aims. Georgescu-Roegen (1975) suggested the integration of the natural system as a variable in the economic activity, giving the origin to the first postulates in circular bioeconomy.

According to the concept of the hierarchy established in the European regulation, reduction of consumption, waste prevention, sorting, adequate treatment and recycling or disposal of the final materials are the issues to move towards a circular economy. Opposite to a linear economy, based on extraction, production and elimination of waste, a circular economy aims at transforming waste into resources and, according to the Ellen MacArthur Foundation¹, it should be based on three principles, driven by design: 1) eliminate waste and pollution, 2) circulate products and materials (at their highest value) and 3) regenerate nature. In this way, a circular economy aims at decoupling economic activity from the consumption of finite resources producing a resilient system that would be good for business, people and the environment.

In this transformation of waste into resource, the differentiation between biological and technical cycles highlights the importance of the introduction of materials that are more environmentally friendly for production and, in consequence, the importance of biowaste from municipal waste as resource to produce bioproducts. In terms of bioeconomy, biologic materials are prominent in front of other resources, and organic waste becomes products or resources after having a transformation. In this system, raw materials and waste are in the same cycle and commute to create goods preventing waste generation.

Circular bioeconomy and *biocircular economy*² are concepts sometimes indistinctly used but most of the related references address the concept of circular bioeconomy rather than the other one. In any case, both concepts refer to the same overarching content. A bioeconomy adds value to biowaste and by-products, transforming biological resources into higher value products by efficient production of renewable biological resources. While a circular economy aims at increasing the resource efficiency of processes and the use of recycled materials to reduce consumption of fossil and mineral resources, bioeconomy aims at promoting sustainable production of natural resources from biomass rather than fossil and mineral-based resources. Circular Economy and bioeconomy concepts are therefore complementary and can reinforce each other.

¹ Ellen McArthur Foundation: <u>https://ellenmacarthurfoundation.org/circular-economy-diagram</u>

² <u>www.brightlands.com</u>



There are many organisations in the world working on this issue, from governments to private companies and NGOs. Some of the most representative ones are part of the European Circular Economy Stakeholder Platform³.



Section 1.1.2 refers to these organisations in more detail.

Creating circularity in society is a crucial aspect in order to achieve the Sustainability Development Goals (SDGs), adopted by the Member States of the United Nations⁴ (General Assembly resolution A/RES/70/1 of 25 September 2015). There are 17 goals to be achieved by 2030 aiming to end all forms of poverty, fighting inequalities, and tackling climate change among others. BCC project tackles, at least, Goal 9 (Industry, Innovation and Infrastructure), 11 (Sustainable Cities and Communities), 12 (Responsible Consumption and Production) and 13 (Climate Action).

Regarding regulation, the waste framework directive⁵ establishes the hierarchy in waste treatment and sets the targets of the Directive. These targets include a temporary horizon for the rate of recycling and the preparation for re-use of municipal waste. The first deadline sets that for 2020,

preparing for re-use from households shall be increased to at least 50% by weight. Further deadlines indicate that this level should reach a minimum of 55 %, 60% and 65% by weight by 2025, 2030 and 2035, respectively.

According to Figure 1, the recycling rate for the EU-27 increased from 32% in 2014 to 48% in 2019 on average. The range for 2019 goes from 5% in Montenegro to 67% in Germany of the overall recycling rate (ratio between total waste generated - excluding minerals - and the quantities managed through recycling).



For 2019, ten European countries have achieved at least 50% of recycling rate, and some of them as Slovenia, Italy or Lithuania, have more than doubled their rate since 2014. On the other side, nine countries are below 30% of recycling, but all of them showed a huge increase since 2014, and even some others as Albania and Montenegro present values for the first time. Figure 1 shows that the path to achieve the EU goals set for the next years is going to be heterogeneous among the Member States and more effort will be needed in some of them. The countries where the pilots of the project are integrated, which are Bulgaria, Italy, and Spain, achieve ratios of 31%, 51% and 35% respectively. During the observed period Italy and Bulgaria made a huge effort resulting in a high increase, while for Spain the increase is more discrete. Regarding the recycling goals proposed in the waste directive, Italy is quite close to achieving the goal of 55% proposed for 2025.

³ https://circulareconomy.europa.eu/

⁴ https://sdgs.un.org/2030agenda - https://sdgs.un.org/goals

⁵ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives





Figure 1. Municipal waste recycling rates in Europe by country (Source: https://www.eea.europa.eu/ims/waste-recycling-in-europe)

To fulfil these objectives, the directive urges the Member States to develop programmes and plans and, among these, there are those dedicated to the boosting of a circular economy. This has activated the production of several documents at European, national, regional, or local level, aiming at achieving both circular economy and circular bioeconomy. In this sense, for example, the EU approved the European Strategy of Bioeconomy in 2012, updated in 2018.

The waste framework directive also introduces the definition of the end-of-waste criteria, which specifies when certain waste ceases to be waste and becomes a product, or a secondary raw material. According to the definition of end-of-waste, that means that the waste has been transformed into a product, there is market of demand for this product that is lawful, and its use is safe for human and environment. In the context of circularity, end-of-waste is a main issue, as it allows for the reintroduction of the materials in the cycle avoiding being discarded as a waste.

1.1.2. Project Pilots in relation to regulatory framework and good practices

A specific biowaste value-chain has been selected for each pilot: (i) biowaste from the municipal solid waste in the Metropolitan Area of Barcelona (MAB) (Figure 2); (ii) biowaste from the agro-industrial chain in the Metropolitan City of Naples (MCN) (Figure 3), and (iii) biowaste from the agro-forestry chain (both forestry residues and wood processing waste) in the Province of Pazardzhik (PP) (Figure 4). The BCC project analysed the business as usual (BAU) situation and proposed alternatives to improve the management of each waste in the production area. The search of policies and good practices related to the pilots helped to produce relevant information to go towards management of biowaste in the circular bioeconomy context in these pilots.





Figure 2. Value chains in MAB pilot

Figure 3. Value chains in MCN pilot







Figure 4. Value chains in PP pilot

The situation of the pilots was analysed during the first living labs that took place in March and April 2022 with the participation of different important local stakeholders, and during the first peer-review where international experts discussed the whole project and particularly the pilots.

1.1.3. Organisations involved in the European circular economy context

There are several organisations working on the circular economy in institutions, private organisations and NGOs. Table 1 shows some of these organisations in Europe and the pilot territories.

Area	Туре	Name		
EU	Public	The European Bioeconomy Network		
		https://eubionet.eu/		
	Public	European Environmental Agency		
		https://www.eea.europa.eu/		
	Public	European Circular Economy Stakeholder Platform		
		https://circulareconomy.europa.eu/platform/		
	Public	European Knowledge Centre for Bioeconomy		
		https://knowledge4policy.ec.europa.eu/bioeconomy_en		
Spain	Public (civic	Observatorio de Sostenibilidad		
	association)	https://www.observatoriosostenibilidad.com/2019/04/07/economia-circular/		
	Private companies	Observatorio Español de Economía Circular		
		https://www.fenercom.com/wp-content/uploads/2019/10/2018-12-19-0bservatorio-Espanol-de-		
		Economia-Circular-fenercom.pdf		
		https://youtu.be/xBRrOOLFAVs		
Catalonia	Public	Catalunya Circular		
		http://mediambient.gencat.cat/ca/05_ambits_dactuacio/		
Italy	Public	Ministry of Ecological Transition		
		https://www.mite.gov.it		

Table 1. Selection of organisations working for Circular Economy in relation to the topic of the BCC project



		Ispra Ambiente
		https://www.isprambiente.gov.it/it
	NGO	Legambiente
		https://www.legambiente.it
Campania	Public	Campania Region
		http://www.regione.campania.it
Bulgaria	Public	Ministry of Environment and Water
		https://www.moew.government.bg/en/
	NGO	Balkans Sustainable Development Institute
		https://bsdi-institute.eu/

1.1.4. Synergic projects

As mentioned, circular bioeconomy is one of the main interests in the management of biowaste because it searches for the ways to transform it into new materials from a sustainable point of view and to reduce the use of non-renewable sources. From Europe⁶, investment, research, innovation and skills are seen as key areas of focus to ensure growth and further integration of the bioeconomy sectors, particularly investment done in research through entrepreneurship and innovation, and the building of new business, efficiently and competitively on new knowledge.

Because of this, there is an extensive number of projects focusing on circular bioeconomy to solve the issues arising and particularly at local level. The knowledge of similar projects can lead to the creation of synergies and to the contribution of useful information for the current project. Because of this, the following list provides a selection of projects regarding circular bioeconomy and with similar issues to BCC project.

BIOEAST Project: https://bioeast.eu/

Through the BIOEAST Initiative, the Central and Eastern European (CEE) countries set the vision for 2030 to develop knowledge and cooperation based circular bioeconomies, which helps to enhance their inclusive growth and to create new value-added jobs, especially in rural areas, maintaining or even strengthening environmental sustainability. The BIOEAST Initiative's mission is to assist Central and Eastern European (CEE) countries to operationalise their vision for 2030 drawing on their potential and offering opportunities for:

- 1. A sustainable increase in biomass production, to become competitive and leading, high quality, food and feed producers worldwide;
- 2. A circular ("zero waste") processing of the available biomass, to become key players in the development of new bio-based value chains;
- 3. Viable rural areas: to develop an innovative, inclusive, climate-ready growth model. The BIOEAST Initiative has identified five challenges to be addressed.

⁶ <u>https://cordis.europa.eu/article/id/35413-raising-awareness-of-the-bioeconomy-</u>



Biomonitor Project: <u>https://biomonitor.eu/</u>

Over the last twenty years, EU policy makers have prioritized the expansion of bio-based value chains through various EU policy initiatives and research programmes while information and statistics lag behind in various ways. The bioeconomy stakeholders need a sustainable statistical and modelling framework to monitor and measure the bioeconomy and its economic, environmental and social impacts in the EU and its Member States. The BioMonitor project will establish a sustainable and robust framework different stakeholders can use to monitor and measure the bioeconomy and its various impacts in relation to the EU and its Member States.

The project offers a threefold approach:

- Closing the data gaps observed when measuring the bioeconomy by using new and improved datasets
- Enhancing existing modelling tools that guide industries and policymakers in defining long term strategies
- Creating a stakeholder engagement platform and training modules to validate and disseminate the data; developing a novel modelling framework.

BIOREGIO Project: BIOREGIO | Interreg Europe

BIOREGIO boosts a bio-based circular economy through the transfer of expertise about best available technologies and cooperation models. The aims include:

- improving knowledge related to the circular economy of biological streams i.e. the bio-based circular economy
- increasing recycling rates of biological materials e.g. food waste/biowaste, municipal and industrial sludge and agricultural residues
- transferring expertise about:
 - · cooperation models, e.g. ecosystems, networks, administrative cooperation,
 - best available technologies, e.g. bio refinery, biogas production

The project also defines activities regarding the development of policy instruments, best practices of a bio-based circular economy and best available technologies describing regional biological streams. Also, they propose actions to boost participation through regional stakeholder group meetings, interregional events, policy briefs, expert papers and regional dissemination events. The results expected include the improvement of policy instruments, improvement of cooperation and awareness towards and increasing professional capacity among stakeholders.

CESME Project: <u>https://www.interregeurope.eu/cesme/</u>

The CESME project addresses SME inclusion in the circular economy, by interregional meetings identifying good practices aiming to examine how best regional and local authorities and business development agencies can improve relevant policy instruments and design support packages to assist SMEs to enter the circular economy. Through the creation of a return-on-investment analysis - Circular Economy Toolkit quantifying the economic and social benefits of circular value chains as well as a White Book guiding SMEs step by step into the circular



economy, the CESME partnership hopes to introduce new circular initiatives targeted SMEs. These initiatives will be implemented and tested for feedback and adaptation in order to be replicable tools across the EU as well as monitored against their expected impact. Finally, this will lead to the improved effectiveness of the policy instruments addressed by the project partners.

DECISIVE Project: http://www.decisive2020.eu/

The DECISIVE project brings together a multi-disciplinary consortium willing to design and implement innovative bio-waste management schemes, targeting urban bio-waste by developing decentralised bio-waste management schemes to be implemented in urban and peri-urban area through a circular economy approach. The implementation of decentralised anaerobic digestion (micro-AD) and solid-state fermentation will treat municipal bio-waste -in urban and peri-urban contexts- and produce valuable bioproducts for urban farming, thus closing the organic loop.

New technologies, methods and indicators will be developed and integrated in a decision-support tool to allow their implementation in urban contexts. A decision-making tool will be also developed to allow public authorities and waste experts to assess the potential of such processes for their territory. Two demonstration sites will be implemented by assessing the social, ecological, and economic impacts, and the identification of business outlooks.

Foodrus Project: <u>https://www.foodrus.eu/</u>

FOODRUS, is working to tackle food waste and losses by creating resilient food systems across nine European regions. To achieve this, the project will test 23 circular solutions through diverse forms of collaborative innovation, including: technological (blockchain solutions to manage food losses and waste), social (educational materials and citizen science activities to promote sustainable consumption habits), organisational (last mile networks to foster local consumption and donation), and fiscal (new 'Pay As You Throw' schemes).

These innovative solutions will empower and engage all the actors in local food systems, from farmers to endconsumers and everyone in between, to build a multi-actor alliance to tackle the challenge of food loss and waste.

Hoop Project: https://hoopproject.eu/

The HOOP project supports 8 lighthouse cities and regions in developing large-scale urban circular bioeconomy initiatives that will focus on making bio-based products from urban biowaste and wastewater. The HOOP Urban Circular Bioeconomy Hub will create an online platform to foster knowledge exchange and replication in cities and regions across Europe. HOOP will provide Project Development Assistance (PDA) to Albano-Laziale (Italy), Almere (The Netherlands), Bergen (Norway), Kuopio (Finland), Münster (Germany), Murcia (Spain), Greater Porto (Portugal), and Western Macedonia (Greece).



REHAP Project: <u>https://www.rehap.eu.com/</u>

Rehap aims to strengthen the European bio-economy industry by creating novel materials from agricultural and forestry waste and considering how they can be used commercially in the green building sector. The objectives of the project include:

- Develop methods to convert natural wastes into sustainable polyurethanes. These can be used to develop insulation foams and adhesives, as well as fire retardant products.
- Develop new high-performance bio-resins to produce eco-friendly wooden panels.
- Produce eco-friendly sustainable cement with improved properties.
- Design and assemble an environmentally sustainable and fire-resistant construction solution.
- Demonstrate the development of eco-friendly products and their sustainability and business potential compared to existing solutions.

Roots Project: <u>https://therootsproject.org/</u>

The Roots Project aims to ensure sustainability for orphanages internationally through agricultural projects and educational development programs. We work side by side with these orphanages to implement agricultural projects that will help them create a source of income and food, while simultaneously promoting entrepreneurship and a strong sense of community. We cannot achieve our goals alone. The Roots Project is a non-profit organization based in Providence, Rhode Island ran entirely by young millennial women. We all come from different backgrounds, have different career interests, but we have all been able to come together for one common goal: empowering at-risk children to be healthy, hard-working, and active members in their communities.

Scalibur Project: http://www.scalibur.eu/

In the SCALIBUR Horizon 2020 project, leading waste management companies, technology developers and research organisations have teamed up with four European cities to demonstrate innovative solutions to transform urban food waste and sewage sludge into high value-added products, helping cities to increase their recycling rate and creating new circular economy business opportunities.

Tech4Biowaste Project: https://tech4biowaste.eu/

The Tech4Biowaste project aims to pave the way for the deployment of biowaste technologies and technology configurations by setting up a database providing a comprehensive technology overview (Technology Readiness Level / TRL 4–9) for the valorisation of biowaste (food waste and garden waste) into value-added applications including organic soil improvers, fertilisers, organic chemicals, fuels and energy



Value waste Project: http://valuewaste.eu/

Every year each European citizen produces on average 200 kg of municipal biowaste. This means that between 118 and 138 million tonnes of biowaste arise annually in the EU. The municipal biowaste management systems that currently exist in Europe, such as landfilling, do not give a second life to materials or resources contained in the biowaste. Other alternatives such as incineration and composting do not allow to take full advantage of the biowaste potential. Today, one of the challenges for biowaste management is to integrate a valorisation system in a city context, and to recover products with a market value that offsets the global cost of biowaste valorising. VALUEWASTE proposes an integrated system for urban biowaste valorisation into key strategic products for the EU.

WaystUP Project: https://waystup.eu/

The EU-funded WaysTUP! project aims to establish new value chains for urban bio-waste. The project will display a range of new products produced from urban bio-waste to bio-based processes starting from different feedstocks, including fish and meat waste, spent coffee grounds, household source-separated bio-waste, and used cooking oils. The project is expected to produce a behavioural change in citizens and local communities, improving and changing longstanding perceptions of urban bio-waste during its implementation. This will overall contribute to a more circular economy.

1.2. Definitions

This section includes some definitions that are used in this deliverable and that are also important for the project. They have been collected from the current European guidelines or from bibliography and reported to achieve the wider concept and also to show the sense in which these concepts are used along the text.

1.2.1. Biodegradable waste, biowaste and food waste

Biodegradable waste (Directive 99/31): means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard

According to the European Commission website⁷, bio-waste consists of biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants. It does not include forestry or agricultural residues, manure, sewage sludge, or other biodegradable waste such as natural textiles, paper or processed wood. It also excludes those by-products of food production that never become waste. Currently the main environmental threat from biowaste (and other biodegradable waste) is the production of methane from such waste decomposing in landfills, which accounted

¹ <u>https://ec.europa.eu/environment/topics/waste-and-recycling/biodegradable-waste_en</u>



for some 3% of total greenhouse gas emissions in the EU-15 in 1995. The Landfill Directive (1999/31/EC) obliges Member States to reduce the amount of biodegradable municipal waste that they landfill to 35% of 1995 levels by 2016 (for some countries by 2020) which will significantly reduce this problem.

'Bio-waste' (Directive 98/2008) means biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants.

'Food waste' (Directive 98/2008) means all food as defined in Article 2 of Regulation (EC) No 178/2002 of the European Parliament and of the Council (3) that has become waste.

For the Biocircularcities project, biowaste is the focus of the research because municipal waste, organic industrial waste and forestry waste are the selected streams of the pilots respectively for the MAB, MCN and PP.

1.2.2. End-of-waste

End-of-waste (Directive 98/2008): when certain waste ceases to be waste and becomes a product, or a secondary raw material when it has undergone a recovery operation (including recycling) and complies with:

- the substance or object is commonly used for specific purposes
- there is an existing market or demand for the substance or object
- the use is lawful (substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products)
- the use will not lead to overall adverse environmental or human health impacts

1.2.3. By-products

'By-product' (Directive 2008/98): A substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste (see definition) but as being a by-product only if the following conditions are met:

- further use of the substance or object is certain;
- the substance or object can be used directly without any further processing other than normal industrial practice;
- the substance or object is produced as an integral part of a production process; and
- further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts

'Animal by-products' (Regulation 1069/2009) means entire bodies or parts of animals, products of animal origin or other products obtained from animals, which are not intended for human consumption, including oocytes, embryos and semen.



1.2.4. Waste and waste management

'Waste' (Directive 2008/98) means any substance or object which the holder discards or intends or is required to discard;

'Waste management' (Directive 2008/98) means the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker

'Separate collection' (Directive 2008/98) means the collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment;

1.2.5. Good and best practices and best available techniques

'Best available techniques' (Directive 2010/75/EU) means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

'techniques' includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;

'available techniques' means those developed on a scale which allows implementation in the relevant industrial sectors, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;

'best' means most effective in achieving a high general level of protection of the environment as a whole

'BAT reference document' (Directive 2010/75/EU) means a document, resulting from the exchange of information organised pursuant to Article 13, drawn up for defined activities and describing, in particular, applied techniques, present emissions and consumption levels, techniques considered for the determination of best available techniques as well as BAT conclusions and any emerging techniques, giving special consideration to the criteria listed in Annex III;

'BAT conclusions' means a document containing the parts of a BAT reference document laying down the conclusions on best available techniques, their description, information to assess their applicability, the emission levels associated with the best available techniques, associated monitoring, associated consumption levels and, where appropriate, relevant site remediation measures;

Best Available Techniques (BAT) is the means to demonstrate compliance with the optimisation requirement.

BAT is a system of work which compares options and makes choices using As Low As is Reasonably Practicable (ALARP) principles.



1.2.6. Policy instruments

'Policy instrument' is a linkage between policy formulation and policy implementation. The intention in policy formulation is reflected in policy implementation through instruments. Policy instruments are often known as governing tools as well, particularly when they are applied with all conditions associated to them. The implementation of governing tools is usually made to achieve policy targets of resource management but adjusted to social, political, economic, and administrative concerns. Thereby, concerns of sustainability largely depend not only on what instruments are selected but also on how they have been applied. Assessment of policy instruments thereby can be an important component of policy sustainability. (Ali, 2013).



2. Methodology

The organisation of the collection of both policy frameworks and good practices has been done through a systematic method based in an MSExcel document. In that way, for both databases, it will be possible to organise the information according to selection parameters. Also, the databases can be regularly updated depending on new policies, good practices or improvement for the classification. This provides added value to this report and allows to share information easily with other users.

