



Report on the standardization landscape and applicable standards

CIRC-PACK - Towards circular economy in
the plastic packaging value chain

Prepared by: UNE

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	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

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	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

ABBREVIATIONS

In this document the following abbreviations and acronyms are used, and in this list they are indicated with its meaning:

ASTM: American Society for Testing and Materials
 CEN: European Committee for Standardization
 CENELEC (CLC): European Committee for Standardization in the Electrical field
 CWA: CEN or CENELEC Workshop Agreement
 EAD: European Assessment Document
 EN: European Standard
 ESO: European Standardisation Organisation
 hEN: Harmonised European Standard
 ICS: International classification of standards (field used for search)
 IEC: International Electrotechnical Commission
 ISO: International Organization for Standardization; International Standard
 NMC: National Mirror Committee
 NSB: National Standardization Body, examples are UNE, AFNOR, BSI, DIN, etc.
 SC: Subcommittee
 SR: Standardization Request, formerly "Mandate"
 SR:
 TC: Technical Committee
 TR: Technical Report, a type of document published by a standardization body
 TS: Technical Specification, a type of document published by a standardization body
 UNE: Spanish Association for Standardization
 WG: Working Group
 WI: Work Item

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	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

SAPONIA D.D.: SAPONIA KEMIJSKA, PREHRAMBENA I FARMACEUTSKA INDUSTRIJA D.D.

FATER: Fater S.p.A.

CRF: CENTRO RICERCHE FIAT SCPA

UNE: Asociación Española de Normalización or Spanish Association for Standardization, please note that before 2017 it was known as AENOR, the acronym of Spanish Association for Standardization and Certification.

RINA: RINA CONSULTING – D' APPOLONIA SPA

EKODENGE: EKODENGE MUHENDISLIK MIMARLIK DANISMANLIK TICARET ANONIM Sirketi

ECOEMBES: ECOEMBALAJES ESPANA, S.A.

CITY OF RIJEKA: GRAD RIJEKA-GRADSKO VIJECE

KARTALMUN: KARTAL BELEDIYE BASKANLIGI

CALAF IND: CALAF TECHNIQUES INDUSTRIALS SL

OCU EDICIONES: OCU EDICIONES SA

ICLEI EURO: ICLEI EUROPEAN SECRETARIAT GMBH (ICLEI EUROPASEKRETARIAT GMBH)

PLASTIPOLIS: PLASTIPOLIS

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

PUBLISHEABLE SUMMARY

D7.4 is the first deliverable for task T7.3 “Standardization activities” within WP7 “Exploitation, market analysis and business plan”.

This deliverable collects information on the standardization landscape to provide information for other WP, ensure compatibility and interoperability of CIRC-PACK and facilitate the acceptance and utilization by the market of the developed solutions.

The Spanish Association for Standardization, recently called UNE, and previously called AENOR, as National Standardization Body (NSB), member of CEN-CENELEC is responsible of task 7.3 to provide support regarding the standardization activities.

The objectives of this deliverable are:

- To raise awareness on the role of standardization and a deeper comprehension about it amongst the stakeholders of CIRC-PACK.
- To find suitable standards and technical bodies developing standards that should be taken into account during the project.

After an explanation of standardization, the deliverable includes the search itself. The methodology of the research comprised the analysis of different data bases, covering different fields or topics and standardization developing bodies.

The first step of the research was the proposal of several key words, agreed with other stakeholders. With those key words, other suitable search fields were identified in order to refine the results; technical bodies, International Classification of Standards (ICS), etc. All the standards found during that search were again filtered according to their suitability to the CIRC-PACK scope.

The result of the deliverable is a list of standards and technical bodies, with recommendations on actions about them. The three general topics identified as more relevant were: plastics, packaging and environment. This will serve as a basis for the further topics related to standardization in this project.

As this deliverable is done during the first months of the CIRC-PACK project, at this stage the map of standards and standardization considers the stakeholders mainly as users of standards. As the project goes on, it is expected that the stakeholders will play a more active role, shifting from mere users to contributors, project leaders or similar roles. The recommendations stated in the deliverable consider this expected change.

The deliverable has identified three main topics of interest; plastics, packaging and environment; selecting almost 30 technical bodies with relevant standards, from three different standards developing organizations, namely CEN, ISO and ASTM. The technical bodies range from broad technical committees with hundreds of standards to very specific working groups, with just a few standards under their scope. Table 3 summarizes the findings and for each technical body includes a recommended action.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

For each topic and each technical body, the most relevant standards have also been identified and are included in Tables 4 to Table 6, with a general comment on them. An effort has been done in order to identify the most relevant standards for each work package.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

Table of contents

1	Introduction	1
2	Short introduction about standardization	1
1.1	What are standards?.....	1
1.2	Reasons to consider standards and standardization	2
1.3	Types of documents.....	3
1.4	European policies, legislation and standards.....	5
1.5	Overview of the standardization landscape relevant for CIRC-PACK.....	6
2	Standardization map	8
2.1	Methodology.....	8
2.2	Technical bodies overview	9
2.3	List of standards identified.....	11
2.3.1	Standards about plastics.....	12
2.3.2	Standards about packaging.....	16
2.3.3	Standards about environment.....	19
3	Conclusions	21
4	References	22



	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

1 INTRODUCTION

This report is part of work package 7 “Exploitation, market analysis and business plan” and specifically under task 7.3 “Standardization activities”. The main objective of task 7.3 is to facilitate the acceptance and utilisation by the market of the developed solutions. Other objectives consist in providing information for other WPs, ensure compatibility and interoperability with what already exists in the market through standards, as well as to use the standardization system as a tool for dissemination of the project results and interaction with the market stakeholders.

The purpose of this report D7.4 is to provide information on the standardization landscape and applicable standards relevant for the CIRC-PACK project. It intends to provide preliminary information for the work packages ensuring compatibility and interoperability with already existing solutions by identifying existing standards and standards under development at European and international levels in the fields addressed by the project.

