

Deliverable report

Deliverable no./title: D 7.3 Certification Assessment Layman Report
Lead beneficiary: ITB (ITRB Group)
Nature of deliverable: Report
Dissemination level: PU - Public
Due date: 31.05.2021

This report has provisional status, as it has not yet been formally reviewed by the European Commission

Grant Agreement number: 820477
Project acronym: CREAToR
Project title: Collection of raw materials, Removal of flAme reTardants and Reuse of secondary raw materials
Funding scheme: H2020-SC5-2018-2019-2020
Coordinator: FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.
Project Website: www.creatorproject.eu

TABLE OF CONTENTS

DOCUMENT HISTORY AND CONTRIBUTION OF THE PARTNERS	4
1 INTRODUCTION AND OBJECTIVES	5
2 SUSTAINABLE CONSUMPTION AND PRODUCTION	6
2.1 CERTIFICATION SCHEME AND LABELS	7
2.2 EUROPEAN UNION POLICY	8
3 EU'S MAPPING ON EXISTING CERTIFICATION SCHEMES IN THE PLASTIC RECYCLING INDUSTRY	10
3.1 RECYCLERS' CERTIFICATIONS (VOLUNTARY SCHEMES)	10
3.1.1 ISO STANDARDS & CERTIFICATIONS	10
3.1.2 EU ECO-MANAGEMENT AND AUDIT SCHEME (EMAS)	10
3.2 WEEE RECYCLERS' CERTIFICATIONS: WEEELABEX AND CENELEC STANDARDS (VOLUNTARY SCHEMES AT THE MOMENT)	11
3.3 EUROPEAN STANDARDS AND CERTIFICATIONS REGARDING RECYCLED PLASTIC (VOLUNTARY SCHEMES)	11
3.3.1 EUCERTPLAST	11
3.3.2 RECYCLASS	11
3.4 GREEN LABELS / ECO-LABELS CERTIFICATIONS (VOLUNTARY SCHEMES)	12
3.5 HBCD CERTIFICATIONS	13
3.5.1 REACH CERTIFICATE OF COMPLIANCE (MANDATORY SCHEME)	13
4 CREATOR'S CERTIFICATION SYSTEM	14
4.1 OBJECTIVES OF A QUALITY ASSURANCE SYSTEM	14
4.2 CREATOR'S QUALITY ASSURANCE SYSTEM	14
4.3 CREATOR'S LABELLING	15
5 CONCLUSION	16
6 ANNEX 1: ECOLABELS FROM EUROPEAN STATES	17

Abbreviations

B&C	Building and construction
BFRs	Brominated flame retardants
CENELEC	European Committee for Electrotechnical Standardization
EASA	European Union Aviation Safety Agency
ECHA	European Chemicals Agency
EU	European Union
HBCD	Hexabromocyclododecane
ISO	International Organization for Standardization
QMS	Quality management system
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SCP	Sustainable consumption and production
SLS	Smart labelling system
UN	United Nations
WEEE	Waste from Electrical and Electronic Equipment

DOCUMENT HISTORY AND CONTRIBUTION OF THE PARTNERS

Table 1: Version management

VERSION NR	REVISER	CONTENT
V0	Christina Dalla, Rocco Lagioia (ITB)	Deliverable template
V1	Francisca Gaona (ITB)	First draft
V2	Justina Devoto (ITB)	First review
V3	Gwen Dons, Els Herremans (OVM)	Review
V4	Irma Mikonsaari, Carolyn Fisher (Fraunhofer ICT)	Review and submission

Table 2: Partners' contribution to the deliverable

PARTNER	SHORT NAME	ROLE IN THE WP	CONTRIBUTION TO THE DELIVERABLE
ITRB Group	ITB	Leader WP7 (task 1.7)	Author of deliverable 7.3
Coolrec BV	CLR	Contributor	Information generated in WP2 & WP1 (Characteristics that the waste inputs materials must fulfil to be used in the purification process)
Fraunhofer gesellschaft zur foerderung der angewandten forschung E.V.	ICT	Contributor and review	Information on the purification process and on procedures to be followed in the laboratory (information generated in WP10 in D10.2 EPQ – Requirement no. 2)
Openbare vlaamse afvalstoffenmaatschappij	OVM	Contributor and review	Reviewer

1 INTRODUCTION AND OBJECTIVES

The CREAToR project is developing and demonstrating a process to sort and remove hazardous, already banned bromine-containing flame-retardants from waste streams using continuous sorting and purification technologies: laser-induced breakdown spectroscopy (LIBS) for sorting, and supercritical CO₂ and natural deep eutectic solvents (NADES) for continuous extraction in twin-screw extruders.