2.1. Methodology behind the collection of regulations and policies on Circular Bioeconomy

This section describes the methodology to construct the database on regulations and other relevant documents within the circular bioeconomy policy framework. The database consists of a MSExcel file that provides different fields with the aim of classifying and sort the registers. This would be useful for the analysis and interpretation of results.

2.1.1. Methodology description

To achieve one of the main objectives of the deliverable, a **list** with legal acts and other interesting documents on circular bioeconomy and biowaste management was created to have a clear overview of the existing policy



framework both at European and pilot territories level.

The collection of the different acts was done thanks to the contribution of local partners, whose efforts were addressed to identify the legal acts at local, regional, and national level. The national levels were Spain (ES), Italy (IT), and Bulgaria (BG); the regional Catalonia (ES), Campania (IT) and the South-Central region (BG); and the local Metropolitan Area of Barcelona (ES), the Metropolitan City of Naples (IT) and the Pazardzhik Province (BG). The documents collected were classified according to the main topics identified from the beginning of the project and consortium partners were invited to contribute to the definition of further topic categories to not dismiss individual particularities regarding their local conditions.

All legal acts and programmes on circular bioeconomy and biowaste management were organised in an excel database called DataBase of Policy Framework (DBPF), which includes

other fields such as: year, country, summary and interest for the project. In this way, the information can be



managed and filtered more easily when looking for a specific regulation or programme at a specific territorial level. The legal acts were then analysed from different points of view with the aim to provide information ready to use later in the project to identify which are the barriers and the drivers to the implementation of a circular bioeconomy in the pilot territories.

2.1.2. Main features of the policy framework database

The database contains 16 fields, which enables classifying the acts and producing significant information in accordance with the aims of the project. Table 6 summarises the fields of the database, the description with the instructions to guide the local partners and show the example of the values for the waste framework Directive 2008/98/EC. Following are different reported fields included in the policy framework database.

The **type of waste** identifies the type of organic waste considered by regulations/acts. In most of the cases the regulation can be general and concern a wide range of waste, but their selection in the regulations was done in accordance with the project scope. The type of waste categories identified and inserted in the DBPF are: *Agriculture organic waste; Biowaste; Food waste; Forestry residues; Green waste; Industrial organic waste; No organic; Several waste*

Sector: identifies the seven main groups to classify the documents, which are Administration, Agriculture and products, Circular Economy, Climate change, Energy, Industry and Waste Management. Administration refers to those aspects related to reporting or taxation; Agriculture and products includes application to soil and fertilisers.

Topic and sub-topic: "Topic" is the main category identifying the specific document and for each topic some subtopics were defined. Therefore, sub-topic is more specific and allows classifying better the law/document. Table 2 identifies the sectors, topics and subtopics used for classifying the documents.

Sectors	Topics	Subtopics	
Administration	Circular Economy	Animal feed	Public procurement
Agriculture and products	Environment protection	Assessment	Quality
Circular economy	Health protection	BAT	Registry
Climate change	Marketing	Classification of waste	Renewable sources
Energy	Organic production	Emissions	Separate collection
Industry	Prevention of waste	General	Soil protection
Waste Management	Public fundings	Incineration	Statistics
	Renewable energy	Landfill of waste	Subsidies
	Reporting	Liability	Taxation
	Treatment of waste	Planification	Treatment of waste
	Waste management	Prevention of waste	

Table 2. Sectors	, Topics and	sub-topics	of the DBPF
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To produce a database with more reliable and useful classification, more topics and sub-topics were identified and proposed by the partners while providing data. The websites of official institutions as Eur-lex for Europe and the respective national web pages, also provide topics related to each act, which were also included in the DBPF for the classification of the collected documents.

This gives a wider range of topic and sub-topic that can help to better classify the acts and identify those niches that are considered regarding circular bioeconomics.

The **administrative level** indicates the area of competence of the document. The typology of documents existing in each area is shown in Table 3. The main issue to highlight is the binding capacity of the type of documents. Most of the collected acts are binding, and consequently are totally or partially compulsory but the execution can differ between areas because can be a decision of each Member State. The "not binding" acts come mostly from the UE⁸ and propose recommendations or opinions that can be the seed for a new legal act in the future.

Area	Level	Document	Binding	Comments			
UE	UE	Regulations	Binding in their entirety	Directly applicable in all EU Member States			
	UE	Directive	Binding objectives	The Member States are free to choose the manne they see fit to achieve those objectives			
	UE	Decisions	Binding in their entirety	Decisions specify to whom they are addressed, and are binding only on them			
	UE	Recommendations and opinions	Not binding	Enacted by public institutions. When there is no need or no possibility to produce binding acts			
	UE	Plans Programmes Strategies	Not binding	Guidelines to achieve certain usually emerging from regulation			
SPAIN (ES)	National	Organic law	Binding	Needs absolute majority from Congreso de los Diputados for approval. Enacted by Parliament			
	National	Law	Binding	Needs majority from Congreso de los Diputados for approval. Enacted by Parliament			
	National	Real Decreto Ley	Binding	Enacted by Government. Only in case of emergency (ex. COVID situation)			
	National	Real Decreto	Binding	Enacted by Government. Approval by Council of Ministries. Signed by the head of state and countersigned by the President of the Government			
	National	Orden	Binding	Enacted by Legislative power. Approval from one or more ministries			
	National	Resolución	Not binding	Enacted by official bodies			
	National	Plans Programmes Strategies	Not binding	Guidelines to achieve certain usually emerging from regulation			
CATALONIA	Regional	Llei	Binding	Enacted by the Parliament			

Table 3. Documents in each administrative level

⁸ <u>https://eur-lex.europa.eu/collection/eu-law/legislation/recent.html?locale=en</u> <u>https://ec.europa.eu/info/law/law-making-process/types-eu-law_en</u>



REGION						
	Regional	Decret	Binding	Enacted by the Consell de Govern or by Presidència		
	Regional	Decret Llei	Binding	Provisional provision enacted by the Parliament. Executive power.		
	Regional	Ordre	Binding	Enacted by Consellers.		
	Regional	Plans Programmes Strategies	Not binding	Guidelines to achieve certain usually emerging from regulation		
METROPOLITAN Area of Barcelona (Mab)	Local	Ordenança	Binding	Enacted by the local Council. Binding for the municipality		
	Local	Plans Programmes Strategies	Not binding	Guidelines to achieve certain usually emerging from regulation		
ITALY (IT)	National	Decreto Legislativo (DLgs)	Binding	Enacted by Government		
	National	Decreti ministeriali (DM)	Binding	Enacted by Ministry		
	National	Decreti attuativi	Binding	Enacted for specific application		
	National	Decreto Presidente della Repubblica (DPR)	Binding	Enacted by the President of the Italian Republic		
	National	Plans Programmes Strategies	Not binding	Guidelines to achieve certain usually emerging from regulation		
CAMPANIA REGION	Regional	Leggi Regionali	Binding	Enacted by the regional council, they are valid in the specific region. They are published in the "Bollettino Ufficiale" (BUR) of the region.		
	Regional	Decreti Regionali	Binding	Enacted by the President of the Region.		
	Regional	Linee guida	Not binding	Regional Guidelines to achieve certain usually emerging from regulation		
	Regional	Plans Programmes Strategies	Not binding	Regional Guidelines to achieve certain usually emerging from regulation		
METROPOLITAN City of Naples (MCN)	Local	Decreti sindacali	Binding	Enacted by the Mayor		
	Local	Determine dirigenziali	Binding	Enacted by a local manager of the entity		
	Local	Plans Programmes Strategies	Not binding	Local Guidelines to achieve certain usually emerging from regulation		
BULGARIA (BG)	National	Programme	Not binding	Elaborated by a Ministry in order to map the main priorities in the next programming period.		
	National	Ordinance	Binding	Enacted by Bulgarian Government and they have binding character.		
	National	Laws	Binding	Enacted by the Bulgarian Parliament and they have a binding character to all – individuals and companies.		
SOUTH-CENTRAL Region	Regional	Programme	Not binding	The development is coordinated by the Ministry for Regional Development and Public Works, and respective regional administrations participate.		



	Regional	Plans Programmes Strategies	Not binding	Guidelines to achieve certain goals usually emerging from a regulation.		
PAZARZHIK Province (PP)	AZARZHIK ROVINCE (PP) Local Local Programme Not bindin		Not binding	Guidelines to achieve certain goals at local level usually emerging from a regulation at a national level.		
	Local Plans Strategies		Not binding	Local strategies, which are developed with the participation of a large group of stakeholders, representatives of different sectors.		

The type of content assesses if the **document** consists of a rule or a plan, program or strategy.

The rule identifies the type of act according to Table 3.

The **binding** column indicates if the document is binding or not.

The **code** and **year** include the year in which the act was published and the number of the act. This allows making a quick classification based on the year, because in the code the year appears in the first term.

The **title** is the full title text as it appears in the official publication in the original language. Because of this, the next column includes the **translation** into English, if necessary.

The **transposition** indicates if the considered act is a transposition of a higher rule from European law or from the respective national law.

Summary. The main content of the act summarised including relevant aspects

Interest for BCC. Indicates which of the content of the act is more related to BCC project. In the case of crosscutting concept acts, it is indicated that there is general interest not specific.

The **keywords** highlight the main specific concepts of the document not already included in the title that helps to classify the rule. The list of keywords has been taken form the official sites indicated in section 2.1.3.

The **hyperlink** links the information to the official source, where the act can be found. It is the permalink, whose address never changes, and the address contains the text "eli". The permalinks, normally included for the consolidated version of the rules, when existing, is relevant since make it possible to have the document in which all the modifications are included.

2.1.3. Sources of information

To collect the legal acts in each area, the official sources were consulted in order to obtain reliable and updated information. According to the administrative level, there are different organisms that own the online databases on laws. Table 4 summarises the official organisms where the legal acts can be found for each level and country.

Table 4. Official sources of information for documents collected in the DBPF

Main area	Level	Publication	Website address
UE		Official Journal of European Community	https://eur-lex.europa.eu/

D3.1. POLICY FRAMEWORK AND GOOD PRACTICES ON CIRCULAR BIOECONOMY AND BIOWASTE MANAGEMENT



SPAIN	National	Boletin Oficial del Estado	https://boe.es/			
	Regional	Diari Oficial de la Generalitat de Catalunya	https://dogc.gencat.cat/ca/inici/			
	Local	Butlletí Oficial de la Província (BOP)	https://bop.diba.cat			
ITALY	National	Gazzetta Ufficiale de la Repubblica Italiana	https://www.governo.it/provvedimenti https://www.gazzettaufficiale.it			
	Regional	Bollettino Ufficiale Regione Campania	http://www.burc.regione.campania.it/eBurcWeb/publi cContent/home/index.iface			
	Local	Albo Pretorio	https://www.cittametropolitana.na.it/albo-pretorio1			
BULGARIA	National	State Gazette	https://dv.parliament.bg/DVWeb/index.faces; https://www.lex.bg			
	Regional	Newsletter of the Regional Development Ministry	https://www.mrb.bg			
	Local	Regulatory section of the administration of Pazardzhik Province	https://www.pz.government.bg			

Apart from the official journals for each area, there are other reliable sources that were consulted to identify legal acts or plans and programmes in a specific area. This would be the case of the Catalan Waste Agency, whose web page collects the legislation related to waste from European, national (Spain) and regional (Catalonia) levels⁹.

For the Italian case the website of the Ministry of Ecological Transition has also been consulted, available at: <u>https://www.mite.gov.it</u>.

For the Bulgarian case the website of the of the Ministry of Environment and Waters has also been consulted, available at https://www.moew.government.bg.

2.1.4. Internal structure of the policy framework database

The excel file has three main sheets for the introduction of data and classification of fields. The main sheet to introduce the information, named "Database", is where the selected documents can be added. The other sheets are for the lists of classification. Figure 5 shows the three sheets with the lists of these classifications for the different fields and the sheet of the database to introduce values by considering the different options of the drop-down menu.

⁹ https://residus.gencat.cat/es/consultes_i_tramits_-_nou/normativa



Figure 5. Lists for the classification of the types of documents at different administration levels (left) and topics and sub-topics (right) and drop-down menu in the introduction of data (bottom) in the DBPF

	C		D	E	F		G	Н	I	J
	National_ES	National_IT		National_BG	Regional_CAT	Regio	nal_CAM	Regional_SCR	Local_BCN	Local_N
	Ley	Decreto legisl	ativo	Act	Llei	Leggi	Regionali	Programme	Edicte	Decreti
1	Orden	Decreti minis	teriali	Strategy document	Ordre	Decre	ti Regionali		Instruccio	Determ
ľ	Real decreto	Decreti attua	tivi danta dalla namu	Programme	Decret	Linee	guida		Ordenança	Regolan
ľ	Resolucion Real Decrete Logislativ	Decreto presi	dente della repu	IDDIICa	Acord	Progra	amma cio		Reglament	Linee gu
ľ	Programa	Stratogia			Programa	Dolibe	gia		Acord	Delibera
ľ	Plan	Decreto Dina	rtimentale		Pla	Delibe	a		Acoru	
ľ	Estrategia		rumentale		Estratègia					
ľ	Loti atcella	Deliberazione	2		Estrategia					
ľ		Decreto-legge	- -							
	Regulations	Options	Database Pivot	t table Discards	(+) :	•		1		•
	• : ×	$\checkmark f_x$								
	А		В	С	D		E	F C	а н	1
	Waste	Sector		Торіс	Subtopic		Content			
	Agriculture/Farm	Administ	ration	Bioeconomy	Animal feed		Rule			
	Biowaste	Agricultu	re and products	Circular Economy	Assessment		Strategy			
	By_products	Circular_	economy	Classification of wast	e BAT		Plan			
I	Food waste	Climate_	change	Environment protect	ion Classification of	waste	Program			
	Forestry residues	Energy		Health protection	Emissions					
(Green waste	Industry		Marketing	General					
	ndustrial organic was	te Waste_N	lanagement	Organic production	Incineration					
	Municipal waste			Prevention of waste	Landfill of wast	е				
	Plastic_and_packaging			Public fundings	Liability					
	Sewage sludge			Renewable energy	Planification					
	Regulations	Options	Database Pivo	ot table Discards	+	•				
	0 • : ×	√ fx								
	В	С	D	E	F		G	н	1	J
1	Vaste 🗸 Se	ector	 Topic 	Sub-topic	🗢 Administrativ	/e 🖵 C	ontent 🖵 F	tule 🖵 Bind	ling 🧅 Code	
				-						
			Waste	~						
			Agriculture/Farm Biowaste							
			By_products							
			Forestry residues							
			Green waste Industrial organic v	vaste 🗸						

Potential users of the DBPF only need to fill one row per document and chose options available in the cells while the rest of the fields should be written, as for title, translation, or summary fields. The drop-down menu is important to avoid duplicity in the terms, as for example "health and safety" and "health/safety", which would produce a new classification despite referring to the same concept.



2.2. Methodology behind the collection of Good Practices on Circular Bioeconomy

The findings arising from good practices across the EU context can be a starting point to develop policy instruments and other measures, particularly related to biowaste prevention and valorisation. Indeed, those GPs can inspire potential solutions for the case studies regarding reduction in waste generation and the valorisation of biowaste in line with circular bioeconomy principles through for example industrial symbiosis and biorefinery implementation. The coupled analysis of the policy framework and of good practices can support the formulation of recommendations for local decisions-makers to improve the implementation of circular economy policies.

To discuss the relevance of selected GPs according to the definitions exposed in section 1.2, some considerations must be made. The level of implementation of some actions as separate collection of the biowaste is different from each Member State, as seen in section 1.1.1. and Figure 1. This means that the effect of a same GP would not be the same in different areas and that according to the contexts a practice can be considered a good practice or not, depending on the degree of implementation of that action. The selection of the alternative scenarios for the pilots was also based on circular bioeconomy practices considered good for the specific contexts. The project searches for the implementation of the most innovative circular bioeconomy practices in local biowaste management diverting biogenic waste streams from composting, use in power-and-heat generation and use for biofuel production to bio-based operations for material use. This will be achieved in the pilots of the Metropolitan City of Naples and the Metropolitan Area of Barcelona. In the case of MAB also the biomethane production for biofuel can be of interest for the pilot as there are several facilities in the area aiming at this process from the treatment of municipal biowaste, even its base comes from a non-innovative technology as it is anaerobic digestion. Also, in the case of Pazardzhik Province, where separate collection of biowaste is not implemented correctly yet, or the possibilities of valorisation of biomass other than energetic are limited, more basic (less innovative) good practices can produce results that would however increase biowaste management quality. Also, the good practices proposed for the alternative scenario for the case of Pazardzhik can be of interest for other remote regions of Bulgaria and neighbouring countries from Eastern Europe.

2.2.1. Methodology description

Like the methodology used for building the DBPF, to collect and analyse international good practices (GPs) related to the circular bioeconomy (biowaste prevention measures and valorisation of biowaste) an excel database was also created and named Database of Good Practices (DBGP). The identified virtuous national/regional policy instruments will be then analysed to check if some of them can be used as successful examples in the selected urban contexts. Consortium partners participated in the collection of Good Practices.

The first step consisted of having an overview of the sources (websites or others) to collect good practices. This preliminary analysis had the aim of assessing the concepts under which the GPs are currently classified. As well as for policy documents, the organisation through a database can help in classifying and filtering GPs according to specific fields. Using a database for the GPs is a living method to be kept updated along the project life.



As second step, the different fields in the DBGP and the content of each were discussed with local partners to define the concepts for the classification. The fields included aspects such as the location of the GP, the type of biowaste or the type of action.

The scope of the origin of GPs was initially the EU and the areas of the pilots, but other GPs out of this scope were included if the actions were relevant to the project and could have significant interest for the pilots.

The main criteria applied was to search for GPs on biowaste in a circular economy system.

2.2.2. Main features of the good practices database

The DBGP contains 11 fields with detailed information of each GP, which are detailed as follows.

The territorial identification of the location of the GPs has been made according with NUTS¹⁰ (*Nomenclature des Unités Territoriales Statistiques*) used in Eurostat. The database identifies per each GP the country (**NUTS1**), the regional level (**NUTS2**) and the local level, which can be Provincial (**NUTS3**) or Local Administrative Units (**LAU**).

The **type of waste** aims to identify what is the main material considered in the GP. In this case, it must be mentioned that GPs related to biowaste have been prioritised ahead of other organic waste. The types of waste considered were selected according to the project's aims and pilots, and include agriculture organic waste, household biowaste (separated collection of municipal biowaste), household waste (separated collection of municipal waste, forestry residues, green waste (from households), industrial biowaste and vegetable oil (from households).

The **type of action** describes what is the main action undertaken with the GP. The most relevant actions to be included in the classification of the GPs were Technological innovation, Optimization and efficacy of collection System, Communication and dissemination activities, Taxation, Control, surveillance, and sanctions, Prevention, Separate collection, Preparing for re-use, Decentralised treatment, System Nudge, and Optimization of biodegradable waste composting plants.

The objective of the measure indicates the main goal to be fulfilled with the implementation of the GP.

The **initial situation/baseline** describes in detail which is the current situation to be improved with the measure and why the improvement is needed. The description of these facts would help to assess the impact of the GP.

The **new situation** describes what is the current scenario after the measure of the GP has been implemented.

The **results** assess how the change impacted in the sector affected by the GP, quantitatively or qualitatively.

The link or reference cites the original source of the GP.

¹⁰ <u>https://ec.europa.eu/eurostat/web/nuts/background/</u>



2.2.3. Sources of information

The information about good practices can be found in several platforms and web pages. Table 5 presents resources of platforms of good practices. Apart from these web pages of public institutions, other sources have been consulted such as websites of private companies and European projects, and consortium resources from experiences.

Area	Site	Web address			
	European Circular Economy Stakeholder Platform	https://circulareconomy.europa.eu/platform/en/good-			
UE		<u>practices</u>			
	Municipal Waste Europe	https://www.municipalwasteeurope.eu/			
	In Bulgaria, the GPs have been collected directly from several	http://belovo.eu			
	municipal websites of those municipalities, which are very	https://sofiawastemanagement.eu			
Bulgaria	active on the topic.	https://gabrovo.bg			
		https://velingrad.bg			
		https://bsdi-institute.eu			
ltalı	Ministry of the Ecological Transition	https://www.mite.gov.it			
Italy	Italian Circular Economy Stakeholder Platform	https://www.icesp.it/buone-pratiche			
	Ministry for the Ecological Transition and demographic	https://www.miteco.gob.es/es/calidad-y-evaluacion-			
Spain	challenge	ambiental/temas/economia-circular/buenas-practicas-			
		economia-circular/			
Catalonia	Plataforma Residus Municipals (Municipal Waste Platform)	http://residusmunicipals.cat/			
Gatalonia	Som gent de profit (We are profit people)	https://somgentdeprofit.cat/			

Table 5. Web pages related to good practices or platforms

The **European Circular Economy Stakeholder Platform** has a section that includes relevant practices, innovative processes and 'learning from experience' examples. All information is provided by the stakeholders themselves who remain responsible for accuracy and veracity of the content. The selection of the GPs is done according to a described guideline and depending on their relevance to the circular economy, completeness and clarity of information, practical character of expected results, awareness-raising and educational components. The site includes a total of 731 good practices related to multiple areas and sectors, and 53 of them correspond to the topic of Bioeconomy and Biomimicry.