This deliverable consists on the identification and analysis of related existing standards and relevant standardization technical bodies and includes recommendations about the interaction with them. It comprises also a short introduction about standardization in order to facilitate a deeper comprehension on this issue.

The task will be completed with the contribution to the ongoing and future standardization developments from the results of the project, promoting this way the inclusion of the findings of the project in future new or revised standards that can be easily used by the European or international industry and also helping to better achieve a market acceptable solutions from the outcomes of the project.

2 SHORT INTRODUCTION ABOUT STANDARDIZATION

1.1 What are standards?

Standards are voluntary technical documents that set out requirements for a specific item, material, component, system or service, or describe in detail a particular method, procedure or best practice. Standards are developed and defined through a process of sharing knowledge and building consensus among technical experts nominated by interested parties and other stakeholders - including businesses, consumers and environmental groups, among others. These experts are organized in Technical Committees (TCs), which are subdivided in Subcommittees (SCs) or Working Groups (WGs). These TCs are included in the structure of the Standardization Organizations (National, European and International). All the TCs work following the internal regulations of their organization, which are quite similar. When the work is carried in a TC at National or European level with the same scope as an International TC they are called mirror committees.

The standardization bodies operate at different levels:

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

- National (UNE, AFNOR, BSI, DIN, etc.)
- Regional (CEN, CENELEC, ETSI). For the scope of CIRC-PACK it is European level.
- International (ISO, IEC, ITU).

Sometimes there are different standardization bodies at the same level, but covering different fields. This is the case of ISO (general), IEC (electrical) and ITU (telecommunications) at International level, or CEN, CENELEC and ETSI at European level in the same way.

There are also different standardization documents. The most widespread is the standard, which has a different code depending on the organization under which it was developed, e.g. EN for European Standards, ISO for International standards. Other types of documents are Technical Specifications (TS), Technical Reports (TR) and Workshop Agreements (CWA). Further Amendments to the standards are identified by adding A1, A2, etc. at the end of the standard code.

The formal definition of a standard is a “document, established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context”. These include requirements and/or recommendations in relation to products, systems, processes or services. European Standards (ENs) are documents that have been ratified by one of the three European Standardization Organizations (ESOs), CEN, CENELEC or ETSI; recognized as competent in the area of voluntary technical standardization as for the EU Regulation 1025/2012.

1.2 Reasons to consider standards and standardization

Standardization activities are relevant in many projects funded by H2020 Program for various reasons. The main ones are because standards help to increase the impact of the project and to establish a baseline in the initial steps in order to consider interoperability and industry recognised state of the art. Standards are documents developed in an open and regulated process involving relevant stakeholders. Therefore, standards provide confidence and many times are required to reach the market, especially in certain sectors like construction, ITC, etc. Furthermore, according to recent studies from US Department of Commerce, standards affect around 92% of global commerce. Standards also aim to ensure compatibility and interoperability with what already exists in the market.

The role of different types of standards in relation with research can be shown and explained in many different ways, such as the one shown in Figure 1.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version:	1
	Reference:	D7.4	Date:	31/10/2017

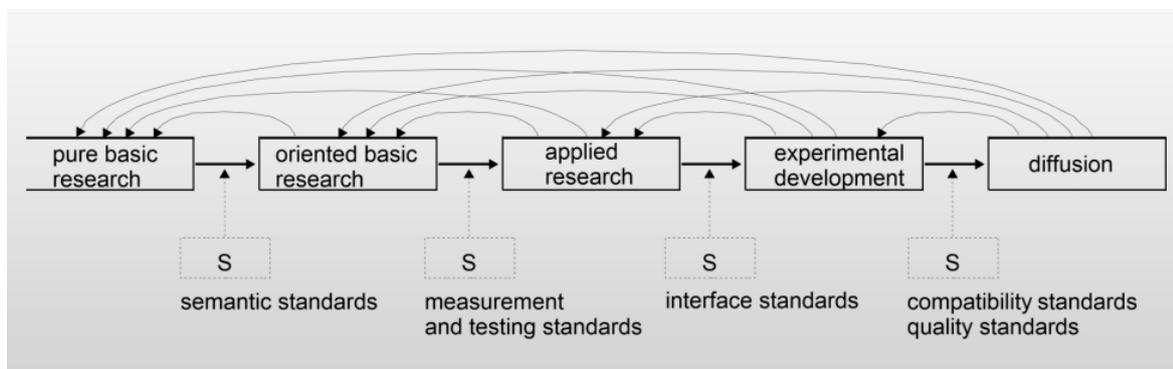


Figure 1 – Relation of different types of standards and research

The use of standards and standardization is encouraged in several publications and is widely accepted, especially at European level. More details can be found in the European Commission webpage devoted to standardization policy, included as a reference.

1.3 Types of documents

At European level, all the members of CEN shall adopt EN standards as national standards and have to withdraw any existing national standard which could conflict with them. A summary of the characteristics of the different standardization documents can be found in the following Table 1.