CREAToR will cover the whole value chain, starting by collecting thermoplastic waste streams from building and construction and from waste electrical and electronic equipment. The project will implement methods to collect secondary raw materials, identify the presence of hazardous flame retardants, remove these contaminants from the materials and finally reuse the materials.

Brominated flame retardants (BFRs) are a large group of substances used in several products to prevent fire hazards. Due to the abundance, low cost and high performance of bromine, brominated flame retardants have had a significant share of the market for years. Some BFRs are toxic and can cause adverse effects to human health and the environment. They can travel large distances, persist in the environment¹ and in food², and bioaccumulate in human³ and animal tissue.

In CREAToR's case studies, purified waste material will be reused as a valuable secondary raw material for new B&C insulation panels (closing the economic circle), for automotive interior application, and for producing 3D printed parts for aerospace applications.

To further increase the economic feasibility of the approach, an optimised logistic concept and a harmonised material quality classification scheme will be developed and applied. CREAToR will develop a circular economy solution, transforming waste streams that are currently incinerated into value-bringing secondary raw materials. The economic viability of CREAToR will be validated through material benchmarking and LCA/LCC assessment for the whole value chain, resulting in next generation products.

Targeting a non-specialist audience, the first objective of this document is to present the certification schemes used to promote sustainable consumption and production. We first show the contribution made by certifications in promoting sustainable production that seeks the least negative economic, environmental, and social impact. We then enumerate the existing European certification schemes that are relevant within the plastic recycling market.

The second objective is to introduce CREAToR's certification system. To develop our certification we need a label and an audit methodology to set up the requirements.

Chapter 4.1 includes a brief description of the quality assurance system being developed within the consortium. This system will be a fundamental pillar to establish a quality certification for the companies that will implement this project's new technologies. The CREAToR certification proposal is presented in full in the public deliverable 1.4 *Analysis of recycling agents' conceptions & beliefs on SLS methodology*, in May 2021.

Finally, we will describe the label that the CREAToR project will introduce onto the recycled materials (output), which will contain information on the recycled material characteristics, supporting component manufacture by end-users. There is more information regarding this label in the public deliverable 1.3 *Smart labelling system methodology report*.

¹ Salamova and Hites, A. Salamova, R.A. Hites; Discontinued and alternative brominated flame retardants in the atmosphere and precipitation from the Great Lakes basin; *Environ. Sci. Technol.*, 45 (2011), pp. 8698-8706

² Ashizuka et al., Y. Ashizuka, R. Nakagawa, S. Murata, D. Yasutake, T. Hori, M. Horie, C. Nishioka, T. Takahashi, I. Tamura, T. Teshirogi, K. Sasaki; Daily intake of brominated dioxins and polybrominated diphenyl ethers estimated by market basket study; *Organohalogen Compd.*, 69 (2007), pp. 2769-2772

³ Abdallah and Harrad, M.A. Abdallah, S. Harrad; Polybrominated diphenyl ethers in UK human milk: implications for infant exposure and relationship to external exposure; *Environ. Int.*, 63 (2014), pp. 130-136

2 SUSTAINABLE CONSUMPTION AND PRODUCTION

Sustainable consumption and production (SCP)⁴ is defined as “the use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product, so as not to jeopardise the needs of further generations”.