Municipal Waste Europe is the European umbrella association representing public responsibility for waste whose members are national public waste associations and similar national or regional associations. They are committed to sustainable waste management that minimises the impact of waste on the environment and promotes resource efficiency, taking into account local conditions. Municipal Waste Europe promotes the interests of its members at European level, through joint positions on waste management issues and legislation and keeps its members informed on the latest EU policy developments. The association encourages the sharing of information among its members, including the exchange of good practice in the local management of waste, which can be found in the section of the website called Case studies.

The **Spanish Ministry for the Ecological Transition and Demographic Challenge** (MITECO) offered two calls on good practices in the Circular Economy with the aim of creating a collaboration space to boost the progress of



value chains, where good practices can be shared among different stakeholders to create synergies and favour the transition towards the circular economy. The first event took place in 2020 and the second in 2021, and now the 2022 edition is in-progress. From the two previous events, 2 catalogues were produced with 42 and 46 good practices respectively for 2020 and 2021 and are published also in English and cover a wide scope of subjects with a specific section that includes waste management.

The Catalan platform **Residus Municipals** *(Municipal Waste Platform)* promotes the improvement in the management of municipal waste through the sharing of experiences in the territory, where different users can present their experiences. Residus Municipals is a space that facilitates the exchange of knowledge between municipalities and agents in the sector and provides professionals with tools to facilitate the achievement of the Objectives 2020. In addition to this web platform, residusmunicipals.cat also organizes face-to-face activities occasionally. On the platform an updated collection of actions and good practices adopted in prevention, minimization, and reuse of waste, as well as all the relevant information about its management are available

The web **Som gent de profit** (We are profit people) is an awareness project lead by the Waste Agency of Catalonia addressed to the reduction of food waste through different tools, advice and workshops to share and disseminate the knowledge.

The **Italian Circular Economy Stakeholder Platform** has a section in which there is an overview of the good practices of a circular economy developed by stakeholders of the national areas (companies, associations, entities), which are focused on closing the loop for the resource valorization. There are examples of new business models focused on industrial and urban scales. The database ICESP of good practices includes the shared experiences of each stakeholder involved.

The **Italian Ministry for the Ecological Transition** (MITE) offers a specific section called "Direzione generale economia circolare (EC)", which is focused on (I) the promotion of policy for a circular economy; (ii) waste management; (iii) integrated policy for the product sustainability (Ecolabel).

In **Bulgaria** there is not yet a specific website or platform containing and updating good practices in the area of circular economy. However, the Balkans Sustainable Development Institute (BSDI) developed in 2019 in a partnership with several other institutions from the Balkan Peninsular, the so-called **White Paper on Circular Economy and Sustainable Development of Balkans**. The document contains many good practices from Bulgaria, Serbia and North Macedonia.

The websites of some Bulgarian municipalities like **Gabrovo, Belovo, Sofia**, and **Velingrad** represent also a very good source for good practices which are being implemented by the Bulgarian local administrations.

2.2.4. Internal structure of the good practices database

The excel file is composed of 2 sheets, one for the list of options for the drop-down menu and the other to introduce the data (Figure 6). This database (DBGP) needs most of the fields to be introduced manually as the scope for most of the fields is wider and cannot be limited as location at level of country or region. The only


fields that have limited options are type of biowaste and type of action, which have been both previously codified.

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39												
40						-						
41					Agriculture organic waste Household biowaste	^						
					Food waste Food waste Forestry residues							
42					Green waste Industrial	~						
43					Thixed monicipal waxe							
44	1											
45												-
	$\P \to $	Bio	owaste Databa	se PivotTable	+				•			

Figure 6. Overall look of the fields in the excel DBGP



3. Results

The results have been organised firstly regarding the collection of policies and regulation and secondly, the list of good practices and the results analysis are presented, and also a list of local actions about the circular economy, such as the European Week for Waste Reduction.

3.1. Policy framework on Circular Bioeconomy and Biowaste Management

The documents compiled in the BDPF, from binding acts to plans and programs, give an overview of current regulations and policy instruments concerning circular bioeconomy and biowaste management at European level as well as at national (Bulgaria, Italy, Spain) and regional level of the three pilot cities, i.e. Barcelona, Naples and Pazardzhik. The idea is to give a general vision of each country/area. Except for the cases of special interest for the discussion, the identified documents will not be described in this report, but the complete list can be found in Annex 1. For more details, the DBPF includes a summary of each document focusing on the aims of the project.

To better understand how the DBPF was built and to interpret the results of the analysis and further discussions, the following aspects must be considered:

- The scope includes those documents that can present a certain relation to the circular bioeconomy and biowaste even if there is not a direct link. This includes issues as emissions from treatment plants, landfill or taxation, that can affect the implementation of a circular bioeconomy.
- Regarding legal acts, only main documents in force have been considered; partially modifying rules have not been introduced in the database unless the changes were relevant to prevent an excessively extensive database.
- The database has been conceived as a living element to be updated along the project. This means both the extension of the number of registers and the concepts to classify the new registers can vary along the project lifetime.

Currently, the policy framework database compiles 122 documents from Europe and the different pilot areas studied for the project, according to the considerations mentioned above. The number of registers can be increased, and the database updated along the project because new regulations or programmes can appear in the future. Because of this, a new version of the DBPF will be provided at the end of project.

The access to this database can be found in the following link:

https://fundacioent.sharepoint.com/:x:/g/EWCHHBGXkp5Brpw3eHQ8_I0BbTwWVKAGNA2FBG6tbRMxKg?e=IR0 KRb

Figure 7 shows the overall look of the compiled excel DBPF. As it can be seen, there is an easy visual identification of the registers whose fields (described in section 2.1.2) provided of a drop-down menu. The same



system has been used for type of waste, topic, sub-topic and document to fill the fields, as explained in the methodology section.

F8		≺ √ ƒx U	E_UE							~
	В	С	D	E	F	G	н	I.	J	
1	Waste	Sector 💌	Topic	Sub-topic	Administrative 🖵	Content 🖵	Rule 🚽	Binding 🚽	Code	-
2	Sewage sludge	products	Environment protection	Soil protection	UE_UE	Rule	Directive	yes	1986/278/CEE	
3	Plastic_and_packaging	Waste_Management	Environment protection	Prevention of waste	UE_UE	Rule	Directive	yes	1994/62/EC	
4	Various	Waste_Management	Treatment of waste	Landfill of waste	UE_UE	Rule	Directive	yes	1999/31/EC	
5	Various	Waste_Management	Classification of waste	General	UE_UE	Rule	Decision	yes	2001/118/EC	
6	Various	Administration	Reporting	Statistics	UE_UE	Rule	Regulation	yes	2002/2150	
7	Various	Waste_Management	Treatment of waste	Landfill of waste	UE_UE	Rule	Decision	yes	2003/33/EC	
8	Various	Administration	Environment protection	Liability	UE_UE	👻 le	Directive	yes	2004/35/EC	
9	Various	Waste_Management	Environment protection	General	UE_UE National ES	∧ le	Directive	yes	2008/98/EC	
10	Various	Administration	Environment protection	Liability	National_IT National_BG	le	Directive	yes	2008/99/EC	
11	Various	Administration	Public fundings	Public procurement	Regional_CAT	n&progra	Communicati	no	2008/0400	
12	By_products	Waste_Management	Health protection	Treatment of waste	Regional_SCR	y le	Regulation	yes	2009/1069/EC	
13	Various	Energy	Renewable energy	Renewable sources	UE_UE	Plan&progra	Decision	yes	2009/548/EC	-
	Regulation	s Options Data	Abase Pivot table	Discards (+)	: 4					•

Figure 7. Overall look of the excel database of policy framework (DBPF)

Table 6 shows the example for one of the introduced acts (Directive 2008/98 on waste and repealing certain directives) and reports the description of each field included in the DBPF. In this case, the classification is quite general because this directive treats a wide scope of aspects related to waste, being difficult to classify as unique topics.

 Table 6. Fields in the DBPF for the Directive 2008/98, on waste and repealing certain directives

Field	Description	Example (Directive 2008/98/EC)
Type of waste	Biowaste, By_products, Food waste, Forestry residues, Industrial organic waste, Municipal waste, Plastic_and_packaging, Sewage sludge, <i>several waste</i>	Several Waste
Sector	Administration, Agriculture and products, Circular Economy, Climate_change, Energy, Industry, Waste_Management	Waste management
Торіс	Agriculture;By_products;Circular_economy;Climate_change;Emission;Energy;Environment_protection;Fertilisers;Health_and_safety;Industry;Plastic_and_packaging;Trade;Waste_Management;Organic_production	Waste Management
Sub-topic	For each topic different sub-topics were defined	General
Administrative level	EU; National; Regional; Local	EU
Content	Rule; Plans&Programs	Rule
Rule	Depending on each Administrative level, different rules apply	Directive
Binding	Yes; not	Yes



Code	Codification of the rule considering the year, the number of the rule and the publishing organism	2008/98/EC
Year	Year of the publication	2008
Title	Full title of the rule in original language	Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
Translation	Translation of the title of the rule into English	n.a.
Transposition	For different levels than EU, indicates if the rule is a transposition of an EU rule and Reference (Rule+Code) should be given	n.a.
Summary	Summary of the rule	Legal framework for treating waste in the EU aiming to protect the environment and human health by emphasising the importance of proper waste management, recovery and recycling techniques to reduce pressure on resources and improve their use. Establishes waste hierarchy management. Confirms the principle "polluter-pays". Promotes national plans on waste management and prevention
Interest for BCC	Highlights in one sentence the interest of the rule for BIOCIRCULARCITIES project	General information on waste management framework
Keywords	Indicate which are the specific subjects of the act not included in the title	waste management; prevention of pollution; environmental protection; waste recycling; European standard; environmental law; waste disposal
Hyperlink	Link of the act to the official publication site	http://data.europa.eu/eli/dir/2008/98/2018- 07-05

n.a. not applicable

A similar analysis has been performed for the rest of the gathered documents. As an example, *Regulation (EC) No* 2150/2002 of the European Parliament and of the Council of 25 November 2002 on waste statistics, has been classified by topic "*administrative formalities*" and subtopic "*statistics*", which is more specific.

For more particular details, it is recommended to consult the DBPF excel.

It is worth underlining that most of the documents included in the DBPF are binding. Indeed, the legal acts need to be accomplished by the affected population or administration. For European acts, there are also delegated and implementing acts (delegated decisions, implementing regulations...) which are both non-legislative acts. The delegated decisions are intended to supplement or amend non-essential parts of legislative acts and are adopted by the Commission based on an explicit delegation granted in a legislative act and in consultation with expert groups. The implementing regulations ensure the conditions for implementing legally binding acts and are



GUIA SOBRE LA CODIFICACIÓ, LA CLASSIFICACIÓ

I LES VIES DE GESTIÓ DELS RESIDUS A CATALUNYA

CATÀLEG DE RESIDUS DE CATALUNYA

Coversitiet de Catalones Descentement de Territori

adopted by the Commission (or exceptionally the Council) after it consults committees comprising experts from the EU Member States.

Other documents of interest existing in the different areas, which are not binding, are the plans, programmes or strategies developed to promote the improvement of waste management and the circular economy. Among these, the strategies for circular economy or bioeconomy, catalogues or waste management plans were identified. An example of these documents is the Waste Catalogue of Catalonia, which adapts the European List of Waste to codify the different waste streams and gives examples of management and detailed recommendations for disposal and treatment for each of them.

Several plans and programmes produced at the pilot levels and related countries were identified to promote the implementation of a circular economy. Some of them were

published through a legal act, as for example *Regulation (EU) 2021/783 of the European Parliament and of the Council of 29 April 2021 establishing a Programme for the Environment and Climate Action (LIFE), and repealing Regulation (EU) No 1293 /2013*.

As already mentioned, 99 of the 122 documents collected in the DBPF correspond to binding documents, as Directives, Regulations or Decisions for Europe and the equivalents in the other territorial levels (national, regional, local), while the other 28 were plans, programs or strategies. This means that there is not only a wide framework on waste management, circular economy and other environmental issues, but also the commitment through compulsory documents to achieve the goals in the different topics.

The BCC project, according to priorities proposed in the call, seeks for innovative valorisation of biowaste preferably other than composting and anaerobic digestion or energetic valorisation. Nevertheless, the current legal and policy framework considers the valorisation of biowaste mainly regarding these ways. To foster innovative biowaste valorisation towards bio-based operations for material use specific regulations and policies need to be introduced.

Following, the DBPF is analysed in detail considering territorial level and classifications of the acts.

3.1.1. European CBE policy framework

At European level, a total of 45 documents concerning circular bioeconomy and biowaste management were identified. There are 16 Decisions, 13 Directives, 7 Regulations, 7 Communications and 2 BREF¹¹ documents. Except BREF and Communications, the rest are legal acts (36), which are of interest to the BCC project. In this sense, it must be considered that the content of Table 3, indicating which Regulations can be applied directly in the EU Member States, while Directives allow for some flexibility to national Governments in the way of

¹¹ BREF: BAT reference document.



executing them, and Decisions are only applicable in the specified territories. Then, the Member States can apply some of the rules without enacting national documents. Regarding Directives, it is important to remember that those rules oblige the Member States to implement the guidelines in the way they consider more suitable.

Figure 8 shows the number of EU documents collected in the DB currently in force referring to publication date. The older ones are the Directives of use of sewage sludge in agriculture, landfill, and packaging.



Figure 8. Documents of the policy framework database related to circular bioeconomy per period at EU level

There are 12 documents published during the first decade of the century, concerning lists of waste, animal byproducts, emissions, environment protection, renewable energies and one of the most relevant, which is Directive 2008/98 on waste. During the period of 2011-2020, there was a strong increase in the number of documents published (30 documents), particularly plans and programs as a result of the implementation of measures to achieve the goals of Directive 2008/98 on waste concerning aspects such as circular economy. There was also a change in the contents embodying fertilisers and new documents on plastics and calculation methods of recycling ratios were introduced. During the last period, modifications of regulations on waste, landfill and packaging and animal by-products have been observed.

The documents collected consider different waste regarding the type of waste (31) and only a few are focused on specific subjects as plastic and packaging (5) or industrial organic waste (4). The main sector represented at European level is Waste Management (24) followed by Administration issues (8); with fewer documents accounting for Circular Economy and Agriculture&Products (4 each). According to the classification in the DBPF of topics showed in section 2.1.2, the main topics identified for the EU documents were Environment protection (16 registers), Treatment of waste (12 registers), Reporting (4 registers) and Circular Economy (3 registers). There is a high number of Plans and Programs (10) on EU registers, most of them regarding the implementation of circular economy principles.

Table 7 summarises the main EU documents regarding circular bioeconomy, biowaste management and other relevant environmental issues and some of the subjects addressed in the gathered documents are specifically discussed below.



Area	Title
Plans and programs on Circular Economy	COM (2015) 614 final. Communication from the Commission to the European Parliament, the Council, the European economic and Social Committee of the Regions — Closing the loop — An EU action plan for the circular economy
	COM/2018/673 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A sustainable Bioeconomy for Europe: Strengthening the connection between economy, society and the environment
	COM/2019/640 final. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. The European Green Deal
	COM2020/98/final Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A new Circular Economy Action Plan for a cleaner and more competitive Europe
	Regulation (EU) 2021/783 of the European Parliament and of the Council of 29 April 2021 establishing a Program for the Environment and Climate Action (LIFE), and repealing Regulation (EU) No 1293/2013
Framework on waste	Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
	Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste
Landfill	Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste
	Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste
Emissions	Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)
Plastic and packaging	Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags
	Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste
	Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment
Fertilisers	Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/200

Table 7. Main CBE regulations and plans, programmes, and strategies at EU level

Waste management

Directive 2008/98 lays down the European framework for waste management, including biowaste, according to the waste hierarchy¹². It sets the goals for preparing for re-use and recycling of municipal waste (as well as biowaste) for the next periods. Regarding recycling, the modifying Directive 2018/851 sets the value of

¹² <u>https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en</u>



recycling at 65% in weight basis by 2035. It must be noticed that the values proposed refer to the recycling rate and not to the separate collection rate. The Commission Decision 2011/753, the Commission Decision 2019/1004 and the Guidance on municipal waste data collection (2016) provided by the EC define the proper way to calculate the recycling percentages.

The end-of-waste criteria, which is also defined in article 6 of the Directive 2008/98 and modified by Directive 2018/851, and already defined in section 1.2, is of interest to the BCC project because according to its aims, these criteria should apply when biowaste is valorised. These criteria would contribute to achieving higher levels of environmental protection and economic benefits and encourage recycling by reducing the administrative burden for private companies and local administrations. A detailed report on end-of-waste criteria can be consulted in Delgado et al. (2009).

Circular economy and related plans

The EU aims for the transition to a circular economy to make Europe cleaner and more competitive. And to achieve this, since the first circular economy action plan (2015 - 2019), the EU has worked through different strategies based on plans and programs rather than laws, which are represented by the waste framework directive and other directives related to waste, plastics, eco-design, fertilisers and water reuse. Plans, programs and strategies apart from circular economy include documents based on sustainability, zero pollution or critical raw materials, as well as the Green Deal (in 2019).

There are also other programmes to promote circular economy such as the Program LIFE, deployed under Regulation (EU) 2021/783 establishing a programme for the environment and climate action (LIFE).

Plastic and packaging

The EU has produced several regulations regarding the reduction of plastic from fossil fuels (single-use plastic, packaging, etc). At first sight, there is no connection between these rules and the circular bioeconomy, but it affects it in two ways. First, the reduction in the packaging promoted by the EC should produce a reduction of plastic waste in biowaste. More specifically this can be seen in Regulation (EU) 2019/1009 about the marketing of fertilising products, which limits the plastic presence in digestate and compost above 2 mm to 2,5g/kg dry matter. Second, the reduction of plastic production can promote indirectly the production of bioplastic from biowaste used as a raw material for this valorisation process.

Concerning this issue, the EU is working on a policy framework on bio-based, biodegradable and compostable plastics¹³ in which these products can offer a more sustainable alternative to fossil-based and non-biodegradable plastics. Currently, only Directive (UE) 2019/904 (single-use plastic) and Directive (UE) 2015/720 (reduction of plastic bags) aim at a real limitation in plastic use.

Research in this field is available and some reports have been produced (Hann et al., 2020; 2021).

¹³ <u>https://ec.europa.eu/environment/topics/plastics/bio-based-biodegradable-and-compostable-plastics_en</u>



Other measures

Regarding other documents, Directive 2010/75 promotes the environmental protection by the reduction of emissions through the application of the Best Available Techniques¹⁴ for the benefit of citizens' health and the environment, and addresses efficient energy use, waste prevention and management and measures to prevent accidents and limit their consequences.

Council Directive 1999/31 and Directive 2018/850 about landfill and the limitation of landfilling biodegradable waste are also relevant since they contribute to improving the separate collection of biowaste in order to achieve the targets of the waste framework Directive and the reduction of biodegradable waste in landfills. In fact, the admission of biowaste from separate collection in landfills is already prohibited and for 2035 only 10% of total MSW will be accepted into landfills. In parallel, Decision 2019/1004 indicates that from 2027 only biowaste from separate collection will account for the calculation of the recycling percentage. This means that the biostabilized material generated from mechanical and biological treatment will not be counted as "recycled material".

3.1.2. Bulgarian CBE policy framework

The analysis of the Bulgarian policy framework on circular bioeconomy and biowaste management includes three levels: Bulgaria (BG), South-Central Region (SCR) and Pazardzhik province (PP). The total number of Bulgarian documents collected in the DBPF is lower than the other pilots. In fact, 12 documents were gathered and only two are not binding. Out of the identified documents, 10 are at national level and only one from local and regional level, and regarding type of waste only two are specific for biowaste and for sewage sludge. The topics are mainly focused on environment protection (8). At regional and local level, only two documents were identified, one for each level, and refer to environment protection.

The National Management Plan is one of the main documents of the Bulgarian regulation, establishing the framework for waste management. The national Regulation PMS20/25.01.2017 for Separate Collection of Biowaste and Treatment of Biodegradable Waste should be highlighted, being the only one of the DBPF that refers exclusively to biowaste. Nearly all the rest of the Bulgarian documents correspond to the transposition of European rules on landfill, environment protection or sewage sludge.

Regarding the evolution along the time, as happened in the European context, during the period of 2011-2020 most of the documents in force have been produced (Figure 9).

¹⁴ https://eippcb.jrc.ec.europa.eu/reference/





Figure 9. Documents of the policy framework database related to circular bioeconomy per period at Bulgarian level

The main documents of the Bulgarian policy framework regarding circular bioeconomy and biowaste management are reported in Table 8. Only two of the 12 documents have been reported as relevant since they refer to waste management and to separate collection of biowaste.