Table 1. Characteristics of different standardization documents				
Type	International code	European code	National code	Main characteristics
Standard	ISO IEC	EN	UNE, NF, BS, DIN, etc. When adopting: UNE-EN, NF-EN, UNE-ISO, NF-ISO, etc.	<ul style="list-style-type: none"> • Elaboration: 3 years • 2 steps of member approval • European: compulsory national adoption • Revision: every 5 years
Technical Specification	ISO/TS IEC/TS	CEN/TS CLC/TS	When adopting: UNE-CEN/TS, NF- CEN/TS, UNE-ISO/TS, NF-ISO/TS, etc.	<ul style="list-style-type: none"> • Elaboration: 21 months • 1 step of member approval or internal approval in TC • European: optional national adoption • Revision: at 3 years (upgrading to EN or deletion)

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

Technical Report	ISO/TR IEC/TR	CEN/TR CLC/TR	When adopting: UNE-CEN/TR, NF-CEN/TR, UNE-ISO/TR, NF-ISO/TR, etc.	<ul style="list-style-type: none"> • Elaboration: free timeframe • Internal approval in TC • European: optional national adoption • No revision required
Workshop Agreement	IWA	CWA	Variable	<ul style="list-style-type: none"> • Elaboration: free timeframe (usually few months) • Internal approval in the Workshop • European: optional national adoption • Revision: at 3 years (upgrading to EN or deletion)

European and International Standardization Organizations (e.g. CEN and ISO) have signed formal agreements in order to avoid duplication of efforts and promote global relevance of standards, which allows adopting or developing in parallel each other's standards with the same content and code.

The technical collaboration between ISO and CEN was formalized through the Vienna Agreement (VA). European standards developed through the Vienna Agreement have EN ISO codification while International Standards developed through the Vienna Agreement remain only with ISO code.

In a similar way, CENELEC has close cooperation with its international counterpart, the International Electrotechnical Commission (IEC) through the Frankfurt Agreement (FA). As a result, new electrical standards projects are jointly planned between CENELEC and IEC, and where possible most are carried out at international level. This means that CENELEC will first offer a New Work Item (NWI) to its international counterpart. If accepted, CENELEC will cease working on the NWI. If IEC refuses, CENELEC will work on the standards content development, keeping IEC closely informed and giving IEC the opportunity to comment at the public enquiry stage.

European and international organizations (CEN and ISO or CENELEC and IEC) vote in parallel (both organizations are voting at the same time) during the standardization process. If the outcome of the parallel voting is positive, the standard will be published both at European and International level, leading at the international level. Close to 80% of CENELEC standards are identical to or based on IEC publications and a slightly lower figure is applicable for CEN and ISO.

National standards could also be proposed as a base for new European or International standards. The following Figure shows the possible tracks of the standards.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version:	1
	Reference:	D7.4	Date:	31/10/2017

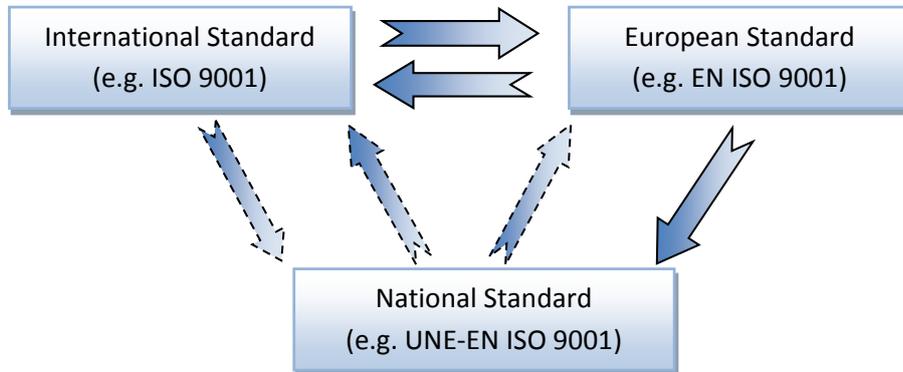


Figure 2 – Possible tracks of standards adoption

Therefore, the code of any standard is the combination of the above mentioned issues, and could be explained as shown in Figure 3.

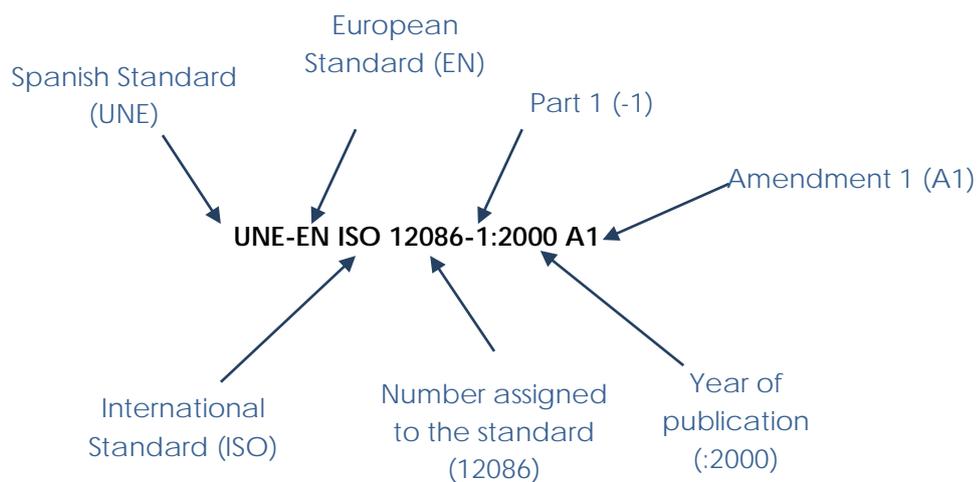


Figure 3 – Example of identification of elements in the code of a standard

1.4 European policies, legislation and standards

Standards can be closely linked with legislation all over the world, but especially in Europe. There are many ways that this link is built. The first one is because standards are usually the simplest and fastest tool to fulfil most of the requirements from European Directives; those standards are called “Harmonized standards” and fulfilling the requirements of the standards guarantees the fulfilment of the essential requirements of the related European Directives. The most relevant harmonized standards related to the present project is the *Directive 94/62/EC* of 20 December 1994 on packaging and packaging waste.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

Another way to link standards and the legislative framework is by supporting the public policies and technical development in certain areas: usually this is done by a Standardization Request, formerly known as Mandate. A Standardisation Request is a demand from the European Commission to the European standardisation organisations (ESOs), such as CEN or CENELEC, to draw up and adopt European standards in support of European policies and legislation, such as Directives and Regulations. Draft mandates are drawn up by the Commission services through a process of consultation with a wide group of interested parties (social partners, consumers, SMEs, relevant industry associations, etc.). The European standards, even developed under a mandate and for European legislation, remain voluntary in their use, excepting the Annex ZA of the harmonised standards of construction products.