There are several mechanisms currently in use to increase the sustainability of production processes and consumption patterns. Lebel and Lorek (2008)⁵ have identified 11 such approaches:

Table 3: Mechanisms to increase the SCP

MECHANISM	DESCRIPTION
Produce less	Innovations in production processes reduce the environmental impact per unit made.
Green supply chains	Firms with leverage in a chain impose standards on their suppliers to improve environmental performance.
Codesign	Consumers are involved in the design of products and services to fulfil needs with less environmental impact.
Produce responsibly	Producers are made responsible for waste from product disposal at the end of life.
Service rather than sell	Producers provide a service rather than sell or transfer the ownership of assets, which reduces the number of units produced while still providing the functions needed.
Certify and label	Consumers preferentially buy labelled products. Labels are based on independent certification, and producers with good practices increase their market share.
Trade fairly	Agreements made with producers may include a minimum price and other investments or benefits. Consumers preferentially buy products labelled as or sold through fair trade channels, and producers get a better deal.
Market ethically	Reducing unethical practices in marketing and advertising would reduce wasteful practices and overconsumption.
Buy responsibly	Campaigns educate consumers about the impacts of individual products, classes of products, and consumption patterns, resulting in overall behaviour changes.

⁴ Ministry of Environment Norway. Report of the Sustainable Consumption Symposium; Ministry of the Environment: Oslo, Norway, 1994.

⁵ <https://www.annualreviews.org/doi/pdf/10.1146/annurev.environ.33.022007.145734>

Use less

Consumption may be reduced for a variety of reasons, for example, as a consequence of producing less. There are many potential environmental gains from less overall consumption.

Increase wisely

Increasing the consumption of underconsumers can be affected in ways that minimise environmental impacts as economic activity expands.

All of these mechanisms have some disadvantages, but we will only name the certification issues, as this is the focus of this document. The main disadvantage is that consumers are easily confused by too much information or by a lack of transparency and credibility of competing schemes.

2.1 CERTIFICATION SCHEME AND LABELS

Since the 1970s, certification has emerged to distinguish environmentally or socially preferable products from conventional alternatives. Now, it incorporates several complex issues, from labour and production processes to end-use considerations. Moreover, standards, codes, and labels associated with these certifications are supposed to provide the characteristics of product and processes in a summarised, easily accessible form.

The International Organization for Standardization (ISO) distinguishes between three types of environmental labels⁶:

- **Third-party verified product labels** (type I, ISO 14024): voluntary programmes by independent third parties. Products are classified within a specific product category according to their comparative or relative impact based upon established criteria. The label is awarded to market-leading products with improved performance from a sustainability point of view.
- **Green claims and self-declarations** (type II, ISO 14021): these involve a first party (producer, distributor, or retailer) declaration of a product's characteristics. There are also second party schemes which involve certification by industry associations.
- **Product environmental declarations** (type III, ISO/TR 14025): quantified product information based on life cycle impacts. These impacts are presented in a form that facilitates comparison between products (e.g. a set of parameters).

Table 4 presents one example of each type of label:

Table 4: Examples from different types of labelling

TYPE I	TYPE II	TYPE III
European Ecolabel	China Environmental Labelling Type II	EcoLeaf Environmental Labelling Program
		

⁶ <https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100323.pdf>

2.2 EUROPEAN UNION POLICY

The concept of sustainability first appeared in the Brundtland Report (published in 1987), which was elaborated for the United Nations (UN) in order to warn about the negative environmental consequences of economic development and globalization. As a part of a new sustainable development roadmap, the UN approved the 2030 Agenda, which contains the Sustainable Development Goals and is a call to action to protect the planet and guarantee the global well-being of people.

Sustainable development⁷ is a core principle of the Treaty on European Union and a priority objective for the Union's internal and external policies. In the framework of the EU's Sustainable Development Policy, the promotion of sustainable consumption and production is a key issue. The EU has introduced a whole range of policies and initiatives aimed at sustainable consumption and production. These should improve the overall environmental performance of products throughout their life cycle, stimulate demand for better products and production technologies, and help consumers make informed choices. Under the European Green Deal and, in particular, the new Circular Economy Action Plan⁸, a sustainable product policy legislative initiative was announced to make products fit for a climate-neutral, resource-efficient and circular economy.