Table 8. Main CBE regulations and plans, programmes, and strategies at Bulgarian level

Area	Title
Plans and programs on Circular Economy	National Waste Management Plan 2021-2028
Separate collection	Regulation PMS20/25.01.2017 for Separate Collection of Biowaste and Treatment of Biodegradable Waste

The main strategic goal of the **National Waste Management Plan 2021-2028** is improving the application of the hierarchy in the management of waste from society and business sector according with Directive 2008/98, by reducing the harmful effects of waste and preventing its generation and encouraging its reuse; increasing the amount of recycled and recovered waste and reducing the quantities and the risk of landfilled municipal waste.

Regulation PMS20/25.01.2017 for separate collection of biowaste determines aspects related to the separate collection of biowaste and other biodegradable waste suitable for valorisation, the end-of-waste criteria for biowaste and products of biological treatment, and quality requirements for the compost and its use.

3.1.3. Italian CBE policy framework

The CBE documents collected in the DBPF for the Italian pilot belong to Italy (IT), Campania Region (CAM) and the Metropolitan City of Naples (MCN). 23 documents were identified, of which 16 at national, four at regional and three at local level and 18 are rules while the rest are plans and programs. Most of the documents at national level consider several waste streams regarding the type of waste (11), while at regional and local level municipal waste takes relevance (two in each case). Regarding the sector, the main issue at national level is Waste Management, while for regional and local areas the Administration issues are more relevant and related to planification and taxation. The main topic at national level is Environment Protection (10 documents) as well as



for regional level (2 documents), followed by Circular Economy (2 documents). Only five of the documents are not binding and refer to planification.

There are no Italian documents currently in force that were published before the year 2000, and, as like Europe and Bulgaria, the more prolific period is 2011-2020 (Figure 10). During the initial period, the identified documents are mainly related to waste management and environment protection, while later concepts as circular economy and plastics and packaging take their place.

Figure 10. Documents of the policy framework database related to circular bioeconomy per period at Italian level



Table with main regulations and plans, programs and strategies at Italian level will be inserted

Table 9. Main CBE regulations and plans	, programmes, and strategies at Italian level
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Area	Title						
Environment	National						
protection	Legislative Decree 152/2006 "Norms Concerning the Environment", commonly called "Single Environmental Text"						
	Deliberation n. 105/2021. Guidelines of waste classification						
	Regional						
	Regional Law 14/2016. "Norms concerning actuation of the European and national law on wastes"						
	Regional Law 4/2008 "Norms concerning the management, transformation and reuse of waste"						
Circular Economy	National						
	Towards a Model of Circular Economy for Italy Overview and Strategic Framework						
	National						
Plastic and packaging	LEGISLATIVE DECREE 3 September 2020, n. 116 Implementation of directive (EU) 2018/851 amending directive 2008/98 / EC on waste and implementation of directive (EU) 2018/852 amending directive 1994/62 / EC on packaging and packaging waste.						
	Decree n. 261, 23/6/2021 - Approval of general programme of prevention and management of packaging and waste related packaging 2019-2023						
Waste management	National						
	Deliberation n. 105/2021. Guidelines of waste classification						



3.1.4. Spanish CBE policy framework

The territorial scope of the Spanish CBE policy framework includes Spain (ES), Catalonia (CAT) and the Metropolitan Area of Barcelona (MAB). In this case, the DBPF accounts for 42 documents, 25 at national level, 14 at regional level of Catalonia and three at local level of the MAB. At national (ES) and regional (CAT) levels, most of documents consider several waste streams regarding the type of waste, but at local level (MAB) all three documents refer to municipal waste. Regarding the sector, waste management is the main category, with 11 documents at national level. Administrative issues are also relevant, with at least seven documents at national and at regional level and three at local level. The documents related to Administration include Taxation, Subsidies or Reporting. Of the 42 documents, 11 are plans and strategies, which focus on Waste Management and Circular Economy, and 31 legal acts focused on more diverse topics.

Environment Protection, Treatment of Waste and Circular Economy are the main topics at national level with (11, 5, and 4 documents each). Of these, 12 correspond to plans and programs and the rest are spread over different categories as air quality, sewage sludge or prevention, among others. At regional level, environment protection is the main topic (5), followed by public fundings and treatment of waste (2 each). Of them, two are plans and programs and two more related to taxation, while the rest correspond to different categories. At local level three documents were identified in relation to waste management, which are plans and programs and taxation policies. The documents are mainly binding at all levels, and those that are not, are plans and programs.

The two regulations currently in force, published before year 2000, are related to fertilisers (more specifically sewage sludge) and plastic and packaging. During the first decade of the century, the focus was environment protection and waste management, and 8 documents were published (Figure 11). During 2011-2020, 26 documents were published, and circular economy became the main topic debated in plans and programs. Most recently, in April 2022, the new national law on waste has been published.



Figure 11. Documents of the policy framework database related to circular bioeconomy per period at Spanish level

In the case of the Spanish policy framework, and particularly at Catalan level, the environmental regulations have been several and appeared a long time ago. In fact, following the former regulation on waste at European level (Council Directive 75/442/EEC of 15 July 1975 on waste), Catalonia published the Law 6/1993 on waste



even before the Spanish one, in 1998 (Law 10/1998, on waste). As a result, until 2010, the number of documents in Spain and Catalonia are similar (6 to 5), but it is in the next period, with the publication of plans and programs at national level that the difference increased in favour of national level. Nevertheless, the progress at Catalan level achieved certain standards of quality of separate collection and particularly biowaste and the promotion of composting or anaerobic digestion facilities for biowaste rather than mechanical treatment plants for mixed municipal waste. This was accompanied by innovative policies of taxation and other economic tools that promoted the improvement of the waste management system.

The documents considered more relevant to CBE at Spanish level are summarised in Table 10. Some of the subjects are specifically discussed below.

Area	Title							
Plans and Programs	National							
	National Framework on Waste Management (PEMAR) 2016-2022							
	Action Plan on circular Economy PAEC 2021-2023							
	anish Strategy on Circular Economy. España Circular 2030							
	Spanish Strategy on Bioeconomy. Horizon 2030							
	Regional							
	Catalan Strategy on Bioeconomy 2021-2030 ¹⁵							
	Program of public procurement of innovation (2017)							
	Sectorial Plan of Infrastructures for the Management of Municipal Waste of Catalonia (PINFRECAT20)							
	Program of Prevention and Management of Waste and Resources of Catalonia (PRECAT20)							
	Agreement GOV/73/2015, on approval of the Strategy to boost green economy and circular economy							
	Catalan strategy of ecodesign for circular and ecoinnovative economy							
	Local							
	PREMET25. Metropolitan Program on Prevention and Use of Resources and Municipal Waste 2019-2025							
Waste	National							
	Law 7/2022, on waste and polluted soils for a circular economy							
	Regional							
	Law 8/2008, on the financing of waste management infrastructures and taxes on disposal of waste refuse							
	Legislative Decree 1/2009, on passing of recast text of Law on waste							
	Decree 152/2017, on classification, coding, and management of waste in Catalonia							
	Law 3/2020, on the prevention of food losses and food waste							

Table 10. Main CBE regulations and plans, programmes, and strategies at Spanish level

¹⁵ ACORD GOV/141/2021, de 14 de setembre, pel qual s'aprova l'Estratègia de la Bioeconomia de Catalunya 2021-2030. Departament d'Acció Climàtica, Alimentació i Agenda Rural. Generalitat de Catalunya



	Local				
	Metropolitan Agreement for Zero Waste Exp 9000350/19				
Financial	National				
	- no documents at national level -				
	Regional				
	Law 8/2008, on the financing of waste management infrastructures and taxes on disposal of waste refuse				
	Law 5/2020, on fiscal, financial, administrative and public sector measures and the creation of the tax on facilities that affect the environment				
	Local				
	Fiscal regulatory ordinance 2021/904671 of metropolitan taxes on treatment and disposal of municipal waste				
Fertilisers National					
	Royal Decree 506/2013, on fertilising products				
	Regional				
	Legislative Royal Decree 1/2016, on passing of recast text of the Law of integrated pollution prevention and control				
Environment	National				
protection	Law 26/2007, on environmental responsibility				

Plans and programs

Plans and programs published at national level tackle circular economy and waste management. Usually, they are accompanied by a legal act for the passing of the Program through the corresponding body (Parliament, Government, etc.). The Spanish Strategy on Circular Economy is aligned with the EU plans and main objectives are addressed to the reduction of waste, food waste, water and pollutant emissions and preparation for re-use, heading goals for 2030. Economy policies, taxation, sustainable consumption or rural development are among the key issues promoted to achieve the circular economy system. The National Action Plan in Circular Economy setting 5 topics (production, consumption, waste, raw materials, water) and 3 lines of action (research, participation, employment) has been developed in accordance with the EU's Circular Economy Action Plan.

At regional and local level, there are also plans and programs related to waste as the Catalan Strategy on Bioeconomy 2021-2030 and the Metropolitan Program on Prevention and Use of Resources and Municipal Waste 2019-2025 (PREMET25).

Waste management

As mentioned, there was an early deployment of regulation on waste in the Catalonia region, that sets out the foundations of further regulations. Currently, the regional administration is preparing a new regulation to repeal Legislative Decree 1/2009, but this process still is at a very early stage.

Other regulations not included in the DBPF, because they belong to Spanish territories which are out of the scope of the project, are the regional laws on waste. They have been published in most Autonomous Communities (see Annex 2). Of particular interest is the Law 8/2019, on waste and polluted soils of the Balearic Islands,



which promoted the elimination of single-use plastic as drinking straws and defined certain aspects of the decentralised composting in small facilities.

There are also regulations at local level through bylaws (see Annex 2). They are mainly focused on waste and the circular economy. Regarding waste, these bylaws define conditions for separate collection of municipal waste and regulate the charges levied to finance the service, including possible incentives for participating in separate collection. Some local administrations can incentivise companies through reductions in waste charges, in case they have circular economy plans or they adopt a series of good practices.

Taxation

Another important piece of regulation in the Catalan framework is the Law 8/2008, on the financing of waste management infrastructures and taxes on disposal of waste refuse. This law repeals the original one from 2003, when the tax was created. The tax rate for the landfill tax was 10 ℓ /t in 2004 when it was implemented. In 2009 it was extended to waste incineration (5 ℓ /t). These tax rates have been increased steadily. As of 2022, the tax rates are 59,10 and 29,60 ℓ /t, respectively, for disposition in landfills and for incineration. And it is approved that they will continue to increase until 2024 to achieve, respectively, 71,60 and 35,80 ℓ /t. This measure has encouraged separate collection, to avoid the payments, and, on the other hand, the funds collected from these taxes have also contributed to improve separate collection. For the year 2020, the revenue collected by Catalan Government from this tax was 68.548.887 ℓ from disposal and 13.591.701 ℓ from incineration. On average 96% of this revenue is annually channelled back to Local Authorities according to their separate collection results and types of treatment. In 2020, this revenue was allocated to the treatment of the municipal biowaste (72%) and to the improvement of separate collection (26,6%), while a small part (1,4%) was kept as remaining. The total funds collected since 2011 have been above 600 million euros, used to improve the waste management system (Figure 12).

The new landfill and incineration tax created at a national level by Law 7/2022 poses a certain risk to preexisting taxes. However, it still needs to be clarified to what extent. Whereas the existence of a single national tax may limit the possibilities for Autonomous Communities, the Law states that they will have the capacity to increase the tax rates above the minimum national values and that the revenue will be allocated to the regions according to where the taxable event takes place.





Figure 12. Evolution of the revenue raised by the tax on landfill and incineration in Catalonia (ARC, 2020)

Fertilisers

Regulations regarding fertilisers in Spain, once it become part of the EU (1986), have their origin in the Royal Decree 72/1988. Later, other documents in 1998, 2005 and the current Royal Decree 506/2013, on fertilising products have regulated the sector. Initially, the regulations were addressed to chemical fertilisers, and it was in 2005 when a stronger commitment with organic amendments and the use of waste as resources to produce them started. In the current regulation, biowaste from municipal origin is considered as an ingredient for biological treatment and for the production of growing media according to Royal Decree 865/2010. Regarding the digestate, it can be used as an ingredient for a biological process, but it is not considered as a fertiliser itself under the precepts of the RD 506/2013. Nevertheless, considering its use in agriculture, it should fulfil other requirements as hygienisation according to other acts, as Regulation 1009/2019 or Regulation 1069/2009 and according to use as waste recovery operation R10.

3.1.5. CBE policy framework database analysis as a whole

This section analyses the combined information of the different areas considered, in order to assess in a general context which are the priorities regarding subjects tackled by regulation and programs. This general vision would help also to ascertain what are the relevant concepts for a circular bioeconomy that are not considered or which of them can complicate its implementation. This kind of information can be also useful to define regulatory gaps later in the project.

The work of collection of documents produced a total of 122 registers from Europe, national, regional and local territories of the BCC project regarding circular bioeconomy and with relevant interest for the project. Most of the documents collected in the DBPF have been produced in the European (45) context. Regarding the pilot areas, Figure 13 compares the production of documents at the three levels in each country. At regional level, Catalonia has been the most active region. In the studied countries (Spain, Italy and Bulgaria), the local administrations are the ones that produce less documents, as it can be expected that they adapt the upper existing regulations.





Figure 13. CBE documents produced by area of the pilots

The Bulgarian CBE policy framework can be considered younger than that of the other pilot areas, a reason why the production of CBE documents is lower compared to the others. Contrarily. Catalonia generated more documents in promoting regulation and plans regarding environment and particularly waste management than the other pilot regions.

3.1.5.1. Analysis of policy framework database by type of waste

The main classification of the documents collected in the DBPF was done according to the type of waste. Most of the documents refer to general aspects of waste and to several types of waste (Figure 14).



Documents focusing on a unique type of waste are the minority, as happens with Directive 1999/31 that is centred on sewage sludge. In fact, 70% of registers (85 out of 122 documents) were classified as *several waste*, and refer to regulations on waste management, waste categorization or statistics. The documents related to specific waste include Plastic&Packaging (11), Municipal Waste (9), which apply at national, regional, and local level but not at European level. Finally, the rest of the categories include sewage sludge (5), industrial organic waste (4), by-products (4), forestry waste (2), food waste (1) and biowaste (1). Municipal waste management is normally the responsibility of the local administrations, and therefore its presence is limited within the collected documents at European level. It must be remembered that the EU law provides Directives, whose objectives must be accomplished but in the way the Member States consider more appropriate through a transposition. Forestry waste is important in Bulgaria, for the



nature of the territory, that is mainly constituted by forested areas (56%) and agricultural lands (36%). Indeed, for the Bulgarian pilot the agro-forestry biowaste was selected as a chain to be analysed, due to its relevance to the project. The documents that only refer to food waste are published in Catalonia and one document in Bulgaria refers to biowaste exclusively (Regulation PMS20, of 25.01.2017 for Separate Collection of Biowaste and Treatment of Biodegradable Waste), which is specifically dedicated to biowaste, even if the biowaste source separation is not yet implemented in the territory. In the case of Italy, the main type of waste in the classification of the documents is municipal waste, while the rest are more general in this sense.

3.1.5.2. Analysis of the policy framework database by sector

The main sectors represented by the collected documents are Waste Management (57) and Administration (31). The main issues in each of these two categories are, respectively, Environment protection (21) and Treatment of Waste (21), and Reporting (8) and Public Fundings (4).





The publication of documents regarding Waste Management comes from Europe (24), while those related to administration are more similarly represented among the different areas considered, with less than 10 each, and the EU accounts for the higher number (8). The significant documents published in Catalonia can also be highlighted (6).

Figure 15 shows graphically the distribution of sectors, where Climate Change and Energy have only three documents each. Agriculture and products groups include the documents related to land use as fertilisers or sewage sludge.

3.1.5.3.Analysis of the policy framework database by topics

Most of the collected rules referred to environment protection or waste management in general terms, which means that they present the wider concept of waste and can include all the types proposed (agriculture organic waste, biowaste, food waste, forestry residues, green waste, or industrial organic waste). In particular, up to 4 documents

were specifically related to industrial organic waste and only 1 to food waste, which is a Catalan law of 2020 regarding prevention of food waste (Figure 16).

Regarding the topics used to classify the gathered documents, the majority were focused on general aspects of environment protection (53 documents). This does not mean that they do not consider specific aspects of waste, but the document refers to different issues regarding waste. For example, Directive 2008/98 on waste (and



subsequent amendments) talks about separate collection, different kind of waste, classification of waste, programs, etc. On the other side, Regulation 1069/2009 about animal by-products is more specific.



Figure 16. Representation of topics and sub-topics in the collected documents in the DBPF (EU, ES, IT and BG)

After environment protection, treatment of waste occupies the next level with 24 documents in the analysed territories. Circular Economy and Reporting to administration are next, with 12 and 8 documents respectively. Recently, several regulations regarding plastic and packaging are being produced highlighting its importance in environmental issues that get closer to the number of documents related to environment protection. It is well known that the current concern about plastic in the environment converted into the banning of single-use plastic products, and the consequent focus on the promotion of production of less impacting materials as compostable packaging to substitute plastic from petrol. This is an example of how the need of achieving certain goals, which in this case is the elimination of single-use plastic, can address the development of binding legal acts. Regarding the Circular Economy, different programs have been launched in the last decade with deadlines for 2030. As an example, in the European context in 2020 the new Circular Economy Action Plan (COM/2020/98 final Circular Economy Action Plan-CEAP) through which the EC encourages the Member States to adopt the recommendations to achieve a circular economy implementation was launched. It could be expected that, as far as Member States conceive their future in a more circular way, legal binding acts would be enacted to fulfil the circular economy aims.

Below these topics, reporting, marketing or public fundings take their places, with lower numbers of documents. Health protection, renewable energy or organic production are the topics less represented in the existing legal acts.



Nevertheless, none of the documents refer to biowaste management explicitly, but the concept is included in the content of several rules among other questions. This can suggest that more specific weight should be given the importance of biowaste in the context of circular bioeconomy.

Regarding the subtopics, Planification seems to be the tool to achieve the goals proposed; because of this, up to 31 documents are published in the analysed areas, at least with one document in each. Documents about Prevention (12) are mainly focused on avoiding plastic waste impacts in the environment and are produced at different levels.

3.1.5.4. Analysis of policy framework database by period

As seen in previous sections when analysing the data by areas, the distribution along the time of the production of documents is quite similar. Nevertheless, when considering all data (122 documents), a significant increase in the publication of documents is observed after the Waste Framework Directive in 2008 (Figure 17). The Directive 2008/98 repealed Directive 2006/12/CE after a short time because it was considered necessary to clarify concepts in the interests of clarity and readability. This included the improvement of the definition of waste, prevention, and life cycle of products among others. Even though, it is worth highlighting that the directive of 2006 replaced a directive on waste that was in force since 1975. Fortunately, after this time, not only general rules on waste have changed but also other related subjects as emissions, formalities and landfill have been updated.



In 2018 there is another variation mainly caused by the publication of plans and programs about the circular economy at European and national level and to the revision of all Directives related to waste management. Also, it must be considered that for year 2020 there were some deadlines to be fulfilled, and for 2025 and so on, there are the goals for recycling and the objectives 2030 according to the Sustainable Development Goals of the United Nations.



In a temporal perspective, the existence of environmental laws coming from more than 30 years ago, as Directive 86/278 on sewage sludge, highlights the existence of issues to be solved in the EU among the Member States to agree on a modification. In the case of rule on sludge, the last attempt of modification was in 2000 with the 3rd draft of the Working document on sludge (EC, 2000), but it did not progress at all, and few substantial modifications have been introduced, and none of them affects the limits of heavy metals for use of sewage sludge in agriculture.

3.2. Collection of good practices on Circular Bioeconomy and Biowaste Management

The Good Practices compiled in the DBGP give an overview of some of the current actions concerning circular bioeconomy and biowaste management in the European Union, as well as pilot territories level. The GP collected belong to different territories not only to pilot areas. This is because the relation between GPs and the chains of the pilots do not correspond. Thus, there are GPs from different European countries and also out of Europe.

The access to this database can be found in the following link:

https://fundacioent.sharepoint.com/:x:/g/EXIMh2XzacR0vKW0c162ZNIBY9uoc0CJ2uuy-IOFgUITJg?e=dy0pPf

GPs were ranged according to the database fields and gathered as it can be seen in the caption of Figure 18.