A database of Standardization Requests may be found in the [European Commission related webpage](#), being some examples of them related to this project are:

- M/88 M/317 Second Standardisation mandate to CEN related to the packaging and packaging waste directive;
- M/200 Mandate to CEN for standardisation and study related to packaging and packaging waste);

There is also a mandate related with circular economy, but it deals mostly with energy using products and it is not applicable for CIRC-PACK.

Harmonised European standards (hENs) are the harmonised technical specifications developed by CEN or CENELEC following the mandates given by the European Commission. The Harmonised European standards are identified by the inclusion of an Annex ZA. Manufacturers, other economic operators, or conformity assessment bodies can use harmonised standards to demonstrate that products, services, or processes comply with relevant EU legislation. The references of harmonised standards must be published in the Official Journal of the European Union.

1.5 Overview of the standardization landscape relevant for CIRC-PACK

According to the objectives of CIRC-PACK, the most relevant standards will be related to packaging and the environment. The environmental issues in standardization are addressed in two different levels:

- Horizontal level: documents applicable to a wide range of sectors, products or activities. Usually provide a common framework or general methodology (e.g. Series ISO 14000 with standards for life cycle analysis, labelling, environmental management, etc.).
- Vertical level: documents applicable for specific sectors (e.g. biodegradability of plastics, CO₂ emissions of a specific technology/process, etc.)

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

The horizontal level standards are mostly a tool which usually is used as a basis for more specific documents at vertical level. In such latter case, the environmental issues can be considered as a clause of a product standard or can be a standard itself. An example of the first one is the clause of environmental considerations in a standard for plastic bags, including requirements of a minimum percentage of recycled material, maximum energy consumption and a limit for CO₂ emissions in the manufacturing process. An example of a vertical standard on environment is EN 13193:2000 *Packaging - Packaging and the environment – Terminology*.

Both standards are considered in the present report, though the last type is considered as more relevant for the purpose of CIRC-PACK.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

2 STANDARDIZATION MAP

2.1 Methodology

The methodology used for the identification of standards and standards under development relevant for CIRC-PACK project is described as follows.

A list of key concepts was prepared to act as a starting point for the identification of standardization areas, selecting keywords related to the aims and goals of the project. The list was agreed by UNE and CIRC-PACK partners and is reported in Table 2.

Table 2. Keywords used in the preliminary search	
1.	Plastic containers
2.	Biodegradability
3.	Compostability
4.	Recyclability
5.	Environmental footprint
6.	Plastic packaging
7.	Multilayer packaging
8.	Life cycle analysis
9.	Environmental impact
10.	Bio-based materials
11.	Eco-design
12.	Polymer materials
13.	Plastic parts
14.	Plastic tests

Using the aforementioned keywords, significant number of standards were identified. Through the standards, the relevant technical bodies (technical committees TC, subcommittees SC and working groups WG) were identified and other fields for the search, such as the International Classification of Standards (ICS). Both were intended to filter the search, however, sometimes the results of the search rather than filtering the results, were enlarging them. In both cases, the use of different search fields and search engines is useful to verify the results.

The most relevant field for CIRC-PACK is the standardization body. There are various reasons to map the technical bodies and not only the standards. The main one is that a new deliverable with recommendations on how to link the results of CIRC-PACK with standardization is foreseen at the end of the project (M32) and it has to be based on the

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

relevant technical bodies. Another reason is that in order to follow the evolution of a particular standard it is also necessary to trace the technical body responsible for it.

Once identified the relevant technical bodies, they were included in a summary table and a list of existing relevant standards was also included in the deliverable. Published standards and standards under development were identified for each standardization area, together with the technical committee responsible for the respective standards.

The standardization study covers European standards developed by the European Committee for Standardization ([CEN](#)) and the European Committee for electrotechnical Standardization ([CENELEC](#)). Moreover, the study covers also the International standards developed by the International Organization for Standardization ([ISO](#)) and the International Electrotechnical Commission ([IEC](#)). Although it is not expected to find relevant standard in the electrotechnical field, as environmental issues are considered in a similar way, some common standards could be identified in such a field. In the topics covered by CIRC-PACK, also the American Society for Testing and Materials (ASTM) is relevant and therefore, it was included in the research. The databases and websites used for the research are included as references.

The study is structured in standardization areas for which relevant standardization technical committees (TCs) and other technical bodies within them were found. For those TCs published standards and standards under development are referred. The relationship with the project found for each of the identified areas is explained, as well as the relevant European Directives or Regulations.

CIRC-PACK involves many tests to characterize the general properties of materials and products used under different work packages. Both the materials and the products already exist in the market or intend to replace the existing ones and therefore for their characterization the same standards will be used.

There are literally hundreds of standards for the characterization of mechanical properties, physical-chemical properties, films, production process, etc. None of the previously mentioned keywords are related to such a characterization. All these characteristics and related standards have in common that are well-known and are currently used by the partners and therefore a full list of them is found as not very relevant for the project. Therefore, no list of that standards is included in the present deliverable, but a link to an updated list is included in the references.

2.2 Technical bodies overview

As previously explained, the key topics or key words are the starting point of the research, but the standardization work is carried out and focused on technical bodies, committees, subcommittees or working groups which are not completely aligned with the key words (e. g. the scope of the technical body is not coincident with the key word). Therefore, the following Table 3 offers an overview of the relevant technical bodies for this project.