Figure 1⁹ shows the EU policy framework for sustainable consumption and production. Some regulations are mandatory instruments: Eco-design sets mandatory minimum requirements for energy-related products on the market and the Energy Label specifies mandatory consumer information to be provided, enabling a comparison of products, with a primary focus on energy consumption in the use phase.

Other voluntary regulations give support to producers and organisations that go beyond what is required by legislation in their efforts to protect the environment and quality of life. The Ecolabel is an example of these voluntary regulations. It is an environmental excellence label awarded to products and services meeting high environmental standards throughout their life-cycle.

⁷ https://ec.europa.eu/info/strategy/international-strategies/sustainable-development-goals_en

⁸ https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en#:~:text=The%20EU%27s%20new%20circular%20action,clearer%20and%20more%20competitive%20Europe.&text=1%20targets%20how%20products%20are,for%20as%20long%20as%20possible.

⁹ <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52017DC0355>

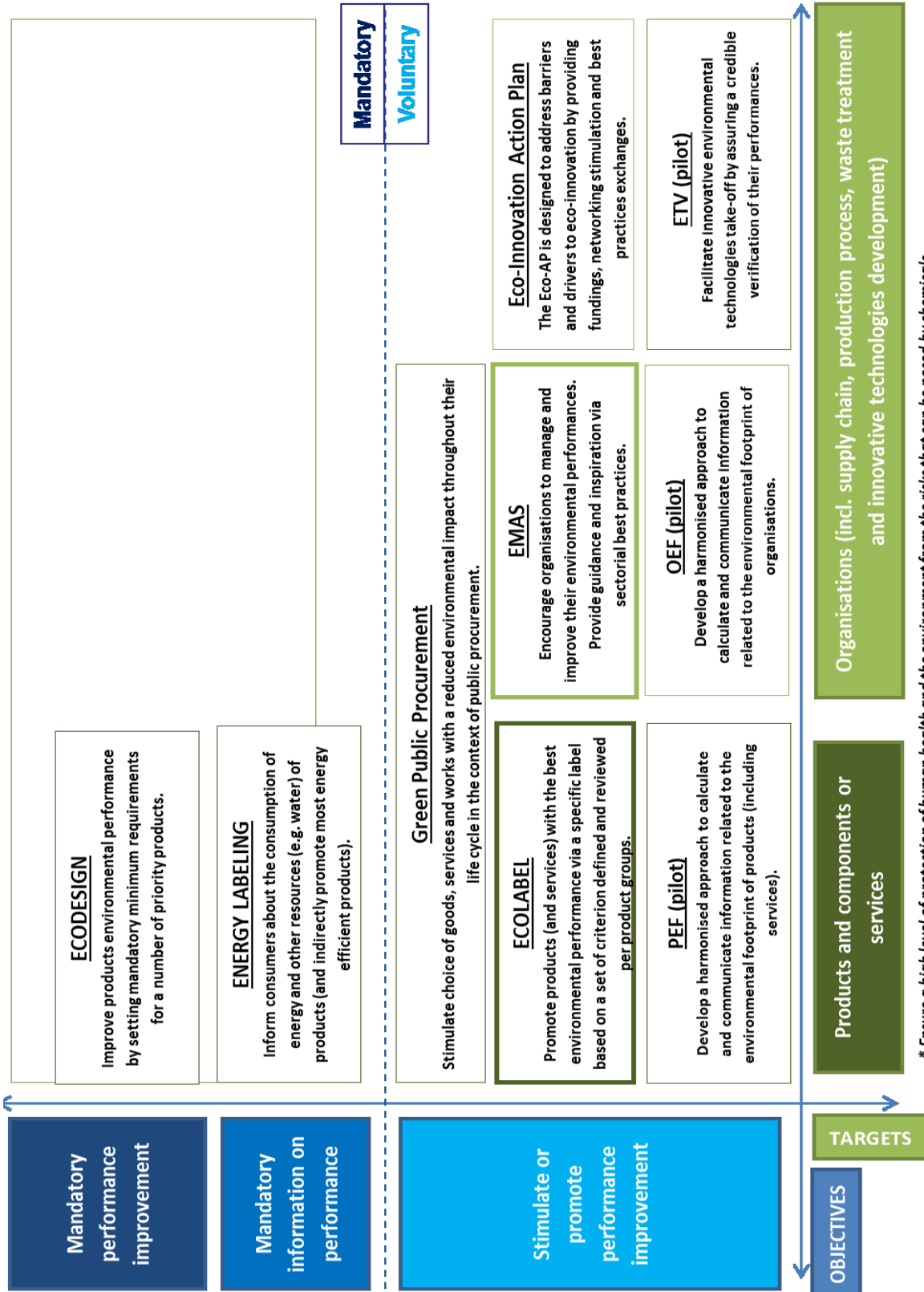


Figure 1: EU policy framework for sustainable consumption and production

3 EU'S MAPPING ON EXISTING CERTIFICATION SCHEMES IN THE PLASTIC RECYCLING INDUSTRY

The future implementation field of the CREAToR project technologies is the recycling industry. Although within the project we have 3 types of demonstrators (components for aeronautics, construction and automotive fields), the main innovation in CREAToR is not the end-user's products but the purification and recycling process.

In chapter 3.1 we present the ISO certifications that recyclers usually try to achieve. We also include EMAS, which is a voluntary audit scheme that the EU offers to waste pickers.

Chapter 3.2 concerns recyclers of WEEE (waste from electrical and electronic equipment), who are obliged to follow special standards.

Chapter 3.3 is dedicated to the European standards and certifications regarding recycled plastic.

Chapter 3.4 then shows the ecolabels which are being used in Europe to demonstrate the eco-friendly status of products or services.

Lastly, the registration, evaluation, authorisation and restriction of chemicals (REACH) certificate of compliance is explained. This certificate establishes which companies comply with the REACH chemical regulation and whether their products comply with the limits regarding the content of bromide flame retardants (especially hexabromocyclododecane (HBCD)) and other hazardous materials.