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Country 1 (NUTS	Regional level (NUTS	Provincial level (NUTS3)	Type of biowaste	Type of action	Title 🗸	Objective *	Initial situation	New situation	Balance	Source
2 Italy	Lombardia	Milan	Food waste	Prevention	Food waste prevention in	Incentivising food waste	Poor knowledge of the situation on food waste and low	Estimation of volume of food waste and definition of the ways to	Definition steps to determine the needs in each case.	Report. Chifari et al., 2020
3 Spain	Catalonia	Barcelona	Household	System Nudge	Reduction of impurities in	Increasing the quality of	High content of impurities in biowaste	Reduction of mouth of the biowaste container	Reduction of impurities from 18% to 8%	Report. Chifari et al., 2020
4 Italy	Lombardia	Milan	Household	System Nudge	Door-to-door collection in	Increasing the separate	Collection in bring banks with low separate collection rate	Door-to-door collection	Increase of separate collection from 34% to 51% and impurities reduction in biowaste to 3.4%	https://www.municipalwaster lt/files/Benchmarking%20big%
5 Spain	Catalonia	Gavà	Household	Optimization and efficacy	Reduction in mouth of	Reduction of impurities	High content of impurities in biowaste	Reduction of mouth of the biowaste container	Reduction of impurities from 25% to 2.5%	http://residusmunicipals.cat/a de-la-boca-en-contenidors-de
6 Spain	Catalonia	Vilablareix	Vegetal oil	Optimization and efficacy	Door-to-door collection of	Social benefit and	Separate collection of paper and cardboard, packaging, glass,	Implementation of separate collection of vegetal oil and textile	Increase of collection of 31% between 2018 and 2019	http://residusmunicipals.cat/s /20210415093459.pdf
7 Czechia	Bohemia	Prague	Food waste	Prevention	Food donation	Reduction of food waste	High generation of food waste.	Amendment of legislation to facilitate the prevention of food	15 food banks in Prague alone through around 120 NGOs with kitchens	https://www.eea.europa.eu/j in-europe
8 Finland	Helsinki Region	Helsinki	Household	Separate collection	Home composting	Increasing the quantity	Biowaste collected separately or along with residual waste	Separation of biowaste to be treated locally by means of	Less collection and transport. Reduction of emissions. Reduction or municipal charges for participants.	Report. Chifari et al., 2020
		-		Prevention	Wasted Food	Fostering	In 2017, more than 40 million tons	Programme on Sustainable	Developing of several tools for preventing and diverting wasted	Report. Chifari et al., 2020

Figure 18. Overall look of the excel DBGP

Opposite to the policy framework database, in this case no further modifications were applied to the distribution or initial classification of the field, because the GPs collected fitted the project premises.

Even if section 3.2.1 will present all the selected good practices more in detail, the database is a useful tool to have all the information at sight and helps to classify and filter the GPs for type of waste and type of action.

For each GP, the fields of the database were filled as detailed in Table 11, along with an example of good practice for Italy.



Field	Description	Example
Country (NUTS1)	Mainly for the countries included in the project but suitable GPs from other countries have been also welcome	Italy
Regional level (NUTS2)	Mainly for the regions included in the project but suitable GPs from other regions would be also welcome	-
Local level (NUTS3/LAU)	Mainly for the provinces included in the project but suitable GPs from other provinces would be also welcome	Milan (LAU)
Type of waste	Agriculture organic waste; Biowaste; Food waste; Forestry residues; Households waste; Green waste; Industrial organic waste; Municipal mixed waste; No organic	Food waste
Type of action	Technological innovation; Optimization and efficacy of collection System; Communication and dissemination activities; Taxation; Control, surveillance, and sanctions; Prevention; Separate collection; Preparing for re-use; Decentralised treatment; System Nudge; Optimization of biodegradable waste composting plants	Prevention
Title of policy/measure	Title given to the measure	Food waste prevention in Italy
Objective of the measure	Aim or target of the measure/policy	Incentivizing food waste prevention and reduction through awareness raising and voluntary agreements
Initial situation	Description of the situation before the implementation of the GP	Poor knowledge of the situation on food waste and low participation
New situation	Description of the action	Estimation of the volume of food waste and definition of the ways to prevent its generation
Results	Result of the implementation with values if possible (% of increase/decrease, number of communities/persons affected)	Definition of the protocol to implement the logistics to reduce food waste through local procurement
Link/Reference	Link to web page or reference to the document of origin	

Table 11. Fields in the DBGP for the GP "Food waste prevention in Italy"



3.2.1. List of collection of good practices

This section presents the GPs collected that were identified as relevant for the project.

Title of policy/measure	1. Food waste prevention in Italy
Location	Italy, Campania, Milan
Type of waste	Food waste
Type of action	Food waste prevention
Objective of the measure	Incentivising food waste prevention and reduction through awareness raising and voluntary agreements
Description	The Milan Urban Food Policy Pact is an international pact signed by 209 cities around the world involving more than 450 million inhabitants (Milan City Council, 2015. For the coordination of this initiative, Milan put together a technical team – a panel of prominent experts with a strong track record in food-related issues and international experience. This technical team is coordinated by International Partners for Sustainable Agriculture (IPSA) and counts on the collaboration of: RUAF Foundation (International Network of Resource Centres on Urban Agriculture and Food Systems), the UN Food and Agriculture Organization (FAO) through the Food for Cities Initiative, and the Housing and Land Rights Network of Habitat International Coalition (HIC). This initiative is based on the voluntary agreement Milan Food Policy developed in 2015 by the Municipality of Milan and Fondazione Cariplo (Milan City Council, 2015. This policy aims to support the city's food industry players fostering a new strategic approach for food systems and food related challenge such as food waste prevention. Through local procurement, developing logistics for distributing surplus food, and valorising discarded organic material, cities aim to build more resilient urban food systems. Food waste is one of the 6 categories grouping the framework indicators foreseen from this international protocol. Each city needs to evaluate the following indicators: 1) Total annual volume of food losses and waste; 2) Annual number of events and campaigns aimed at decreasing food loss and waste; 3) Presence of policies or regulations that address food waste prevention, recovery and redistribution; 4) Total annual volume of surplus food recovered and redistributed for direct human consumption.

Title of policy/measure	2. Reduction of impurities in selectively collected biowaste in Spain
Location	Spain, Catalonia, Barcelona
Type of waste	Household biowaste
Type of action	System Nudge
Objective of the measure	Increasing the quality of selected collected biowaste and compost
Description	Separate collection of biowaste was first introduced in Barcelona in 2001 and was progressively deployed up until 2010. However, the levels of impurities in this separately collected biowaste were high. In 2014, the City Council of Barcelona was interested in adopting measures to reduce these levels. With this objective in mind, the area of Maternitat-Sant Ramon was selected to test a change in the collection system (SIRESA, 2016, (Ajuntament de Barcelona, 2014. In the original system, biowaste was collected by means of large open-lid street containers. The level of impurities was then around 18% in weight (January 2014-February 2015). In March 2015, the City Council changed the lid of 31 containers. The lid was them fixed to the container, with an approximate 30 cm round hole in the middle:



$\blacksquare \blacksquare \blacksquare \longrightarrow \blacksquare \blacksquare \blacksquare \blacksquare$
This measure induced changes in behaviour of users that were using these containers incorrectly, and as a consequence, during the period April-December 2015, the level of impurities fell to an average value of 8% Another effect of the measure was that the total quantity of selectively collected biowaste fell by almost 11%, comparing the same periods.

Title of policy/measure	3. Door-to-door collection in Milano (Italy)
Location	Italy, Campania, Milan
Type of waste	Household waste
Type of action	System Nudge
Objective of the measure	Increasing the separate collection of municipal solid waste and increasing the quality of the collected materials
Description	Municipal waste collection services can present very different characteristics. Door-to-door separate waste collection has been implemented widely across Europe. High collection frequencies for biowaste and recyclables induce citizens to separate these fractions. However, even in countries where this system is consolidated (such as Italy), its application is mostly limited to low-density small municipalities. This makes the case of Milano (Italy) of particular interest due to is size (1.3 million inhabitants) and high density (more than 7 000 inhabitants/km ²).
	In February 2012, a step before the introduction of separate collection of biowaste was to replace the traditional black bag with a transparent bag for the collection of the residual waste, to facilitate the monitoring of this collection. This simple change brought about an increase in separate collection of plastic (+1%), paper (+0.7%) and glass (+0.2%). The use of transparent bags is a system nudge to influence citizens behaviour in improving the quality of sorted waste fractions.
	Then, the municipality implemented door-to-door collection in four phases, from November 2012 to June 2014, one quarter after another. Paper and cardboard, glass and food waste are now collected in bins assigned to each household (for small buildings) or to each building (in case of large ones). Light metals, plastic and residual waste are collected in bags.
	Separate collection increased from 34.5% in 2011 to 51% in 2014. The quality of separately collected biowaste is very high, with only 4.3% of non-compostable materials.

Title of policy/measure	4. Reduction in mouth of biowaste container in Gavà (Catalonia)
Location	Spain, Catalonia, Gavà
Type of waste	Household biowaste
Type of action	Optimization and efficacy of separate collection system
Objective of the measure	Reduction of impurities in biowaste
Description	In 2006, containers of 800L for collection of biowaste in the municipality were substituted by 240L containers with small round mouths of 30cm diameter to avoid the presence of non-biodegradable waste. The opening of the container is only possible when the collection truck discharges the content. Awareness campaigns were used to improve collection as well as monitoring of big producers. Due to this, the content of impurities in biowaste fell from 25% to 2,5%



Title of policy/measure	5. Door-to-door collection of vegetable oil in Vilablareix (Catalonia)
Location	Spain, Catalonia, Vilablareix
Type of waste	Vegetable oil
Type of action	Optimization and efficacy of separate collection system
Objective of the measure	Social benefit and valorisation of oil
Description	In 2019 the municipality included the separate collection of vegetal oil from citizens. A particular container of about 2-3L is provided to citizens and once filled they have to call to activate the collection service, which is a door-to-door system once a month. The worker will empty the container and leave it again. Also, there is the option to bring the oil to the civic amenity site. The awareness campaign included information about the pollutant potential of oil if spread in the environment and was disseminated through the web page and social media. The quantity of oil collected increased from 614 L to 807L from 2018 to 2019, which is a success. The collection is done by a company and the average yearly cost for the service is 360€.

Title of policy/measure	6. Prevention of food waste in Czechia
Location	Czechia, Bohemia, Prague
Type of waste	Food waste
Type of action	Prevention of food waste
Objective of the measure	Reduce food waste from supermarkets
Description	In order to prevent food waste and to promote food redistribution, the legislation was amended in a way that 15% of VAT was abolished in donated food and the stores larger than 400m ² were obliged to donate edible food. At least, 15 food banks with kitchen were created in Prague with the participation of 120 NGOs.

Title of policy/measure	7. Home composting in Finland
Locations	Finland, Helsinki
Type of waste	Household biowaste
Type of action	Source separation and recycling
Objective of the measure	Increasing the quantity and quality of home composted biowaste and diverting waste from public waste collection systems
Description	Biowaste is the most relevant household waste flow (33%) in mass terms in Finland. When feasible, home composting delivers several benefits. First, it contributes to divert biowaste from the general public waste collection system, which implies reductions of costs and related GHG emissions. It is estimated that, in those households carrying out home composting, an average of 60% of food waste generated is home composted whereas 40% is managed through complementary collection services. Second, when home composting households are trained and supported, biowaste is transformed into high quality compost which can in turn provide a cheap source of fertilizer and private green areas. In addition, home composting results in significant lower net emissions than landfilled biowaste. Finland encourages home composting programmes, which are managed at municipal level since the early 90's. Moreover, training, support and infrastructure (e.g. composting units) are provided within these programmes. For example, the Helsinki Region Environmental Services Authority HSY (Helsinki Region Environmental Services Authority, 2019) provides free 2-hour courses on home composting. Home composting programmes are led by public administrations at municipal and regional levels and assessed by the national authorities. As related to the EU waste



legislation, home composting contributes to achieve waste recycling targets. Additional successful
home composting cases can be found in the document Environment Directorate, 2000.

Title of policy/measure	8. Wasted Food Programs and Resources in the United States
Location	USA
Type of waste	Food waste
Type of action	Food waste prevention
Objective of the measure	Fostering food waste prevention through awareness raising and capacity building
Description	Food loss and food waste generation have been acknowledged as important environmental problems in the United States. In 2017, more than 40 million tons of food waste was generated, and around 93% of it ended in landfills or in waste combustion facilities.
	In 2015, the United States Department of Agriculture (USDA) and the Environmental Protection Agency (EPA) presented the goal to reduce food loss and waste by 50% by 2030.
	To achieve this goal, the EPA has a programme on Sustainable Management of Food. Under this programme, several horizontal initiatives are developed, such as providing information on the food recovery hierarchy, supporting the "Further with Food. Center for Food Loss and Waste Solutions" or developing the Winning on Reducing Food Waste Federal Interagency Strategy.
	Besides, several tools for preventing and diverting wasted food have been made available, such as:
	 Reduce Wasted Food Tips "Food: Too Good to Waste" Toolkit and Guide Food donation programmes Resources to support home Composting EPA has also launched the Food Recovery Challenge (FRC), a programme addressed to institutions, businesses and organizations willing to improve their sustainable food management practices and report their results. They can join the FRC as participants or as endorsers. Participants prevent and divert wasted food in their operations, whereas endorsers promote the sustainable management of food by educating organizations and businesses about the benefits of preventing and diverting wasted food.
	The EPA is also working with State Agencies and Local Authorities to address this question. The EPA website gathers all these actions according to 10 regions.

Title of policy/measure	9. Separation of mixed municipal waste in the regional landfill of Pazardzhik
Location	Bulgaria, Pazardzhik
Type of waste	Mixed municipal waste
Type of action	Preparing for re-use
Objective of the measure	The aim is to create a regional waste landfill where separating mixed municipal waste and preparing
	them for re-use, not at the local level but at the regional level
Description	In the regional landfill of Pazardzhik, thanks to the separation and composting installations, the waste is separated at the plant and part of it is being recycled and re-used, and the rest is being deposited in the landfill. This way the part of the waste that can be sold on the market as a raw material will be used.



Title of policy/measure	10. Integrated system of facilities for recycling, treatment and recovery of mixed municipal waste
Location	Bulgaria, Sofia region
Type of waste	Mixed municipal waste
Type of action	Optimization and efficacy of collection System, Technological innovation
Objective of the measure	The goal is to achieve 90% utilization and recycling and only 10% waste disposal
Description	The plant for mechanical-biological treatment of household waste produces RDF-fuel, electricity and bioestabilised, and before that all materials are determined.
	A project has also been developed that utilizes the produced RDF by producing energy, allowing secondary recycling and reducing by 90% the amount of waste that reaches the landfill.
	Waste processing is performed by Herhof technology and includes the following steps:
	• Conveying and preliminary sorting, separation of hazardous and bulky materials;
	• Mechanical treatment for the separation of recyclable materials and the production of RDF fuel;
	• Biological treatment through a patented process of biological drying, stabilization and production of high-quality RDF fuel and compost-like product.

Title of policy/measure	11. Municipal Collection system in Gabrovo
Location	Bulgaria, Gabrovo region
Type of waste	Green waste, food waste and other household waste
Type of action	Optimization and efficacy of collection System
Objective of the measure	Gabrovo wants to be a municipality with zero waste, by receiving a certification as a municipality with zero waste. This is a title given by Zero Waste Europe only to those settlements that manage to reduce waste and organize collection according to world standards of recovery.
Description	The houses with yards in the Gabrovo town and the region are supplied with separation containers for green residues, like grass, leaves, straw, hay. Kindergartens, schools and most of the establishments collect food waste. In Gabrovo town there are also containers for textile waste at many points in the city, as well as a system for collecting cooking fat. The collection of hazardous waste materials and batteries is also organized by using mobile points of collection.
	The main waste facility is the regional landfill of Gabrovo, that apart from municipal waste from Gabrovo, also serves the municipality of Tryavna. Whin this installation there are a separation plant, a composting site, and a space for disposal of waste that cannot be processed and recovered.

Title of policy/measure	12. Biodegradable waste composting plant and pre-treatment for mixed household waste
Location	Bulgaria, Pazardzhik region
Type of waste	Green waste and household biowaste, mixed municipal waste
Type of action	Optimization biodegradable waste composting plants
Objective of the measure	Once it is operational, it is expected that more than 5,000 tons of resources (paper, plastic, glass and metals) will be released from the total household waste, which will be exported for recycling and reuse.
Description	Waste treatment plant that includes two lines: one for composting of separately collected green and biodegradable waste to obtain high quality compost and the other line for pre-treatment of mixed household waste from the municipalities of Velingrad and Rakitovo to obtain recyclable or reusable fractions to send to processing companies. The rest is sent to landfill.



Title of policy/measure	13. KAYT in e-containers separate collection system
Location	Spain, Catalonia, Sant Just Desvern
Type of waste	Household waste
Type of action	System Nudge
Objective of the measure	Increase participation in separate collection
Description	The KAYT idea arose in the project Horizon 2020 Waste4think. With this base, the GP implements continuous information systems for users that receive information about its participation in the implemented collection system via WhatsApp, SMS o Telegram. Also, individual meetings are organised to help improving the participation.
	This GP is developed in the framework of the LIFE REthinkWASTE: Rethinking municipal tariff systems to improve urban waste governance aims to provide public organisms of a management tool based on PAYT and KAYT systems

Title of policy/measure	14. Food waste kitchen sink disposers in Malmö
Location	Sweden, Scania, Malmö
Type of waste	Food waste
Type of action	Technological innovation
Objective of the measure	To use waste disposers as an alternative to the separation of food waste in the development areas in Malmo
Description	The proposed practice from City of Malmö consists of a pilot project in which kitchen waste disposers have been installed as an easy-to-manage method of dealing with food waste to produce biogas. Initially, the kitchens of 200 homes, within the Housing Fair BoO1 area, were the participants. The waste disposers are the size of a large thermos and were installed beneath the sink. The developers themselves had to install and maintain the waste disposers and the pipes that were needed in their buildings. The municipally owned water company VA Syd installs and maintains tanks, empties and manages the waste slurry. This GP is developed in the framework of the project Urbans Wins.

Title of policy/measure	15. Green Deal for the recycling of forest biowaste through energetic valorisation
Location	France
Type of waste	Forestry residues
Type of action	Optimization and efficacy of collection System
Objective of the measure	Achieve the objective of 50% of substitution in fossil fuels
Description	Wood waste from deconstruction of buildings is usually derived to landfill, but with this GP the idea is to recover the woody waste as used as energy for cement factories to reduce consumption of fossil fuels.The aim is to fulfil with the goals of the Green Deal document.

Title of policy/measure	16. Increase in caption of biowaste
Location	Spain, Catalonia, El Papiol



Type of waste	Household biowaste
Type of action	Technological innovation
Objective of the measure	Increase the separate collection of biowaste
Description	The implementation of locked containers with key has been used as the tool to increase the biowaste
	from households separately collected. Before the implementation of the system this fraction was separately collected in open containers.
Type of action Objective of the measure Description	Technological innovation Increase the separate collection of biowaste The implementation of locked containers with key has been used as the tool to increase the biowast from households separately collected. Before the implementation of the system this fraction was separately collected in open containers.

Title of policy/measure	17. Intelligent containers in Sant Andreu district
Location	Spain, Catalonia, Sant Andreu (Barcelona)
Type of waste	Household biowaste
Type of action	Technological innovation
Objective of the measure	Increase the separate collection
Description	In the neighbourhood of Sant Andreu in Barcelona city, the separate collection system for biowaste was changed from open containers on the streets with free access to the use of biowaste containers with user identification. To increase the efficiency of the measure, door to door collection for residual, paper and cardboard and light packaging streams was also implemented. After the trial period, it was observed that the increase of the separate collection shifted from 37% to 76%.

Title of policy/measure	18. Increase of separate collection in la Conca de Barberà through DtD and e-containers
Location	Spain, Catalonia, La Conca de Barberà
Type of waste	Household waste
Type of action	Technological innovation
Objective of the measure	Increase the separate collection
Description	Since 2020 the area has separate collection by door-to-door and by intelligent containers, depending on the area. This produced the increase in separate collection up to 61,1% in 2020 in all the area of Conca de Barberà, and 80,2% for 2021, significantly higher than the Catalan average of 45% The opening of the containers is produced through an app or magnetic card. Also, door-to-door collection improves the quality of the collection system.

Title of policy/measure	19. User ID cards in Tarragona to access smart containers
Location	Spain, Catalonia, Tarragona
Type of waste	Household waste
Type of action	Technological innovation
Objective of the measure	Increase the separate collection
Description	Implementation of access control in containers for biowaste and residual waste through identifying card or mobile phone app in three neighbourhoods of the city. In one of them the uses of the residual waste container are limited to 3 days per week, except for sanitary textile (nappies and similar) which is accessible daily. Users would have available a physical information centre and there is the commitment of carrying out visits to private residences or commerce when needed. Educators also would be able to inform user during the deployment of the new service beside the containers. This action would allow to introduce in the future a fairer waste charge.



Title of policy/measure	20. Community Composting in the city of Nitra
Location	Slovakia, Nitra
Type of waste	Household waste
Type of action	Optimization and efficacy of collection System
Objective of the measure	Reducing the amount of landfilled bio-waste
Description	The main issue of this project regarding environmental problems is to reduce the amount of landfilled bio-waste. It is intended to improve the local environment by using compost in already existing ornamental planting. An important goal is also to get the local community familiar with the issue of composting, mainly in terms of its benefits and change of the way how the bio-waste and its use is perceived so far. (i.e., it is not merely a smelly raw material in a garbage container to be disposed of as soon as possible).
	The bio-waste of different homes is transformed by the mains of composting in a three-phase process, from decomposition to maturation. In the meantime, a second chamber is available for bio-waste disposal. The compost obtained is weighed to assess the amount of bio-waste that would otherwise be disposed in the landfill.
	Fifty households are successfully involved in the project. Each household obtained a manual for bio- waste sorting (i.e., what raw materials can be composted), a bio-waste bucket and a key from the composter, as it is lockable to ensure that inappropriate materials are not thrown in by unauthorized persons.