The recommended actions for each technical body are:

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

- None: any action is recommended at this stage. Technical body is included because relevant standards could have been identified, the topic is relevant for CIRC-PACK or it is an “umbrella” technical body (technical committee with relevant subcommittees or working groups under it). The recommendation should be revised in the future.
- Follow: such an action foresees the reading of the main documents issued by the technical body and assess their relevance for CIRC-PACK.
- Participate: with the present action, an active participation is recommended; attending meetings and commenting the documents.

Table 3. Identified technical bodies relevant for CIRC-PACK

Topic	Organism	Technical committee or subcommittee	Recommended action/Comments
Plastics	CEN	CEN/TC 249 Plastics	None.
		CEN/TC 249/WG 9 Characterisation of degradability	None. Though has some standards, it has now a very low activity and a high coordination with ISO
		CEN/TC 249/WG 11 Plastics recycling	Follow the revision of standards. Characterization of recycled materials.
		CEN/TC 249/WG 17 Biopolymers	Follow and potential participation.
		CEN/TC 249/WG 20 Analytical methods for contaminants in recycled plastics	None. No standards currently published.
	ISO	ISO/TC 61 Plastics	None.
		ISO/TC 61/SC 5/WG 22 Biodegradability	Follow and possible participation for selected test methods.
		ISO/TC 61/SC 5/WG 23 Biobased plastics	None, just follow WG 7
		ISO/TC 61/SC 6 Ageing, chemical and environmental resistance	Follow
		ISO/TC 61/SC 6/WG 7 Basic standards	None. No standards published under this SC.
		ISO/TC 61/SC 14 Plastics and environment	Follow.
	ASTM	ASTM D 20.96 Environmentally Degradable Plastics and Biobased Products	Follow.
	Packaging	CEN	CEN/TC 261 Packaging

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

		CEN/TC 261/SC 4 Packaging and the environment	Follow
		CEN/TC 261/SC 4/WG 1 Terminology, symbols and criteria for life cycle assessment of packaging	None
		CEN/TC 261/SC 4/WG 2 Degradability and organic recovery of packaging and packaging materials	Follow
		CEN/TC 261/SC 4/WG 3 Material recovery	Follow
		CEN/TC 261/SC 4/WG 4 Energy recovery	Follow
		CEN/TC 261/SC 4/WG 6 Prevention	None
		CEN/TC 261/SC 4/WG 7 Reuse	None
		CEN/TC 261/SC 4/WG 8 Heavy metals and other dangerous substances	None
	ISO	ISO/TC 122 Packaging	None
		ISO/TC 122/SC 4 Packaging and the environment	Follow. Relevant standards on the topic.
Environment	ISO	ISO/TC 207 Environmental management	None.
		ISO/TC 207/SC Environmental management systems	
		ISO/TC 207/SC 3 Environmental labelling	
		ISO/TC 207/SC 4 Environmental performance evaluation	
		ISO/TC 207/SC 5 Life cycle assessment	
NOTE	Please be aware that at European level, the standardization related to environmental management is discussed at a sector group which decides upon the adoption of ISO standards.		

2.3 List of standards identified

In this clause, relevant standards and standards under development are identified and classified by topic. For each topic, the standards and standards under development are classified by issuing technical body. In order to simplify the table, standards and standards under development are reported under the same name "standards".

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

2.3.1 Standards about plastics

Table 4. Standards about plastics			
Issuing body	Code	Title	Comments
CEN/TC 249/WG 11	EN 15342:2007	Plastics - Recycled Plastics - Characterization of polystyrene (PS) recyclates	To be used for testing and characterization of raw material. WP 3, WP 4 and WP 5.
	EN 15343:2007	Plastics - Recycled Plastics - Plastics recycling traceability and assessment of conformity and recycled content	
	EN 15344:2007	Plastics - Recycled Plastics - Characterisation of Polyethylene (PE) recyclates	
	EN 15345:2007	Plastics - Recycled Plastics - Characterisation of Polypropylene (PP) recyclates	
	EN 15347:2007	Plastics - Recycled Plastics - Characterisation of plastics wastes	
	CEN/TS 16010:2013	Plastics - Recycled plastics - Sampling procedures for testing plastics waste and recyclates	
	CEN/TS 16011:2013	Plastics - Recycled plastics - Sample preparation	
	EN 15346:2014	Plastics - Recycled plastics - Characterization of poly(vinyl chloride) (PVC) recyclates	
	EN 15348:2014	Plastics - Recycled plastics - Characterization of poly(ethylene terephthalate) (PET) recyclates	
CEN/TC 249/WG 9	EN 14995:2006	Plastics - Evaluation of compostability - Test scheme and specifications	Currently under revision
	EN 14987:2006	Plastics - Evaluation of disposability in waste water treatment plants - Test scheme for final acceptance and specifications	
	CEN/TR 15351:2006	Plastics - Guide for vocabulary in the field of degradable and biodegradable polymers and plastic items	
	CEN/TR 15822:2009	Plastics - Biodegradable plastics in or on soil - Recovery, disposal and related environmental issues	
CEN/TC 249/WG 17	CEN/TR 15932:2010	Plastics - Recommendation for terminology and characterisation of biopolymers and bioplastics	
	CEN/TS 16295:2012	Plastics - Declaration of the bio-based carbon content	
	CEN/TS 16137:2011	Plastics - Determination of bio-based carbon content	
	CEN/TS 16398:2012	Plastics - Template for reporting and communication of bio-based carbon content and recovery options of biopolymers and bioplastics - Data sheet	