3.1 RECYCLERS' CERTIFICATIONS (VOLUNTARY SCHEMES)

3.1.1 ISO STANDARDS & CERTIFICATIONS

Certifications based on the ISO standards, which recyclers must meet for quality and safety reasons, are first addressed. Some of these certifications are not only for recycling companies - other types of companies can also be certified under these standards via a third party (certification company).

ISO 45001:2018: specifies requirements for an occupational health and safety (OH&S) management system and provides guidance on its use, enabling organisations to provide safe and healthy workplaces by preventing work-related injury and ill health, as well as by proactively improving OH&S performance.

ISO 9001:2015: is the international standard for a quality management system ("QMS").

ISO 14001:2015: specifies the requirements for an environmental management system that an organisation can use to enhance its environmental performance. ISO 14001:2015 is intended for use by an organisation seeking to manage its environmental responsibilities in a systematic manner that contributes to the environmental pillar of sustainability.

3.1.2 EU ECO-MANAGEMENT AND AUDIT SCHEME (EMAS)

The EU Eco-Management and Audit Scheme (EMAS) is a premium management instrument developed by the European Commission for companies and other organisations to evaluate, report, and improve their environmental performance. EMAS is open to every type of organisation eager to improve its environmental performance. It spans all economic and service sectors and is applicable worldwide. This instrument is based on the ISO 14001.

3.2 WEEE RECYCLERS' CERTIFICATIONS: WEEELABEX AND CENELEC STANDARDS (VOLUNTARY SCHEMES AT THE MOMENT)

The absence of binding standards for WEEE treatment across the EU is distorting recycling markets. The quality requirements of WEEE treatment differ significantly from each state. Consequently, WEEE is often shipped to places where treatment is cheaper and has a lower quality, which creates unfair competition for recyclers. The European Committee for Electrotechnical Standardization (CENELEC) wants to make CENELEC EN 50625¹⁰ standards legally binding, and requiring enforcement, which would create a more level playing field. The objective is to increase the quality of recycling, enable an internal market for WEEE, and consequently move towards achieving the goals of the circular economy. The CENELEC standard is based on WEEELabex certification¹¹.