Title of policy/measure	21. Perseo Bioethanol plant from cellulosic waste from MBT
Location	Spain, Valencia, L'Alcúdia
Type of waste	Industrial biowaste (cellulosic fraction)
Type of action	Technological innovation
Objective of the measure	Valuable valorisation of the cellulosic in a circular economy context
Description	In the biotechnological demonstration plant of PERSEO (PERSEO Bioethanol® plant) the feedstock material, cellulosic rejection streams from waste and wastewater treatment plants from the Barcelona Metropolitan Area, will be transformed for the production of bioethanol. The plant has a capacity to process 25 tonnes/day of feedstock.
	PERSEO, together with the WaysTUP! partner CIEMAT, have developed this bio-technological patented technology (European Patent EPO 2112226, USA Patent 8399228 B2 and international PCT WIPO 099038) to produce second-generation bioethanol from the organic fraction of MSW (PERSEO Bioethanol®).

Title of policy/measure	22. Insect protein
Location	Spain, Valencia, Alicante
Type of waste	Household biowaste
Type of action	Technological innovation
Objective of the measure	Transform biowaste into insect protein to produce alternative product
Description	This new waste-based insect industry challenges the traditional view of organic 'waste', by considering it a 'resource', and hence achieving a reduction of waste as well as retaining and upgrading valuable nutrients. The University of Alicante will work with its team of entomologist researchers, experts on the artificial breeding of <i>Hermetia illucens</i> , and other groups of biodecomposing flies. During the treatment, the waste will be converted into larval biomass which



contains high amounts of protein and fat that can be used in animal feeding
Thus, the WaysTUP! team decided to target the creation of insect protein (protein-rich insect flour) from source-separated bio-waste and meat and fish by-products in Alicante (Spain)

Title of policy/measure	23. Home composting and community composting in Pla de l'Estany area
Location	Spain, Catalonia, Pla de l'Estany
Type of waste	Household biowaste
Type of action	Decentralised treatment
Objective of the measure	Boost the local treatment of biowaste instead of industrial plants
Description	More than 500 of individual composting containers and 12 for community composting were distributed in the area for the treatment of biowaste. All the containers for biowaste collection were removed to promote individual and community composting. The main municipalities are in dispersed rural areas with low production of biowaste, which makes local composting more attractive. The action was accompanied by awareness campaigns on separate collection and home composting. As a result, 133 t in 2016 were treated by home and community composting in the area.

Title of policy/measure	24. Web page for incentivising food waste reduction
Location	Spain, Catalonia
Type of waste	Food waste
Type of action	Communication and dissemination activities
Objective of the measure	To provide a catalogue of actions (tools, advice, recipes) to avoid food waste
Description	Som gent de profit (see section) is a platform (<u>https://somgentdeprofit.cat/</u>) that provides citizens with tools to reduce food waste, which in Catalonia is estimated at nearly 35 kg/inhabitant/year (about 250.000 t). The web page offers a catalogue of actions aiming prevention, such as tools to range the fridge, advice about expiry dates of products, responsible consumption, or cooking recipes. They offer also workshops for schools to raise consciousness.

Title of policy/measure	25. Environmental benefits from the production of sustainable furniture
Location	United Kingdom
Type of waste	Forestry residues
Type of action	Technological innovation
Objective of the measure	Environmental benefits from the production of sustainable furniture
Description	Wood waste from the production of furniture was sent to energetic valorisation as main treatment. With the new system proposed, the wood waste products would be reclaimed and recycled into new office furniture products and non-useful parts would be used for energy recovery for the same industry. The closed-loop process enables to ethically dispose of more than 1,000 tonnes of wood waste each year, which previously was sent for heat recovery. In this context, the conversion of the waste material back to raw material allows repeated making of new particle board.

Title of policy/measure	26. Bioethanol from by-products of food industry
Location	Finland, Päijänne Tavastia, Lahti
Type of waste	Food waste



Type of action	Technological innovation
Objective of the measure	Bio-based process residues from beverage to produce bioethanol
Description	Industrial processes generate different by-products, often in large amounts. Despite the by-products' potential to be utilised in other processes, they often end up as waste. In this case, industrial symbiosis allows to process residues of food industry and be utilised to produce biofuel. The plant in Lahti (Findland) involved in this process is able to produce 1 million litres of bioethanol in a year with 80% of bioethanol.

Title of policy/measure	27. Community composting of food waste
Location	Spain, Castilla La Mancha, Ciudad Real
Type of waste	Food waste
Type of action	Separate collection implementation
Objective of the measure	To implement the initiative for the separate collection of food waste in large generators
Description	In the study area there is a lack related to optimisation of the flows of materials, energy and waste and lack of coordination between different administrations, foundations and occupational centres. Because of this, one of the options considered was the implementation of separate collection of food- waste in large generators.
	The amount of biowaste obtained in the initial phase is 900 kg/month, from which it is expected to obtain about 350 kg/month of compost, which will be supplied to the gardens and greenhouses of the participating centres to agricultural purposes.

Title of policy/measure	28. Plan National pour la Gestion des Déchets - PNGD (National Plan for Waste Management)
Location	Luxembourg
Type of waste	Food waste
Type of action	Prevention
Objective of the measure	Promoting sustainable consumption while reducing food waste along the whole food chain
Description	The PNGD estimates that around 46% of consumer food could be avoided with stronger waste prevention (equivalent to 31000 tonnes, or 56kg/person/year). The objective of the action was to reduce by 50% the food waste quantities. Because of this, it was launched the "Clever lessen" project was launched: promoting sustainable consumption while reducing food waste along the whole food chain. The main actions are:
	 Promotion of labels, in particular the European eco-label. Launch of consumer information and awareness campaigns. Support initiatives in the field of donation and redistribution of foodstuffs intended for human or animal consumption.

Title of policy/measure	29. Large scale implementation of household organic waste separate collection (Part of PNGD)
Location	Luxembourg
Type of waste	Household biowaste
Type of action	Separate collection implementation
Objective of the measure	Implementation of separate collection of biowaste



Description	In the absence of sorting at source and separate collection, bio-waste collected with household,
	assimilated and bulky waste is always subject to an elimination through incineration or landfill.
	Separate collection was implemented, and it was achieved a 41.1% reduction in the organic fraction in
	the household waste bin between 2010 and 2014 was achieved. A better follow-up of the evaluation
	of the composition of food waste is mandatory. Finally, the strengthening of separate collection -
	sorting at household and development of the logistics and infrastructure for separate collection was
	achieved. Then, the objective of reducing the organic fraction contained in unsorted household waste
	by 60% by 2022.

Title of policy/measure	30. Deployment of biowaste valorisation through anaerobic digestion and biomethanisation (part of PNGD)
Location	Luxembourg
Type of waste	Household biowaste
Type of action	Decentralised treatment
Objective of the measure	Extend the production of bioenergy while reducing the amount of unexploitable biowaste.
Description	In the absence of sorting at source and separate collection, bio-waste collected with household, assimilated and bulky waste is always subject to an elimination through incineration or landfill. The treatment of organic waste by anaerobic digestion and biomethanisation is important and was established for the treatment of biowaste and also a national network for the treatment of bio-waste collected separately was established. Also, the use of biomass as an energy resource was strengthened. Home composting was promoted and also the development of quality standards for compost.

Title of policy/measure	31. Implementation of separate collection of green waste
Location	Luxembourg
Type of waste	Green waste
Type of action	Separate collection implementation
Objective of the measure	Recovery of green waste for management different to incineration
Description	This type of waste, which most often comes from the maintenance of orchards and vineyards, hedge cutting or silvicultural work, has often been incinerated on site in the open air. In the absence of an appropriate network for the collection, storage and use of this waste as a source of renewable energy and incineration prohibited, the objective was to recover the biomass produced on the territory of Luxembourg itself via different techniques: grinding and composting and energy recovery in the appropriate facilities. Asa consequence, it was achieved the establishment of a national network for the collection and recovery of green waste and the promotion of alternatives to incineration was achieved.

Title of policy/measure	32. Reducing biowaste from domestic waste
Location	France, Pays de la Loire, Mauges
Type of waste	Household biowaste
Type of action	Optimization and efficacy of collection System
Objective of the measure	Reduction of operational costs of household waste disposal



This practice comes from a political will of a territorial waste management trade union to reduce operational costs of household waste disposal, that were increasing each year. Prior to the project, waste was collected every week, whereas a study showed that not every household would take trash bins outside for disposal (only 10% would) or that trash bins would be only half full. Mauges Communauté has therefore implemented a waste management program, collecting trash every 15 days in an automated way and invoicing households per number and volume of trash bins treated. Thus, households were financially incentivized to reduce their quantity of waste.
One of the ways to reduce waste production is to remove biowaste from domestic waste. To allow households to separate and treat their fermentable waste at source, Mauges Communauté has supplied composters. Households wishing to install a composter had to pay a contribution, 50% of the price being paid by Mauges Communauté thanks to funding from the Environment and Energy Agency (ADEME). 10,000 households have been equipped with composters. The composter came with a user guide, and an advisor was available to explain how to use it.
Today, ADEME funding stopped but Mauges Communauté continues to provide composters and to finance half for households wishing to get one. Thus, the number of households with a composter is constantly increasing, and the implementation of collective composters has started.

Title of policy/measure	33. Valorising green waste in the garden
Location	France, Pays de la Loire, Mauges
Type of waste	Green waste
Type of action	Taxation
Objective of the measure	Valorisation of green waste
Description	Following the 2011 prefectural decree prohibiting burning of green waste, supply of plant residues has steadily increased significantly in landfills and became the most important waste collected by public service in the Mauges (France). The aim of the good practice is to help individuals to value their green waste in situ in order to:
	 Limit waste disposal transport (CO2 reduction), Reduce waste brought to landfills, Reconstitute local circular loops allowing inhabitants to reduce the use of synthetic and/or organic fertilizers, promote biodiversity in the garden, increase biological richness of cultivated soils. Since 2010, the local authority offers a 50% subsidy (capped at 1 500€) for the purchase of a shredder, for associations wishing to buy it and make it available for residents. It benefited 6 associations in 2017. The results show a decrease in the biowaste that arrives to centralised treatment plants. In 2016, to encourage the practice, local authority has entrusted an environmental association (the CPIE Loire Anjou) with the management of the network of associations already in place and with helping new associations to emerge. It has also granted annual assistance to associations for maintenance of their equipment. At the same time, shredding demonstrations in public square or in waste disposal centres were held. A guide document was created, and 50,000 copies distributed.

Title of policy/measure	34. Sustrato universal: ¡cerramos el círculo!
Location	Spain. Different places
Type of waste	Food waste
Type of action	Decentralised treatment



Objective of the measure	To produce growing media substrates from own biowaste in a large chain of supermarkets (Alcampo)
Description	In 25 Alcampo centres in Spain, organic waste is segregated into sealed containers that, once filled,
	are transported by Saica Natur to a composting plant belonging to Castellano Manchega de Limpiezas,
	for recovery. The compost obtained is subsequently used by Semillas Batllé to manufacture the
	universal substrate enriched with this high-quality compost, in 10 % of the final composition of the
	product.

Title of policy/measure	35. Turn used oil into soap
Location	Spain, Madrid
Type of waste	Vegetable oil
Type of action	Preparing for re-use
Objective of the measure	Reduce impact of oil in the environment through re-use and recycling
Description	SOUJI is a 100 % Spanish liquid based on minerals and vegetables, which when mixed and shaken with used cooking oil transforms in just 1 minute into an ecological, multipurpose detergent with a pleasant aroma. No caustic soda or handling risks. The idea is to offer an alternative for the management and reuse of this waste, and to implement a circular model from the origin of the waste.

Title of policy/measure	36. CIA: putting coffee husks to good use
Location	Italy, Marche region, Ancona
Type of waste	Industrial biowaste
Type of action	Technological innovation
Objective of the measure	Improve costs of management of coffee husks
Description	The initial aim of CIA (Controllo Inquinamento Ambientale) was to reduce the amount of money the company spent on waste management. However, waste generated by a production process can become a resource in a circular economy model.
	When coffee beans are roasted using jets of hot water vapour, the coffee husks are not contaminated by any dangerous substances. The first step was to have coffee husks classified as by-products and not waste under Italian law.
	Subsequently, the CIA looked into ways to use this splendid secondary material, in compliance with good industrial practice. Based on the quantities produced and the company's geographical area, in- depth research showed that the most appropriate way to reuse coffee husks was as a fertiliser and soil conditioner by composting them in organic farms.

3.2.2. Analysis of the gathered good practices and relation to pilots

The search through the sources of information (section 2.2.3) provided a list of 36 good practices about circular economy and biowaste management, from different countries. Opposite to the regulation, in this case the aim was not to collect an exhaustive number of references but some of the most significant ones, which can provide useful information for the project.



The consulted sources provide many interesting GPs. For example, the website of Residus Municipals¹⁶ has more than 100 interesting GPs related to municipal waste and the European Stakeholder Platform¹⁷ has more than 700.

The collected GPS on biowaste and circular economy are mainly related to household waste (17) and food waste (10), and few about green and forestry waste (6). Regarding the type of action, the most common one was optimisation and efficacy of separate collection (10). There is still a long way to comply with the recycling objectives in all EU countries, even if the implementation of separate collection is being carried out in all the countries but with different intensities. Because of this, new good practices actions will appear in the coming years.

Communication campaigns and awareness are identified as one of the main resources to improve the separate collection and recycling of waste. The collected good practices include nudging and new technologies as intelligent containers and identification systems as tool to improve separate collection and increase the value of biowaste.

Depending on the area, the relevance of the GPs can be different. For example, there are places where the plain implementation of separate collection is considered as a GP while in others waste separate collection was implemented years ago and the current trends are more related to technological innovation, with an access control system to the collection. There are still actions dedicated to communication and awareness, and some administrations, such as the Waste Agency of Catalonia, require its implementation as a condition to access subsidies related to separate collection¹⁸.

Regarding the type of action, Technological innovation (10) and optimisation of collection system (8) are the categories more represented in the GPs. Decentralised treatment and prevention (4) and implementation of separate collection (4) are next. Finally, System nudge (3), Taxation (1) are less represented in the GPs followed by preparing for re-use, communication and industrial composting process with only 1 representative. As mentioned before, the aims of sustainable development or the goals of the EU regulation for the next years, move local administrations to develop systems to improve separate collection in order to achieve recycling goals.

Among the collected GPs, the most relevant to the pilots are the ones concerning the three selected biowaste chains: biowaste from municipal waste (MAB pilot), biowaste from agro-industrial waste (MCN pilot) and biowaste from agroforestry waste (PP pilot). Most of the GPs converge in the interest of the selected chain in the MAB pilot, because they were related to the separate collection of municipal biowaste. Only a few of the collected GPs refer to the valorisation of agro-industrial biowaste that could be of interest to the selected chain in the MCN pilot. Similarly, for the agroforestry chain selected in the PP pilot, few GPs were collected, and they focus on energy valorisation and use in construction of wood waste.

¹⁶ www.residusmunicipals.cat

¹⁷ https://circulareconomy.europa.eu/platform/en/good-practices

¹⁸ https://www.accio.gencat.cat/ca/serveis/cercador-ajuts-empresa/


3.2.2.1. Good practices related to the MAB pilot

The GPs more relevant to the MAB pilot concern the reduction of the impurities content in biowaste, the increase of the quantity of collected biowaste and the separate collection ratio.

The GPs collected include technological innovation through e-containers with identification systems, apps based on KAYT principles and personal support as awareness actions to help users to check if they are separated correctly. The fundamentals of separate collection have not changed since the initial implementations in the 90s of the last century: technology and awareness. Nevertheless, the development of technology has meant that the monitoring and control, and the reactions are easier and faster. In this sense, some local administrations have stablished tax benefits towards those citizens that more actively participate in the system.

Innovation and the search for new technologies is important to improve separate collection, even though it has been proven that personal support to inform and to nudge should be part of the path to success, which is the procedure followed by the Waste Agency of Catalonia.

The good practices implemented in the pilot area of Barcelona are related to taxation and separate collection. The former, through the Catalan disposal tax, which raises revenue to help the introduction of a biowaste separate collection. The latter, with the aim to increasing the quantity and the quality of collected biowaste through the Zero Waste Metropolitan Agreement, supports the implementation of individual collection schemes and the waste charge reduction for participants in biowaste collection.

3.2.2.2. Good practices related to the MCN pilot

The GPs that are more related to the pilot of MCN are focused on the transformation of agro-industrial biowaste into new fuels as bioethanol or to produce insect protein. These practices correspond to technological innovation and industrial biowaste. Specifically related to the chain of the MCN pilot, only one GP about management of waste coffee was included.

Regarding this pilot, GPs on the separate collection of biowaste are also extremely relevant, because the higher the quality of biowaste the higher the possible uses, particularly regarding bioproducts.

Although many actions are needed to close the loop of the waste cycle in the pilot area of Naples, several private companies are already implementing good circular economy practices at local level (e.g., bioplastics, cosmetics, drugs, biogas and biomethane from biowaste, or shopping bags from fabric scraps, etc.). To encourage the effective dissemination of good practices, appropriate information campaigns should be organized. The increase in the number of innovative practices in the field of the circular economy would support the bio-economy sector which, already now, is worth a few billion euros in the Campania Region.

3.2.2.3. Good practices related to the PP pilot

Regarding the PP pilot, the most interesting GPs are those related to green waste and forestry residues since the selected chain for the project is the biowaste from the forestry sector. The opportunity for this material includes biological treatments as composting, energy valorisation or construction material. The value of forestry



waste or urban trimmings as complementary material for composting has been widely demonstrated due to its capacity to improve the nutrient balance and structure of the process.

The use as biomass also has presented solutions to reduce the dependence of fossil fuels, used as it is or pelletized. These two uses represent good practices for the pilot, however 35% of forestry waste is currently left on the ground in the forest because of the difficulty to transport it to other management sites or even worst landfilled. Because of this, the GPs addressed to separate collection of this stream are relevant to get a better profit in several aspects as environmental and economic. The GPs concerning the energy valorisation of wood waste, which in other areas could be considered as a low innovative practice, in this case, it can be of special interest. Indeed, in the region there is a great potential for wood waste (60% of total area is forest) which remains in part in the forest not collected and not used for heating. Heating systems in some of the public buildings (as for example some schools, hospitals, kindergartens, etc.) located in the rural settlements are still oil boilers. These settlements could use wood waste residues for replacing their current energy systems. Moreover, the risk of fire due to the excess of accumulation of this waste could be reduced with the introduction of this GP. The GPs collected related to green and forestry waste are also addressed to the production of biofuels to reduce the consumption of fossil fuels and recycling of wood waste for production of furniture, mainly for offices.

Other uses as construction material have also been proved and are less explored and in the case of the pilot of Pazardzhik could be of interest. The use of forest biowaste in construction can have important benefits as wood reduces energy consumption due to better isolation (Avellaneda et al., 2020). The project REHAP (Systemic approach to Reduce Energy demand and CO2 emissions of processes that transform agroforestry waste into High Added value Products) focused on the obtention of construction materials from agriculture and forestry waste.

3.2.3. Actions towards circular economy

Actions addressed to the knowledge and implementation of circular economy and bioeconomy are necessary at different levels. The actions carried out regarding circular economy reach countries in all the world, from conferences to practices involving participation in actions. Therefore, public administration must produce plans and regulations to boost the transition, but also other actions involving the direct participation of citizens in events can help to spread awareness. In the frame of the BCC project some actions have been compiled and are described in this section.

3.2.3.1. Europe

At European level there are two examples of actions, the European Week for Waste Reduction (EWWR) and the EU Green Week (GW).



The **EWWR**¹⁹ started in 2009 under the LIFE programme until 2017, when it became financed through the European Steering Committee. The objectives of the EWWR are:

- to raise awareness about waste reduction, product reuse and material recycling strategies, and related European Union and Member States policies,
- to highlight the work accomplished by EWWR participants,
- to mobilise and encourage European citizens to concentrate on four key action themes,
- to reinforce EWWR stakeholders' capacities by providing them with targeted communication tools and training.

One of the actions developed is the Let's Clean Up Europe with cleaning actions across Europe to remove litter from different areas as beaches, forests and elsewhere in nature. The actions are carried by volunteers and staff of participant organisations of the Steering Committee. Apart from the cleaning actions, there are awards and training activities to offer new proposals for the week. People can join the EWWR as an action developer, participant in existing action or as a coordinator (only for public authorities). The EWWR takes place every year with a different topic. In 2021 it was dedicated to Circular Communities.

The **GW**²⁰ is an annual opportunity to debate European environmental policy with policymakers, leading environmentalists and stakeholders from across Europe and beyond, and to raise awareness and involvement among a maximum number of stakeholders and anyone interested in environmental protection at local, regional and national levels.