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

	prEN xxx	Plastics - Bio-based plastics	Under development
ASTM D 20.96	ASTM D5338 - 15	Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions, Incorporating Thermophilic Temperatures	Equivalent to ISO ISO 14855
	ASTM D5511 - 12	Standard Test Method for Determining Anaerobic Biodegradation of Plastic Materials Under High-Solids Anaerobic-Digestion Conditions	Equivalent to ISO 15985
	ASTM D5526 - 12	Standard Test Method for Determining Anaerobic Biodegradation of Plastic Materials Under Accelerated Landfill Conditions	
	ASTM D5988 - 12	Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials in Soil	Equivalent to ISO 17556
	ASTM D6400 - 12	Standard Specification for Labeling of Plastics Designed to be Aerobically Composted in Municipal or Industrial Facilities	Equivalent to ISO 17088
	ASTM D6691 - 09	Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials in the Marine Environment by a Defined Microbial Consortium or Natural Sea Water Inoculum	
	ASTM D6868 - 17	Standard Specification for Labeling of End Items that Incorporate Plastics and Polymers as Coatings or Additives with Paper and Other Substrates Designed to be Aerobically Composted in Municipal or Industrial Facilities	
	ASTM D6866 - 16	Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis	
	ASTM D6954 - 04(2013)	Standard Guide for Exposing and Testing Plastics that Degrade in the Environment by a Combination of Oxidation and Biodegradation	Under revision
	ASTM D7026 - 13	Standard Guide for Sampling and Reporting of Results for Determination of Biobased Content of Materials via Carbon Isotope Analysis	
	ASTM D7444 - 11	Standard Practice for Heat and Humidity Aging of Oxidatively Degradable Plastics	Just for comparative purposes, as the correlation with real conditions is not known.
	ASTM D7473 - 12	Standard Test Method for Weight Attrition of Plastic Materials in the Marine Environment by Open System Aquarium Incubations	



Document:	D7.4. Report on the standardization landscape and applicable standards		
Author:	UNE	Version	1
Reference:	D7.4	Date:	31/10/2017

	ASTM D7475 - 11	Standard Test Method for Determining the Aerobic Degradation and Anaerobic Biodegradation of Plastic Materials under Accelerated Bioreactor Landfill Conditions	Under revision	
	ASTM D7991 - 15	Standard Test Method for Determining Aerobic Biodegradation of Plastics Buried in Sandy Marine Sediment under Controlled Laboratory Conditions		
	ASTM WK29802	New Specification for Virgin Plastics that biodegrade in Soil under Aerobic Laboratory Conditions	Under development. Might be considered for testing of those properties, particularly in WP 3 and WP 4	
	ASTM WK58506	New Practice for Testing Compostable Plastics in Residential Composting Environment		
	ASTM WK34454	New Test Methods for Standard Method for Determining the Disintegration of Compostable Plastics and other Materials in Aerobic Industrial Composting Environments		
	ASTM WK34780	New Specification for Plastic Materials that Anaerobically Biodegrade in Landfills		
	ASTM WK41850	New Test Method for Determining the rate and extent of plastics biodegradation in an anaerobic laboratory environment under accelerated conditions		
	ASTM WK45054	New Practice for preparing samples for ecotoxicity testing after soil degradation		
	ASTM WK54915	New Test Method for Determination of Aerobic Biodegradability of Single and Multilayer Coatings		
ISO/TC 61/SC 5/WG 22	ISO 17088:2012	Specifications for compostable plastics		
	ISO 13975:2012	Plastics -- Determination of the ultimate anaerobic biodegradation of plastic materials in controlled slurry digestion systems -- Method by measurement of biogas production		
	ISO 17556:2012	Plastics -- Determination of the ultimate aerobic biodegradability of plastic materials in soil by measuring the oxygen demand in a respirometer or the amount of carbon dioxide evolved		
	ISO/WD 22403	Plastics -- Assessment of the inherent aerobic biodegradability and environmental safety of non-floating materials exposed to marine inocula under laboratory and mesophilic conditions -- Test methods and requirements	Under development in first stages.	
	ISO/WD 22404	Plastics -- Determination of the aerobic biodegradation of non-floating materials exposed to marine sediment -- Method by analysis of evolved carbon dioxide	Recommended to follow	



	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

	ISO 15985:2014	Plastics -- Determination of the ultimate anaerobic biodegradation under high-solids anaerobic-digestion conditions -- Method by analysis of released biogas	
	ISO/NP 22766	Plastics -- Determination of disintegration of non-floating plastic materials in marine habitats under real field conditions	Under development in first stages
	ISO 20200:2015	Plastics -- Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test	
	ISO 14852:1999	Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium -- Method by analysis of evolved carbon dioxide	Under revision, recommended to follow the revised document
	ISO 14855-2:2007	Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions -- Method by analysis of evolved carbon dioxide -- Part 2: Gravimetric measurement of carbon dioxide evolved in a laboratory-scale test	
	ISO 14851:1999	Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium -- Method by measuring the oxygen demand in a closed respirometer	
	ISO 19679:2016	Plastics -- Determination of aerobic biodegradation of non-floating plastic materials in a seawater/sediment interface -- Method by analysis of evolved carbon dioxide	
	ISO 10210:2012	Plastics -- Methods for the preparation of samples for biodegradation testing of plastic materials	
	ISO 14855-1:2012	Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions -- Method by analysis of evolved carbon dioxide -- Part 1: General method	
	ISO 18830:2016	Plastics -- Determination of aerobic biodegradation of non-floating plastic materials in a seawater/sandy sediment interface -- Method by measuring the oxygen demand in closed respirometer	
	ISO 16929:2013	Plastics -- Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test	Under revision, recommended to follow the revised document
	ISO 14853:2016	Plastics -- Determination of the ultimate anaerobic biodegradation of plastic	