At the moment, France, the Netherlands, Ireland and Slovenia mandate the use of CENELEC (or WEEELABEX) standards.

The WEEE Label of Excellence (WEEELABEX) is a European standard that was created in the course of a project cofinanced by LIFE+ (the environmental program of the European Union) between 2009 and 2012. The WEEELABEX certification is a voluntary European standard for companies that process depreciated computers. This includes companies that destroy data and/or parties that procure used computers for re-selling. The WEEELABEX standard provides uniform rules for the collection, storage, transport, processing, recycling, and re-use of e-waste. The objective of the WEEELABEX standard is to ascertain whether companies that process electronic waste (including depreciated computer hardware) reach the minimum required degree of recycling.

3.3 EUROPEAN STANDARDS AND CERTIFICATIONS REGARDING RECYCLED PLASTIC (VOLUNTARY SCHEMES)

3.3.1 EUCERTPLAST

This certification aims to establish a European certification for post-consumer plastic recyclers. The EuCertPlast organisation has defined requirements based on the European Standard EN 15343:2007 "*Plastics - Recycled plastics - Guidelines for the development of standards for recycled plastics*" and guidelines to encourage the recycling of plastics, particularly focusing on the process for traceability and assessment of conformity and recycled content.

This scheme assesses the good practice, the output quality and the gain in terms of greenhouse gases achieved by the audited recycler. The intention is that the waste collectors have a harmonised European tool to guarantee that the waste they deliver will be recycled in a sustainable manner by the recycler.

3.3.2 RECYCLASS

In August 2020 RecyClass¹², a cross-industry initiative that works to advance plastic packaging recyclability within Europe, presented the Recycled Plastics Traceability Certification. This is an audit scheme aiming to guarantee the transparency and integrity of claims regarding recycled content in plastics. This certification complements the EuCertPlast traceability scheme for recycling processes.

¹⁰ <https://www.digitaleurope.org/resources/eu-wide-uniform-conditions-for-the-proper-quality-treatment-of-weee/>

¹¹ https://www.sustainable-recycling.org/wp-content/uploads/2015/07/SRI_ComparisonStandards_2015en.pdf

¹² <https://recyclass.eu/recycled-content>

These are certifications that can be obtained in reference to the recycling process (EuCertPlast), the content of recycled material included in a plastic product and the level of recyclability of the plastic product (RecyClass).

Figure 2 presents the action zone of each of the certifications in the recycling supply chain.



Figure 2: Certification action areas within the supply chain¹³

3.4 GREEN LABELS / ECO-LABELS CERTIFICATIONS (VOLUNTARY SCHEMES)

Ecolabelling is a voluntary method of environmental performance certification and labelling which is practiced around the world. An ecolabel identifies products or services proven to be environmentally preferable within a specific category.

Ecolabels can be owned or managed by government agencies, non-profit environmental advocacy organisations, or private sector entities. The ecolabel index¹⁴ is currently tracking 455 ecolabels in 199 countries, and 25 industry sectors.

The paragraph below describes the European eco-label. In Annex 1, we have compiled the labels for the different states of EU.

European Ecolabel¹⁵

Established in 1992, the EU Ecolabel is an environmental excellence label for products and services meeting high environmental standards throughout their life cycle: from raw material extraction to production, distribution, and disposal. The EU Ecolabel promotes the circular economy by encouraging producers to generate less waste and CO₂ during the manufacturing process. The EU Ecolabel criteria also encourage companies to develop products that are durable and easy to repair and recycle. The EU Ecolabel criteria provide exigent guidelines for companies looking to lower their environmental impact and guarantee the efficiency of their environmental actions through third party controls. Furthermore, many companies turn to the EU Ecolabel criteria for guidance on eco-friendly best practices when developing their product lines.