Partners can organise events in a free format according to the expected audience with the only requirement that it is in an environmentally friendly and sustainable manner. The topics and sectors range from industry and new technologies to biodiversity and climate change and take place across Europe. These partner events are not organized by the European Commission, and views expressed are of their own.

3.2.3.2. Spain

Hosted by the Ministry of Ecological Transition and Demographic Challenge (MITECO), in 2017 the Workshop on Circular Economy²¹ (Jornada de Debate de Economía Circular) took place. The aim was to think about key issues to develop the Spanish Strategy on Circular Economy. Several conferences gave way to representatives of European and local administrations regarding the role of public administrations and the identification of the priority policies aiming at circular economy. Up to eight different questions were discussed among the

¹⁹ https://ewwr.eu/

²⁰ https://ec.europa.eu/environment/eu-green-week-2022_en

²¹ https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/economia-circular/jornada-debate/



participants in specific groups according to the stakeholders' interests and produce relevant content for the Spanish strategy. The final result was the publication in 2020 of the Spanish Strategy on Circular Economy.

The AMB hold at least twice a year the "Environmental Seminars"²². These seminars aim to promote the exchange of information, experiences and strategies on environmental themes that may be useful for local administrations. These seminars include aspects as energy, waste, sustainability, or water treatment among others. They are addressed mainly to local administrations in order to provide a better service to citizens and improve their participation in related activities.

3.2.3.3. Bulgaria

The Regional Environmental Committee of Pazardzhik Province is summoned at least once each year. It is chaired by the Pazardzhik Regional Administration (PRA - https://www.pz.government.bg), and members are municipalities from Pazardzhik Province, as well as REAP and other energy and environmental actors. The topics discussed by the Committee are: improvement of waste management at local and regional level, larger deployment of local and sustainable RES (renewable energy sources), clean energy and environmental projects in the territory of Pazardzhik Province.

3.2.3.4. Italy

In Italy there are some good examples of actions, one of which is the Circular Economy Network²³. It is a group of companies, organizations and entities aiming to further develop the circular economy concept in Italy. There are annual conferences in which the aim is to collect and share studies, research, and data on circular economy in order to identify the key indicators and analyse the national performance over the years. Also, it is focused on the main challenges and bottlenecks to address, identifying the potential solutions. The resulting strategies will be then shared with policy makers trying to create a link between industries and entities.

Another good example is the Osservatorio Recovery²⁴, which is a platform hosting the criteria for projects related to separated collection and recycling for wood, plastics and electronic wastes, as indicated by the PNRR.

Finally, hosted by the Ministry for the Ecological Transition (MITE)²⁵, there are the initiatives and project criteria on the recycling plants, separate collection and flagships initiatives for wood, plastic and electronic waste supply chains.

²² https://www.amb.cat/web/ecologia/actualitat/seminaris/seminaris-ambientals

²³ https://circulareconomynetwork.it

²⁴ https://www.osservatoriorecovery.it/i-decreti-del-mite-per-leconomia-circolare-e-per-il-piano-operativo-per-il-sistemaavanzato-e-integrato-di-monitoraggio-e-previsione/

²⁵ https://www.mite.gov.it/pagina/pnrr-pubblicazione-decreti-economia-circolare



4. Discussion focused on the pilot areas

The discussion has been developed through a combined analysis of the policy framework and the good practices and has focused on the pilot contexts. Moreover, discussion was also driven by feedback coming from the first group of living labs and the first peer-review session on challenges and potential solutions for the local biowaste management systems. The most significant topics for all pilots revolve around the separate collection of biowaste and innovative treatments for the biowaste valorisation and special attention is given to valorisation of agroforestry waste for the Pazardzhik pilot. This section will be particularly important for supporting the development of policy recommendations fostering the implementation of circular and innovative good practices in the different pilots. For each pilot a discussion is developed starting from the main issues encountered in the selected biowaste chains, understanding the main messages coming from the current policy framework and to finalizing with primary recommendations about the potential good practices or policies that can be appropriate to the specific context.

4.1. Discussion on the Barcelona pilot

Separate collection of municipal waste and biowaste is one of the main concerns in waste management for all pilots but it is especially addressed in the Barcelona pilot. In fact, the key messages arising from the CBE policy framework at Catalan level are related to separate collection. This is in line with the goals of recycling according to the EU and SDG of the United Nations that press and promote to implement separate collection also to reduce municipal waste going to landfill and/or incineration and increase recycling rate. In Catalonia, separation of municipal waste, including biowaste, has been compulsory for municipalities over 5.000 inhabitants since 1996 and for the rest of them since 2010. This fact contributed to achieving the current ratio of separate collection of municipal waste of about 43% (ARC, 2020). Also, in the programs of the Generalitat de Catalunya and Area Metropolitana de Barcelona²⁶ it was aimed to achieve 60% valorisation for biowaste with a maximum of 10% of impurities by 2020.

In the Metropolitan Area of Barcelona, being a pioneer region in implanting biowaste source separation but experimenting with a low quality of biowaste due to high impurities content, the main aim is to deploy a user identification system collection by 2025 and compulsory separate collection of biowaste for citizens through an ordinance.

Also feedback from participatory processes pointed out that the high amount of impurities in biowaste has to be reduced and converged towards the individualisation of the collection systems: changing the collection system from open containers towards door to door or smarts bins. The efficacy of separate collection depends on

²⁶ PRECAT (<u>https://residus.gencat.cat/es/ambits_dactuacio/planificacio/</u>),

PREMET (https://www.amb.cat/web/ecologia/residus/planificacio)



participation of the citizens, which more often is done anonymously and voluntarily. Therefore, the implementation of new collection systems pretends to counteract this with identification technologies. In a subsequent stage, this could make it possible to implement pay-as-you-throw (PAYT) systems. Although individualisation in large cities, particularly in vertical housing, can require challenging infrastructure and technology to be implemented, there are many successful experiences.

Efficient separate collection is not all about technology, but there are sociologic aspects that need to be considered to improve it. Communication to citizens is a complementary or prior tool to individualisation/PAYT to make source separation successful. This sociological aspect is behind the concept of KAYT, a nudging system that can favour a good quality of separately collected biowaste. Raising awareness among citizens is still considered one of the keys for successful separation, but citizens need to receive positive feedback and not only fines. Biowaste separation needs to be convenient to obtain a large and constant participation and low level of impurities. The more society is involved, the better the results obtained.

During the first living lab in Barcelona, it emerged that for the valorisation of biowaste into new value-added products, such as bioplastics, the performance of the industrial scaling must be improved to be profitable. Then, other options were proposed, such as the upgrading of the biogas into methane to inject in the grid as a potential alternative to study for the metropolitan area of Barcelona pilot.

4.2. Discussion on Naples pilot

Insufficient biowaste treatment capacity (i.e. composting and anaerobic digestion) is one of the main challenges in the biowaste management system in the MCN. More than 60% of the source separated biowaste is indeed treated outside the region. Many years of waste mismanagement in the area has generated a lack of trust from locals about waste management treatment. This special social context requires implementing valorisation solutions with visible environmental and economic benefits and improving separate collection to reduce the amount of biowaste sent to incinerators or landfill.

Technology has provided systems to solve problems regarding collection of waste but also to improve treatment to produce high value products and to shift into more environmentally friendly chains. Nevertheless, economic and social factors should also be considered, otherwise they jeopardise the implementation of the action. Regarding this, there are policy documents that promote new techniques and actions towards circular economy, but there are legal constraints and bureaucracy issues that complicate the effective deployment on the ground. It seems that technology, resources and sometimes social commitment and social acceptance, are steps forward for the regulatory framework.

The policies most relevant to the pilot area of Naples are related to providing measures for environmental and human protection and to prevent wastes aiming to improve the efficiency of resources and reducing the environmental impacts.

Locally, most of the CBE regulations are set at Campania Region level and the important goals includes a 5% reduction in the generation of municipal solid waste (MSW) and the implementation of a circular economy to



create more effective interconnections among the various bioeconomy sectors in the region, as well as their value chains.

Inputs from participatory processes suggested for the Metropolitan City of Naples to start a gradual reconversion of local mechanical biological plants into biological treatment exclusively for biowaste. Also, implementing decentralised biowaste treatments, as complementary solutions to the centralised ones could be a potential solution. Indeed, the installation of new large biological treatments facilities for biowaste would be hampered by NIMBY effect and competition with the existing mechanical biological treatment and incineration plants. Increasing the local biological treatment capacity preferring decentralized solutions will allow for each territory to treat its own waste internally and in turn can improve the rate and the quality of separate collection of biowaste reducing the amount of biowaste remaining in residual waste sent to incinerators or landfill.

Concerning the agro-industrial biowaste chain selected for the MCN pilot, experts agreed on the need to retrieve the results from past research and projects, as a starting point to expand the range of available circular solutions for the agro-industrial biowaste chains. Unfortunately, a large fraction of these valuable results has remained unexploited, calling for increased efforts towards actual implementation. Industrial symbiosis and local cooperation can pave the way to circular bio-economy results, capable of promoting new sources of income as well as of decreasing the environmental impacts associated with bio-waste generation and disposal. Raising agro-food industries' awareness thanks to effective information campaigns about biowaste sustainable management is required to create opportunities of coordinated actions by different companies and foster the implementation of new conversion processes to produce added value products. The regulatory framework should also be revised to allow the entry of these new bioproducts into the market, politicians must support the changes and citizens have to be well informed.

4.3. Discussion on Pazardzhik pilot

In the Pazardzhik Province, only 3% of municipal waste is separated, most of the remaining part is sent without treatment to landfill and biowaste is not separately collected. According to local stakeholders, the current source separation system is not working properly, also because of the lack of consumer awareness about the importance of increasing the separate collection rates of different waste fractions. The existing methodology for waste charging, depending on household or commercial surface, is considered not appropriate. Regarding residues from agriculture and forestry, 35% is currently remaining in forests unused causing frequent fires. The lack of tradition and knowledge about utilization of this waste fraction and lack of financial incentives for such activities are the main challenges encountered.

The main key messages regarding CBE policies in the PP pilot area are the reduction of organic waste in landfills, implementation of biowaste separate collection, increase of waste recycling by improving the existing waste collection system and improvement of the current system of waste taxation for households. Even if the valorisation of wood waste is a main concern and has been identified as relevant in the chain to be studied, municipal biowaste still requires a long journey to be fully deployed and implemented.



Experts in the first peer review session agreed that an increase in separation rates could be incentivized by the introduction of a landfill tax, whose revenue would be returned to municipalities according to their performance in separate waste collection. This incentive scheme could make separate collection economically viable as well as biowaste composting/anaerobic digestion treatment cheaper than landfilling. Moreover, a change in waste charges should be introduced to incentivise separate collection of different waste fractions and especially biowaste that is currently not source separated. The market on its own is unable to reach targets if the polluter pays principle or subsidy/incentive schemes are not introduced. Moreover, communication and awareness campaigns about the importance and benefits of source separation were considered absolutely needed to change citizen's behaviour.

Concerning forest residues, the need to valorise a major part of the total amount left in the forest ground by using innovative technologies for collection was validated. Energy valorisation and lignocellulosic valorisation to produce biochemical were considered possible alternatives to investigate giving, however, priority to the second option to incentivise good practices for utilization of agroforestry wastes more in line with the waste hierarchy. Besides forest residues, it was suggested that the focus could be also fixed on the separate collection of garden waste, thinking about composting as a complementary strategy to the actual system. The introduction of specific incentives could stimulate the recovery of agroforestry waste for energy purposes, but also the regulatory framework must be revised in order to allow the introduction of new products into the market. Politicians' commitment is key to support those changes in the system.



5. Conclusions

The conclusions are structured in two sections, which are the main aspects considered in the deliverable: policy framework and good practices.

5.1. About the policy framework

The policy framework has been analysed by collecting legal acts and other documents and have been arranged in a database (DBPF) in MSExcel format, which allows to be increased and improved along the project due to changes in the regulation or apparition of new documents. This will allow to have an updated DBPF version improved in form and content at the end of the project. The database will help to produce useful information for other WPs of the project, such as WP2 and WP4, which are strongly interconnected.

A total of 122 documents were collected from the analysed areas (UE, BG, ES, IT) at three levels, (national, regional, local) from years between 1986 and 2022. The documents were classified into nine types of waste, seven sectors, 13 topics and 21 subtopics, administrative area, year of publication, and type of document. The analysis of the data was conducted jointly for all registers and by countries.

The most productive period at national and regional level was after the publication of the Waste Framework Directive in 2008, which promoted the apparition of plans and local regulations aiming to achieve the goals. This means that significant pieces of legislation from the EU are important to boost actions towards the implementation of regulations and plans at local level, and particularly about the circular economy.

At national level, Spain accounts for 44 documents, Italy for 23 and Bulgaria for 12. Most of these documents are binding (99), through Directives or Regulations at EU level, while the rest correspond to no binding documents such as plans and programs. Regarding the type of waste, most documents collected consider several types of waste (85), which means that they are not focused on a particular type but cover a wide range of waste. Plastic&Packaging (11) and Municipal Waste (9) are the specific types of waste more represented. The Waste Management sector is the most represented (57) followed by those issues related to Administration (31), such as subsidies, taxation or reporting, where in both cases most of the documents are binding (51 and 28, respectively). Other aspects as Energy (3) or Industry (6) presented lower relevant documents for the projects. With regards to Circular Economy, a total of 11 documents were identified and they correspond to programs, plans or strategies.

The main topics identified were Environment Protection (53) and Treatment of Waste (24), the other 11 topics reported less than 10 each, with an average of four documents each. The main sub-topics were Planification (31) and Prevention of Waste (13), and the 19 reminder sub-topics presented less than 10 documents and with an average of four.

Issues tackled in the collected documents, and particularly regarding legal acts, are dealt with wide scope, that means that they do not refer to a particular type of waste and refer to general aspects such as waste



management or environment protection. On the other side, few documents refer to specific waste such as sewage sludge or animal by-products or to specific topics such as classification of waste or marketing of products. The analysis conducted indicates that, for example, as regards to new technologies such as obtention of bioproducts, there is still an empty space that projects like BCC can help to produce useful policies.

Separate collection is a key factor in the quality of biowaste for different purposes, and where individual participation is critical. In this sense, although the policy framework is widely developed regarding scope of type of waste, management, etc., only some local administrations (municipalities) implement actions that involve citizen participation. Regarding regulation, several documents refer to separate collection, but concrete measures to be applied can only be found in lower administrative levels as the obligation to the citizens to separate waste. Whereas European regulation tends to give guidelines to be implemented by Member States, more precision at national level would help to achieve the goals. On the other hand, other regulations such those related to landfill promote separate collection of biowaste by limiting its access.

5.2. About good practices

The collection of good practices has been conducted in a database (DBGP) in MSExcel format, aiming to be updated with other useful GPs for the BCC project throughout its life.

The DBGP has been organised into 11 fields, which include territorial classification (country, region, province), type of waste (Food waste, Forestry residues, Green waste, Household, Industrial, Vegetal oil, Other) and type of action (Communication and dissemination activities, Decentralised treatment, Optimization and efficacy of collection System, Optimization biodegradable waste composting plants, Preparing for re-use, Prevention of food waste, Separate collection implementation, Source separation and recycling, System Nudge, Taxation, Technological innovation), title, objective of the measure, initial situation, description of the action and results or effects and the source where the GP has been consulted.

At least 13 web pages with detailed GPs were consulted and have been very useful for the gathering of examples for the BCC project. There is a huge quantity of information on GPs in different countries and about a wide scope of topics, not only regarding biowaste or municipal waste. Only the most representative for the project were collected.

A total of 37 GPs related to the BCC project have been collected from 11 countries. Most of them (16) belong to Spain and more particularly to Catalonia (11). From Italy and Bulgaria three and four GPs were collected, respectively. Other countries, such as France and Luxembourg, provided between two and three GPs, the rest of countries (Czech Republic, Finland, Slovakia, Sweden, United-Kingdom, USA) provided one or two.

Household waste and biowaste and food waste are the main types of waste of the GPs collected (9 each), while the other categories of waste account for two GP each. The main actions are addressed to technological innovation (10). Other actions regarding source separation as Separate collection implementation, Source separation and recycling, Optimization and efficacy of collection System gather also 10 GPs. Prevention of waste is represented in 4 of the GPs.



Regarding good practices and the pilots, separate collection of biowaste is still an issue in all three, and there are multiple good practices about that running in these areas. Improvements of separate collection systems, including access control technologies, are the main type of actions. Some types of actions are cross-cutting between GPs.

Some GPs are focused on the implementation of new technologies for the innovative valorisation of biowaste, which requires high levels of technology that often are still in a research stage or are in a too-low degree of development to be implemented in real life. Because of this, more research is needed to find solutions to deploy the implementation of these good practices, in which economic benefits sometimes do not compensate the investment costs, and the scaling of the industrial process needs to be boosted towards the achievement of a real circular economy. This can take certain interest when dealing with renewable energies or new processes to valorise biowaste. Renewable energies are promoted by the regulations at different levels to reduce the dependence from fossil fuels and achieve a more circular economy. In relation to waste, energetic valorisation and production of biofuels can promote this change. Other biowaste valorisations, such as biopesticides, nutraceuticals or biochemicals, have been introduced from the implementation of GPs for economic reasons or due to the fact that the yield of process is adequate and produce revenues. Nevertheless, these practices can be usually limited by regulations that require cumbersome formalities and procedures.



6. References

Ali, M. 2013. Sustainability Assessment. Context of Resource and Environmental Policy. Elsevier Inc. Academic Press. <u>https://doi.org/10.1016/C2012-0-02851-7</u>.

ARC, 2020. Annual report of the Agència de Residus de Catalunya. Available at: <u>https://residus.gencat.cat/en/detalls/Publicacions/Memoria-2020-00012</u>. Consultation date: 31/05/2022.

Avellaneda, A., Haurie, L., Lacasta, A.M. 2020. Eficiència energètica en la construcció amb fusta. Dossier Tècnic, 102: 14-18

Chifari, R., Puig-Ventosa, I., Sastre, S., Svatikova, K. 2020. Priority areas analysis and identification of key policy measures for the new national circular economy strategic framework of the Czech Republic. Final report on Consumption and Consumers Behaviour. 92pp.

Delgado Sancho L, Catarino A, Eder P, Litten D, Luo Z, Villanueva Krzyzaniak A. 2009. End-of-Waste Criteria. Technical Report. European Commission. Luxembourg (Luxembourg).

EC, 2000. Working document on sludge, 3rd draft. DG ENV.A.3, Brussels

European Commission. Environment Directorate. 2000. Success stories on composting and separate collection. Office for Official Publications of the European Communities

European Environment Agency. 2020. Bio-waste in Europe — turning challenges into opportunities. Available at: <u>https://www.eea.europa.eu/publications/bio-waste-in-europe</u>. Consultation date: 31/05/2022.

Georgescu-Roegen, N. 1975. Energy and Economic Myths. Southern Economic Journal, Vol. 41(3): 347-381.

Hann, S., Scholes, R., Molteno, S., Hilton, M., Favoino, E., Jakobsen, L.G. 2020. Relevance of biodegradable and compostable consumer plastic products and packaging in a circular economy. European Commission.

Hann, S., Fletcher, E., Molteno, S., Sherrington, C., Elliot, L., Kong, M.A., Koite, A., Sastre, S., Martínez, V. 2021. Conventional and Biodegradable Plastics in Agriculture. European Commission.

Joint Research Centre. 2018. Best available techniques (BAT) reference document for waste treatment. Industrial Emissions Directive 2010/75/EU (integrated pollution prevention and control). Available at: <u>https://op.europa.eu/en/publication-detail/-/publication/782f0042-d66f-11e8-9424-01aa75ed71a1/language-</u> en. Consultation date: 31/05/2022.

Mestre, M.V. 2018. Bioeconomía: el diseño de un cambio de rumbo. Ambienta, 125: 50-67.

Nuclear Institute. 2010. Best Available Techniques (BAT) for the Management of the Generation and Disposal of Radioactive Wastes. Available at:

<u>https://www.nuclearinst.com/write/MediaUploads/SDF%20documents/EARWG/BAT_Good_Practice_Guide_May_2017.pdf</u>. Consultation date: 31/05/2022.