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

		materials in an aqueous system -- Method by measurement of biogas production	
ISO/TC 61/SC 5/WG 22	ISO/CD 22526-1	Plastics -- Carbon and environmental footprint of biobased Plastics -- Part 1: General principles	Under development, recommended to follow
	ISO/CD 22526-2	Plastics -- Carbon and environmental footprint of biobased Plastics -- Part 2: Material carbon footprint, Amount (mass) of CO2 removed from the air and incorporated into polymer molecule	
	ISO/CD 22526-3	Plastics -- Carbon and environmental footprint of biobased Plastics -- Part 3: Process carbon footprint, requirements and guidelines for quantification	
	ISO 16620-3:2015	Plastics -- Biobased content -- Part 3: Determination of biobased synthetic polymer content	
	ISO 16620-5:2017	Plastics -- Biobased content -- Part 5: Declaration of biobased carbon content, biobased synthetic polymer content and biobased mass content	
	ISO 16620-4:2016	Plastics -- Biobased content -- Part 4: Determination of biobased mass content	
	ISO 16620-2:2015	Plastics -- Biobased content -- Part 2: Determination of biobased carbon content	Under revision
	ISO 16620-1:2015	Plastics -- Biobased content -- Part 1: General principles	
ISO/TC 61/SC 6/WG 7	ISO/CD 846	Plastics -- Evaluation of the action of microorganisms	Under development.
	ISO/CD 21702	Measurement of antiviral activity on plastics and other non-porous surfaces	
	ISO 16869:2008	Plastics -- Assessment of the effectiveness of fungistatic compounds in plastics formulations	
	ISO 22196:2011	Measurement of antibacterial activity on plastics and other non-porous surfaces	
	ISO 177:2016	Plastics -- Determination of migration of plasticizers	

2.3.2 Standards about packaging

Table 5. Standards about packaging			
Issuing body	Code	Title	Comments

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

CEN/TC 261	EN 13427:2004	Packaging - Requirements for the use of European Standards in the field of packaging and packaging waste	Covered by Mandate M/317 on packaging and packaging waste. Though they are under responsibility of different WG, as they are linked to the mandate, are presented as a group.
	EN 13428:2004	Packaging - Requirements specific to manufacturing and composition - Prevention by source reduction	
	EN 13429:2004	Packaging - Reuse	
	EN 13430:2004	Packaging - Requirements for packaging recoverable by material recycling	
	EN 13431:2004	Packaging - Requirements for packaging recoverable in the form of energy recovery, including specification of minimum inferior calorific value	
	EN 13432:2000	Packaging - Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging	
CEN/TC 261/WG 1	EN 13193:2000	Packaging - Packaging and the environment - Terminology	Relevant for WP 2 and WP 6
	CR 12340:1996	Packaging - Recommendations for conducting life-cycle inventory analysis of packaging systems	
	CEN/TR 13910:2010	Packaging - Report on criteria and methodologies for life cycle analysis of packaging	
CEN/TC 261/WG 2	EN 14045:2003	Packaging - Evaluation of the disintegration of packaging materials in practical oriented tests under defined composting conditions	
	EN 14046:2003	Packaging - Evaluation of the ultimate aerobic biodegradability of packaging materials under controlled composting conditions - Method by analysis of released carbon dioxide	
	EN 14048:2002	Packaging - Determination of the ultimate aerobic biodegradability of packaging materials in an aqueous medium - Method by measuring the oxygen demand in a closed respirometer	
	EN 14047:2002	Packaging - Determination of the ultimate aerobic biodegradability of packaging materials in an aqueous medium - Method by analysis of evolved carbon dioxide	
	EN 13432:2000	Packaging - Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging	

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

CEN/TC 261/WG 3	EN 13437:2003	Packaging and material recycling - Criteria for recycling methods - Description of recycling processes and flow chart	
	EN 13440:2003	Packaging - Rate of recycling - Definition and method of calculation	
	CEN/TR 13688:2008	Packaging - Material recycling - Report on requirements for substances and materials to prevent a sustained impediment to recycling	
CEN/TC 261/WG 4	EN 13439:2003	Packaging - Rate of energy recovery - Definition and method of calculation	
	CR 13686:2001	Packaging - Optimization of energy recovery from packaging waste	
CEN/TC 261/WG 7	CEN/TR 14520:2007	Packaging - Reuse - Methods for assessing the performance of a reuse system	
CEN/TC 261/WG 8	CR 13695- 1:2000	Packaging - Requirements for measuring and verifying the four heavy metals and other dangerous substances present in packaging and their release into the environment - Part 1: Requirements for measuring and verifying the four heavy metals present in packaging	Under revision
	CEN/TR 13695-2:2004	Packaging - Requirements for measuring and verifying the four heavy metals and other dangerous substances present in packaging, and their release into the environment - Part 2: Requirements for measuring and verifying dangerous substances present in packaging, and their release into the environment	
CEN/TC 261/WG 11	EN 15342:2007	Plastics - Recycled Plastics - Characterization of polystyrene (PS) recyclates	
	EN 15343:2007	Plastics - Recycled Plastics - Plastics recycling traceability and assessment of conformity and recycled content	
	EN 15344:2007	Plastics - Recycled Plastics - Characterisation of Polyethylene (PE) recyclates	
	EN 15345:2007	Plastics - Recycled Plastics - Characterisation of Polypropylene (PP) recyclates	
	EN 15347:2007	Plastics - Recycled Plastics - Characterisation of plastics wastes	
	CEN/TR 15353:2007	Plastics - Recycled plastics - Guidelines for the development of standards for recycled plastics	
	CEN/TS 16010:2013	Plastics - Recycled plastics - Sampling procedures for testing plastics waste and recyclates	
	CEN/TS 16011:2013	Plastics - Recycled plastics - Sample preparation	
	EN 15346:2014	Plastics - Recycled plastics - Characterization of poly(vinyl chloride) (PVC) recyclates	