Web pages:

- CORDIS : https://cordis.europa.eu/project/id/101023516/it
- BBI Europa: <u>https://www.bbi.europa.eu/projects/biocircularcities</u>

Biocircularcities project: <u>www.biocircularcities.eu</u>

Topics of EU website: <u>https://ec.europa.eu/environment/topics_en</u>



ANNEX 1. List of regulations collected

Area	Sector	Document
116	Administration	Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November
UL		2002 on waste statistics
	Administration	Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on
		environmental liability with regard to the prevention and remedying of environmental damage
	Administration	Communication from the Commission to the European Parliament, the Council, the European
		Economic and Social Committee and the Committee of the Regions Public procurement for a better
		environment
	Administration	Directive 2008/99/EC of the European Parliament and of the Council of 19 November 2008 on the
	A 1 1 1 1 1	protection of the environment through criminal law
	Administration	2011/153/EU: Commission Decision of 18 November 2011 establishing rules and calculation
		the European Darliement and of the Council (notified under degument C(2011) 0165)
	Administration	Commission Implementing Decision of 6 December 2013 establishing a format for natifying the
	Aunimistration	information on the adoption and substantial revisions of the waste management plans and the waste
		normation programmes (notified under document C(2013) 8641)
	Administration	Commission Implementing Decision (FII) 2019/1004 of 7 June 2019 Javing down rules for the
	Administration	calculation verification and reporting of data on waste in accordance with Directive 2008/98/FC of
		the European Parliament and of the Council and repealing Commission Implementing Decision
		C(2012) 2384 (notified under document C(2019) 4114)
	Administration	Proposal for a Decision of the European Parliament and of the Council on a General Union
		Environment Action Programme to 2030
	Agriculture and products	Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in
		particular of the soil, when sewage sludge is used in agriculture
	Agriculture and products	Commission Decision (EU) 2015/2099 of 18 November 2015 establishing the ecological criteria for
		the award of the EU Ecolabel for growing media, soil improvers and mulch
	Agriculture and products	Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on
		organic production and labelling of organic products and repealing Council Regulation (EC) No
		834/2007
	Agriculture and products	Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying
		down rules on the making available on the market of EU fertilising products and amending
		Regulations (EC) No 1069/2009 and (EC) No 110//2009 and repealing Regulation (EC) No
	Oireuler cooreru	2003/2003
	GIRCUIAR ECONOMY	Council the European accommission from the Commission to the European Paritament, the
		action plan for the circular economy
	Circular economy	COM/2018/673 final Communication from the Commission to the European Parliament, the Council
		the Furonean Economic and Social Committee and the Committee of the Regions. A sustainable
		Bioeconomy for Europe: Strengthening the connection between economy, society and the
		environment
	Circular economy	COM/2019/640 final. Communication from the Commission to the European Parliament, the
		European Council, the Council, the European Economic and Social Committee and the Committee of
		the Regions. The European Green Deal
	Circular economy	COM2020/98/final Communication from the Commission to the European Parliament, the Council,
		the European Economic and Social Committee and the Committee of the Regions. A new Circular
		Economy Action Plan for a cleaner and more competitive Europe
	Climate change	COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN
		COUNCIL, THE COUNCIL, THE FUROPEAN ECONOMIC AND SOCIAL COMMITTEE THE COMMITTEE OF



	THE REGIONS AND THE EUROPEAN INVESTMENT BANK A Clean Planet for all A European strategic
	long-term vision for a prosperous, modern, competitive and climate neutral economy
Climate change	Regulation (EU) 2021/783 of the European Parliament and of the Council of 29 April 2021
	establishing a Programme for the Environment and Climate Action (LIFE), and repealing Regulation
	(EU) No 1293/2013
Energy	Commission Decision of 30 June 2009 establishing a template for National Renewable Energy
	Action Plans under Directive 2009/28/EC of the European Parliament and of the Council (notified
	under document number C(2009) 5174)
Energy	Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on
	the promotion of the use of energy from renewable sources (recast)
Industry	Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on
	industrial emissions (integrated pollution prevention and control)
Waste Management	European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and
	packaging waste
Waste Management	Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste
Waste Management	Commission Decision of 16 January 2001 amending Decision 2000/532/EC as regards the list of
	wastes (Text with EEA relevance) (notified under document number C(2001) 108)
Waste Management	Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of
	waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC
Waste Management	Reference Document on Best Available Techniques (BAT) in the Slaughterhouses and Animal By-
	products Industries
Waste Management	Reference Document on Best Available Techniques in the Slaughterhouses and Animal By-products
	Industries
Waste Management	Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on
	waste and repealing certain Directives
Waste Management	Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009
	laying down health rules as regards animal by-products and derived products not intended for human
	consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation)
Waste Management	Commission Regulation (EU) No 142/2011 of 25 February 2011 implementing Regulation (EC) No
	1069/2009 of the European Parliament and of the Council laying down health rules as regards
	animal by-products and derived products not intended for human consumption and implementing
	Council Directive 97/78/EC as regards certain samples and items exempt from veterinary checks at
	the border under that Directive Text with EEA relevance
Waste Management	Commission Implementing Decision (EU) 2015/2119 of 20 November 2015 establishing best
	available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament
	and of the Council, for the production of wood-based panels
Waste Management	Commission Implementing Decision (EU) 2015/2119 of 20 November 2015 establishing best
	available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament
	and of the Council, for the production of wood-based panels
Waste Management	Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending
 	Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags
Waste Management	Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available
	techniques (BAT) conclusions for waste treatment, under Directive 2010//5/EU of the European
	Parliament and of the Council (notified under document C(2018) 5070)
waste Management	Commission implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available
	techniques (BAT) conclusions for waste treatment, under Directive 2010/15/EU of the European
W	Parmament and of the Gounch (notified under document G(2018) 5070)
waste management	Commission implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available
	techniques (BAT) conclusions for waste treatment, under Directive 2010/15/EU of the European Devicement and of the Council (notified under dooursest 0(0010) 5070)
Wasta Management	r armannent and of the Guinen (notified under document 6(2018) 5070)
waste management	Directive (ED) 2018/850 of the European Parliament and of the Gouncil of 30 May 2018 amending



	Waste Management	Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste
	Waste Management	Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste
	Waste Management	Commission Implementing Decision (EU) 2019/2031 of 12 November 2019 establishing best
		available techniques (BAT) conclusions for the food, drink and milk industries, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2019) 7989
	Waste Management	Commission Implementing Decision (EU) 2019/2031 of 12 November 2019 establishing best
		available techniques (BAT) conclusions for the food, drink and milk industries, under Directive
	Wasta Managamant	2010//5/EU of the European Parliament and of the Council (notified under document C(2019) /989
	waste management	reduction of the impact of certain plastic products on the environment
	Waste Management	Commission Implementing Regulation (EU) 2020/2151 of 17 December 2020 laying down rules on
		harmonised marking specifications on single-use plastic products listed in Part D of the Annex to
		Directive (EU) 2019/904 of the European Parliament and of the Council on the reduction of the
		impact of certain plastic products on the environment
	Waste Management	Commission Decision (EU) 2020/519 of 3 April 2020 on the sectoral reference document on best
		of excellence for the waste management sector under Regulation (FC) No 1221/2009 on the
		voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)
	Waste Management	Commission Decision (EU) 2020/519 of 3 April 2020 on the sectoral reference document on best
		environmental management practices, sector environmental performance indicators and benchmarks
		of excellence for the waste management sector under Regulation (EC) No 1221/2009 on the
	Administration	voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)
SPAIN (ES)	Auministration	Ley 20/2007, de 0 de disiembre de exclusación embientel
		Ley 21/2013, de 9 de diciembre, de evaluación ambiental
	Administration	Urden de Presidencia PGI/86/2019, de 31 de enero, por la que se publica el Acuerdo del Consejo de Ministro de 7 de diciembre de 2018, por el que se aprueba el Plan de Contratación Pública Ecológica
		de la Administración General del Estado, sus organismos autónomos y las entidades gestoras de la
		Seguridad Social
	Agriculture and products	Real Decreto 1310/1990, de 29 de octubre, por el que se regula la utilización de los lodos de
		depuración en el sector agrario
	Agriculture and products	Real Decreto 865/2010, de 2 de julio, sobre sustratos de cultivo
	Agriculture and products	Urden AAA/10/2/2013, de / de junio, sobre utilización de lodos de depuración en el sector agrario
	Agriculture and products	Real Decreto 506/2013, de 28 de junio, sobre productos fertilizantes
	Circular economy	Estrategia Espanola de Bioeconomia. Horizonte 2030
	Circular economy	Estrategia Espanola de Economia Circular
	Circular economy	Plan de recuperación, transformación y resiliencia
	Circular economy	Plan de acción de economia circular
	Energy	Real Decreto 413/2014, de 6 de junio, por el que se regula la actividad de producción de energía
	Industry	Lev 34/2007 de 15 de noviembre de calidad del aire y protección de la atmósfera
	Industry	Real Decreto Legislativo 1/2016 de 16 de diciembre, nor el que se anrueba el texto refundido de la
	muotry	Lev de prevención y control integrados de la contaminación
	Waste Management	Ley 11/1997, de 24 de abril, de Envases y Residuos de Envases
	Waste Management	Real Decreto 9/2005, de 14 de enero, por el que se establece la relación de actividades
		potencialmente contaminantes del suelo y los criterios y estándares para la declaración de suelos
		contaminados
	Waste Management	Ley //2U22, de 8 de abril, de residuos y suelos contaminados para una economía circular
	Waste Management	Real Decreto 1528/2012, de 8 de noviembre, por el que se establecen las normas aplicables a los



		subproductos animales y los productos derivados no destinados al consumo humano
	Waste Management	Real Decreto 815/2013, de 18 de octubre, por el que se aprueba el Reglamento de emisiones industriales y de desarrollo de la Ley 16/2002, de 1 de julio, de prevención y control integrados de la contaminación
	Waste Management	Resolución de 16 de noviembre de 2015, de la Dirección General de Calidad y Evaluación Ambiental y Medio Natural, por la que se publica el Acuerdo del Consejo de Ministros de 6 de noviembre de 2015, por el que se aprueba el Plan Estatal Marco de Gestión de Residuos (PEMAR) 2016-2022
	Waste Management	Orden APM/189/2018, de 20 de febrero, por la que se determina cuando los residuos de producción procedentes de la industria agroalimentaria destinados a alimentación animal, son subproductos con arreglo a la Ley 22/2011, de 28 de julio, de residuos y suelos contaminados.
	Waste Management	Real Decreto 209/2018, de 6 de abril, por el que se aprueba el Plan Territorial Sectorial de Infraestructuras de Gestión de Residuos Municipales de Cataluña (PINFRECAT20)
	Waste Management	Real Decreto 210/2018, de 6 de abril, por el que se aprueba el Programa de Prevención y Gestión de Residuos y Recursos de Cataluña (PRECAT2O)
	Waste Management	Real Decreto 293/2018, de 18 de mayo, sobre reducción del consumo de bolsas de plástico y por el que se crea el Registro de Productores
	Waste Management	Real Decreto 646/2020, de 7 de julio, por el que se regula la eliminación de residuos mediante depósito en vertedero
CATALONIA Region	Administration	Llei 8/2008, de 10 de juliol, de finançament de les infraestructures de gestió dels residus i dels cànons sobre la disposició del rebuig dels residus
	Administration	Llei 6/2009, del 28 d'abril, d'avaluació ambiental de plans i programes
	Administration	Decret 98/2015, de 9 de juny, del Consell per a la Prevenció i la Gestió dels Residus a Catalunya
	Administration	Decret 197/2016, de 23 de febrer, sobre la comunicació prèvia en matèria de residus i sobre els registres generals de persones productores i gestores de residus de Catalunya
	Administration	ACORD GOV/85/2016, de 28 de juny, pel qual s'aprova la modificació del model tipus de bases reguladores aprovat per l'Acord GOV/110/2014, de 22 de juliol, pel qual s'aprova el model tipus de bases reguladores dels procediments per a la concessió de subvencions en règim de concurrència competitiva, tramitats per l'Administració de la Generalitat i el seu sector públic, i se n'aprova el text íntegre
	Administration	Programa de compra pública d'innovació de la RIS3CAT
	Circular economy	Estratègia catalana d'ecodisseny per a una economia circular i ecoinnovadora
	Circular economy	ACORD GOV/73/2015, de 26 de maig, pel qual s'aprova l'Estratègia d'impuls a l'economia verda i a l'economia circular
	Circular economy	"Acord GOV/141/2021, de 14 de setembre, pel qual s'aprova l'Estratègia de la bioeconomia de Catalunya 2021-2030"
	Climate change	Llei 16/2017, de l'1 d'agost, del canvi climàtic
	Industry	Llei 20/2009, del 4 de desembre, de prevenció i control ambiental de les activitats
	Industry	Llei 5/2020, del 29 d'abril, de mesures fiscals, financeres, administratives i del sector públic i de creació de l'impost sobre les instal·lacions que incideixen en el medi ambient
	Waste Management	Decret Legislatiu 1/2009, de 21 de juliol, pel qual s'aprova el Text refós de la Llei reguladora dels residus.
	Waste Management	Decret 69/2009, de 28 d'abril, pel qual s'estableixen els criteris i els procediments d'admissió de residus en els dipòsits controlats
	Waste Management	Decret 152/2017, de 17 d'octubre, sobre la classificació, la codificació i les vies de gestió dels residus a Catalunya
METROPOLITAN Area of Barcelona (MAB)	Administration	PREMET25. Programa Metropolità de Prevenció i Gestió de Recursos i Residus Municipals 2019- 2025
	Administration	Acord Metropolità pel Residu Zero
	Administration	Ordenança fiscal reguladora de les taxes metropolitanes de tractament i disposició de residus municipals



ITALY (IT)	Administration	Environmental Code
	Administration	Regolamento recante la disciplina dell'autorizzazione unica ambientale e la semplificazione di adempimenti amministrativi in materia ambientale gravanti sulle piccole e medie imprese e sugli impianti non soggetti ad autorizzazione integrata ambientale, a norma dell'articolo 23 del decreto- legge 9 febbraio 2012, n. 5, convertito, con modificazioni, dalla legge 4 aprile 2012, n. 35. (13G00101)
	Administration	Programma nazionale di prevenzione dei rifiuti
	Agriculture and products	Decreto Legislativo 109/2018
	Agriculture and products	Decreto dipartimentale n. 112 del 15 ottobre 2021. Istituzione del Gruppo di Lavoro denominato "Analisi tecnica dell'utilizzo del digestato da digestione anaerobica" a supporto delle attività del Dipartimento per la transizione ecologica e gli investimenti verdi in materia.
	Circular economy	Bioeconomy in Italy: A unique opportunity to reconnect Economy, Society and the Environment"
	Circular economy	Towards a Model of Circular Economy for Italy Overview and Strategic Framework
	Industry	DECRETO LEGISLATIVO 4 marzo 2014, n. 46. Attuazione della direttiva 2010/75/UE relativa alle emissioni industriali (prevenzione e riduzione integrate dell'inquinamento). (14G00058) (GU Serie Generale n.72 del 27-03-2014 - Suppl. Ordinario n. 27)
	Waste Management	Disposizioni urgenti per la cessazione dello stato di emergenza in materia di rifiuti nella regione Campania, per l'avvio della fase post emergenziale nel territorio della regione Abruzzo ed altre disposizioni urgenti relative alla Presidenza del Consiglio dei Ministri ed alla protezione civile. (09G0208)
	Waste Management	Schema di decreto legislativo recante attuazione della direttiva (UE) 2018/850, che modifica la direttiva 1999/31/CE relativa alle discariche di rifiuti
	Waste Management	Decreto 3 dicembre 2019 Approvata e resa esecutiva la procedura per l'esercizio delle funzioni di vigilanza sui Consorzi e sui sistemi autonomi di gestione dei rifiuti.
	Waste Management	Decreto 16 ottobre 2020 Approvazione dello statuto del Consorzio nazionale per il riciclo organico degli imballaggi in plastica biodegradabile e compostabili.
	Waste Management	DECRETO LEGISLATIVO 3 settembre 2020, n. 116, Attuazione della direttiva (UE) 2018/851 che modifica la direttiva 2008/98/CE relativa ai rifiuti e attuazione della direttiva (UE) 2018/852 che modifica la direttiva 1994/62/CE sugli imballaggi e i rifiuti di imballaggio.
	Waste Management	Decreto n. 261 del 23 giugno 2021 - Approvazione del "Programma generale di prevenzione e di gestione degli imballaggi e dei rifiuti di imballaggio 2019-2023".
	Waste Management	Decreto n. 44 del 28 luglio 2021 - Riconoscimento del "Sistema autonomo per la gestione diretta degli imballaggi in PET per liquidi alimentari Coripet".
	Waste Management	Delibera n. 105/2021. Linee guida sulla classificazione dei rifiuti
CAMPANIA REGION	Administration	Guida Operativa Procedura di rilascio dell'autorizzazione unica ambientale (AUA)
	Waste Management	Deliberazione n 1653 - Area generale di coordinamento n 21. Programma e gestione dei rifiuti - criteri attuativi delle soravvenute disposizioni legislative statali in materia di gestione dei rifiuti urbani
	Waste Management	Legge regionale 4 del 14-04-2008 "modifiche alle legge regionale 28 marzo 2007 n 4 norme in materia di gestione, trasformazione, riutilizzo dei rifiuti e bonifica dei siti inquinati
	Waste Management	Legge regionale 26 maggio 2016, n. 14. "Norme di attuazione della disciplina europea e nazionale in materia di rifiuti"
METROPOLITAN City of Naples (MCN)	Administration	LINEE GUIDA PER LA ELABORAZIONE DEI PIANI COMUNALI DELLA RACCOLTA DIFFERENZIATA (EX Art. 3, opcm n. 3639 del 11/01/2008)
	Administration	Deliberazione Giunta Provinciale N.260 del 19 04 2011 per la gestione integrata dei rifiuti
	Administration	Regolamento per la disciplina della tassa sui rifiuti (Tari). Approvato con delibera del Consiglio Comunale n. 27 del 15.04.2020
BULGARIA (BG)	Administration	Administrative Offences and Penalties Act
	Administration	Law on Liability for Prevention and Elimination of Environmental Damages
	Administration	Regulation No 1 of 4 June 2014 on the procedure and templates for providing information on waste

D3.1. POLICY FRAMEWORK AND GOOD PRACTICES ON CIRCULAR BIOECONOMY AND BIOWASTE MANAGEMENT



		activities, as well as the procedure for keeping public registers
	Administration	Environmental Protection Act
	Agriculture and products	Regulation on the order of recovery of sediments (sludge) obtained from sewage treatment, and their utilization in agriculture
	Waste Management	Waste Management Act
	Waste Management	Regulation No 6 of 27 August 2013 on the conditions and requirements for construction and operation of landfills and other facilities and installations for recovery and disposal of waste
	Waste Management	Regulation No 2 of Jult 23, 2014 on Classification of Waste
	Waste Management	Regulation for Separate Collection of Biowaste and Treatment of Biodegradable Waste
	Waste Management	National Waste Management Plan 2021-2028
SOUTH-CENTRAL Region	Waste Management	Regional Waste Management Program - Pazardzhik Region
PAZARZHIK Province (PP)	Waste Management	Regulation 147/30.07.2014 for disposal, collection, including separate, transportation, transfer, of household and construction waste, including bio-waste, hazardous household waste in the Municipality of Pazardzhik



ANNEX 2. Additional good practices

Some additional good practices related to management of biowaste but out of the main scope of the BCC project are listed below. They refer to composting, anaerobic digestion and material valorisation in the construction sector.

Good practices related to composting and anaerobic digestion have been collected from the **Interreg Europe Programme** (https://www.interregeurope.eu/policy-solutions/good-practices)

For additional good practices on **composting** please consult the following GPs:

- Home composting and economic incentives (Italy)
- Home composting pilot action (Greece)
- Home composting support scheme (Portugal)
- Social enterprise in composting and organic farming (Romania)
- Community composting of food waste (Spain)
- Composting municipal wastewater sludge and garden waste pilot project (Romania)

For additional good practices on **biogas** please consult the following GPs:

- Processing alternatives of biodegradable waste anaerobic digestion, energy & biofuel (Finland)
- Power generation by managing organic waste (Greece)
- Biogas production through anaerobic fermentation of wastewater and whey in dairy products factory (Estonia)
- Biogas production plant based on brewery's wastewater (Estonia)
- Maccarese Agricultural company: from animal farming to energy production (Italy)
- Normandy Biogas Production Plant technical committee for project appraisal (France)
- Biogas units for household applications (Romania)
- Green energy from municipality biowaste and wastewater sewage sludge treatment plant (Hungary)
- Biogas and fertilizer from agro-food waste (Romania)
- Biogas and compost from biowaste and sewage sludge water (Spain)
- Biogas from inoperative landfill (Poland)
- Utilisation of biowaste streams bio-based industrial symbiosis (Finland)
- Biogas from manure and slaughter waste (Sweden)

Good practices related to **material valorisation in the construction sector** have been obtained from popular science magazines and are listed below. These GPs can present certain interest for the pilot of Pazardzhik.

- ABOUT IAAC Institute for Advanced Architecture of Catalonia <u>https://iaac.net/iaac/about/</u>
- Construction materials from biomass waste (Materiales de construcción a partir de residuos de biomasa forestal)

 <u>https://blog.caloryfrio.com/materiales-de-construccion-a-partir-de-residuos-de-biomasa-forestal/</u>
- Construction from untapped agriculture and forestry waste (Construcción a partir de residuos agrícolas y forestales infrautilizados) - <u>https://www.energynews.es/residuos-agricolas-y-forestales/</u>
- Transformation of off-shore shoal algae into renewable source fuel (Transformando las algas de arribazón en combustible renovable) <u>https://www.retema.es/noticia/transformando-las-algas-de-arribazon-en-combustible-renovable-908gi</u>
- Organic waste. The new construction materials? (Residuos orgánicos, ¿los nuevos materiales de construcción?) <u>https://www.retema.es/noticia/residuos-organicos-los-nuevos-materiales-de-construccion-vLX8e</u>