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

	EN 15348:2014	Plastics - Recycled plastics - Characterization of poly(ethylene terephthalate) (PET) recyclates	
CEN/TC 249/WG 9	EN 17:2006	Plastics - Evaluation of compostability - Test scheme and specifications	
	EN 14987:2006	Plastics - Evaluation of disposability in waste water treatment plants - Test scheme for final acceptance and specifications	Currently under revision
	CEN/TR 15351:2006	Plastics - Guide for vocabulary in the field of degradable and biodegradable polymers and plastic items	
	CEN/TR 15822:2009	Plastics - Biodegradable plastics in or on soil - Recovery, disposal and related environmental issues	
CEN/TC 249/WG 17	CEN/TR 15932:2010	Plastics - Recommendation for terminology and characterisation of biopolymers and bioplastics	
	CEN/TS 16295:2012	Plastics - Declaration of the bio-based carbon content	
	CEN/TS 16137:2011	Plastics - Determination of bio-based carbon content	
	CEN/TS 16398:2012	Plastics - Template for reporting and communication of bio-based carbon content and recovery options of biopolymers and bioplastics - Data sheet	
	prEN 17228	Plastics - Bio-based plastics	Under development

2.3.3 Standards about environment

The standards identified under this topic are the so called “horizontal” standards, which are useful for a wide range of sectors and activities.

All the standards identified might be used as a tool for some of the tasks under WP 2 and WP 6. The output of those tasks might also have incidence in existing standards and is expected to contribute to the standardization in this topic.

Table 6. Standards about environment			
Issuing body	Code	Title	Comments
	ISO 14006:2012	Environmental management systems -- Guidelines for incorporating ecodesign	Under revision.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

ISO/TC 207/SC 3	ISO/AWI 14007	Environmental management -- Determining environmental costs and benefits -- Guidance	Under development in initial stage.
	ISO/DIS 14008	Monetary valuation of environmental impacts and related environmental aspects -- Principles, requirements and guidelines	Under dev. in advanced stage
	ISO/NP 14009	Environmental management system: Guidelines for incorporating redesign of products and components to improve material circulation	Under development in initial stage.
ISO/TC 207/SC 3	ISO 14020: 2000	Environmental labels and declarations - - General principles	
	ISO 14021: 2016	Environmental labels and declarations - - Self-declared environmental claims (Type II environmental labelling)	
	ISO 14024: 1999	Environmental labels and declarations - - Type I environmental labelling -- Principles and procedures	Under revision
	ISO 14025: 2006	Environmental labels and declarations - - Type III environmental declarations -- Principles and procedures	
	ISO/TS 14027: 2017	Environmental labels and declarations - - Development of product category rules	
	ISO/FDIS 14026	Environmental labels and declarations - - Principles, requirements and guidelines for communication of footprint information	Under development, publication expected for 2018
ISO/TC 207/SC 4	ISO 14031:2013	Environmental management -- Environmental performance evaluation -- Guidelines	
	ISO/TS 14033:2012	Environmental management -- Quantitative environmental information -- Guidelines and examples	Currently under revision
	ISO 14034:2016	Environmental management -- Environmental technology verification (ETV)	For bodies performing inspection.
	ISO 14063: 2006	Environmental management -- Environmental communication -- Guidelines and examples	Currently under revision
ISO/TC 207/SC 5	ISO 14040:2006	Environmental management -- Life cycle assessment -- Principles and framework	
	ISO 14044:2006	Environmental management -- Life cycle assessment -- Requirements and guidelines	Under revision
	ISO 14045:2012	Environmental management -- Eco-efficiency assessment of product systems -- Principles, requirements and guidelines	

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

	ISO 14046:2014	Environmental management -- Water footprint -- Principles, requirements and guidelines	
	ISO/TR 14047:2012	Environmental management -- Life cycle assessment -- Illustrative examples on how to apply ISO 14044 to impact assessment situations	
	ISO/TR 14073:2017	Environmental management -- Water footprint -- Illustrative examples on how to apply ISO 14046	

3 CONCLUSIONS

The present deliverable concerning the standardization landscape and applicable standards has identified the standardization technical bodies and also the main standards relevant for the CIRC-PACK project.

CIRC-PACK will involve several tests and characterization of materials and products using different standards. Most of the standards for “traditional” properties are currently used and well known by the stakeholders. These “traditional” properties consist in mechanical properties, physical-chemical properties, etc. Therefore, the analysis of standards for “traditional” properties has foreseen the identification and elaboration of a full list of standards, which have been included as an annex.

Besides that, the added value of the project is focused on standards and properties related to the circular economy, and therefore related to “environmental” properties. The standardization map is focused on these topics, identifying the most relevant standards and standards under development by different standardization bodies.

The deliverable has identified three main topics of interest: plastics, packaging and environment, selecting almost 30 technical bodies with relevant standards, from three different standards developing organizations, namely CEN, ISO and ASTM. The technical bodies range from broad technical committees with hundreds of standards to very specific working groups, with just a few standards under their scope. Table 3 summarizes the findings for this and for each technical body includes a recommended action.

For each topic and each technical body, the most relevant standards have been identified and reported in Tables 4 to Table 6, with a general comment on them. Moreover, the most relevant standards for each work package have been identified.

	Document:	D7.4. Report on the standardization landscape and applicable standards		
	Author:	UNE	Version	1
	Reference:	D7.4	Date:	31/10/2017

4 REFERENCES

For the elaboration of this report, the following sources have been consulted:

- ASTM website (www.astm.org)
- CEN Website (www.cen.eu)
- CENELEC Website (www.cenelec.eu)
- CEN/CENELEC Projex Online database (projex.cen.eu) (restricted to authorized users)
- ISO Website (www.iso.org)
- ISO Project Portal (isotc.iso.org) (restricted to authorized users)
- IEC Website (www.iec.ch)
- EUR-Lex (eur-lex.europa.eu)
- European Commission Mandate database (ec.europa.eu/enterprise/standards_policy/mandates/database)
- European Commission Webpage on Standardization Policy https://ec.europa.eu/growth/single-market/european-standards/policy_es
- ISO advanced search portal <https://www.iso.org/advanced-search/x/> (open and with search by TC)