¹³ <https://www.aimplas.net/blog/infographic-ecolabels-and-certifications-applicable-to-the-recycling-of-plastic-materials/>

¹⁴ <http://www.ecolabelindex.com/>

¹⁵ <https://eu-ecolabel.de/en/>

3.5 HBCD CERTIFICATIONS

3.5.1 REACH CERTIFICATE OF COMPLIANCE (MANDATORY SCHEME)

The REACH Certificate of Compliance is a document certifying that a product is compliant with the EU REACH regulation (EC) No 1907/2006. It can be either a testing report or a statement issued by a third-party testing organisation, or can also be a self-declaration.

REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. It also promotes alternative methods for the hazard assessment of substances in order to reduce the number of tests on animals.

REACH establishes procedures for collecting and assessing information on the properties and hazards of substances. Companies need to register their substances, and in order to do this they need to work together with other companies who are registering the same substance. The European Chemicals Agency (ECHA) receives and evaluates individual registrations for their compliance, and the EU Member States evaluate selected substances to clarify initial concerns for human health or for the environment. Authorities and ECHA scientific committees assess whether the risks of substances can be managed.

4 CREAToR'S CERTIFICATION SYSTEM

4.1 OBJECTIVES OF A QUALITY ASSURANCE SYSTEM

We need to differentiate between **quality assurance** (QA), quality control (QC) and quality system (QS). **QA** is actions taken to design and manufacture a safe and effective product by building quality controls into the product life cycle. QC refers to test procedures used to verify that a product is safe and effective after manufacturing. **QA** is proactive, aiming to prevent defects through process design. QC is reactive and exists to identify defects after they have happened.

QA and QC are two aspects of quality system. While some QA and QC activities are interrelated, the two are defined differently. QA activities and responsibilities cover virtually all aspects of the QS in one fashion or another, while QC is a subset of the QA activities.

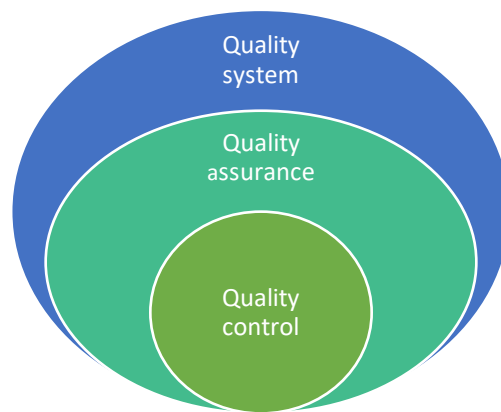


Figure 3: Relationship between a quality system, quality assurance, and quality control

4.2 CREAToR'S QUALITY ASSURANCE SYSTEM

In the CREAToR project, a new process is being developed for the purification of thermoplastic materials containing partially hazardous bromine flame retardant content. While waste containing hazardous materials must follow some legislation, CREAToR's process, being innovative, is not under any industry standards. Because of this, it has been decided to create an internal quality standard for this new process. This standard will be developed following the principles of common **quality assurance**.

More information about the legislation to which the CREAToR project is subject is provided in the public deliverable 1.7 *Assessment of existing legislations and regulations*, prepared by Openbare Vlaamse Afvalstoffenmaatschappij (OVM)¹⁶ in November 2019.

In the **QA**, the necessary procedures will be established for recycling organisations in case they want to implement the purification process developed in CREAToR. These will be based on the quality procedures followed by the partners during the project.

To develop these procedures, the procedures used in the aircraft component production market have been considered as a reference. In the first two years of the project, ITB has started to develop the **quality system** and the **production organisation exposition (POE)**, which are two of the mandatory requirements for European Union Aviation Safety Agency (EASA) approval. Moreover, in the case of CREAToR, the health and

¹⁶ <https://www.creatorproject.eu/wp-content/uploads/2020/12/D17-Assessment-of-existing-legislations-and-regulations.pdf>

safety systems are imperative because the researchers/workers will be in contact with hazardous materials. The purpose of this section is not to develop a health and safety system but rather to provide some guidelines for the safety of workers who are in touch with these hazardous materials.

The **quality management system** (QMS, based on ISO 9001:2008) specifies four levels of documentation that an organisation must observe to document its quality management system: manual, procedures, work instruction and records & documents:

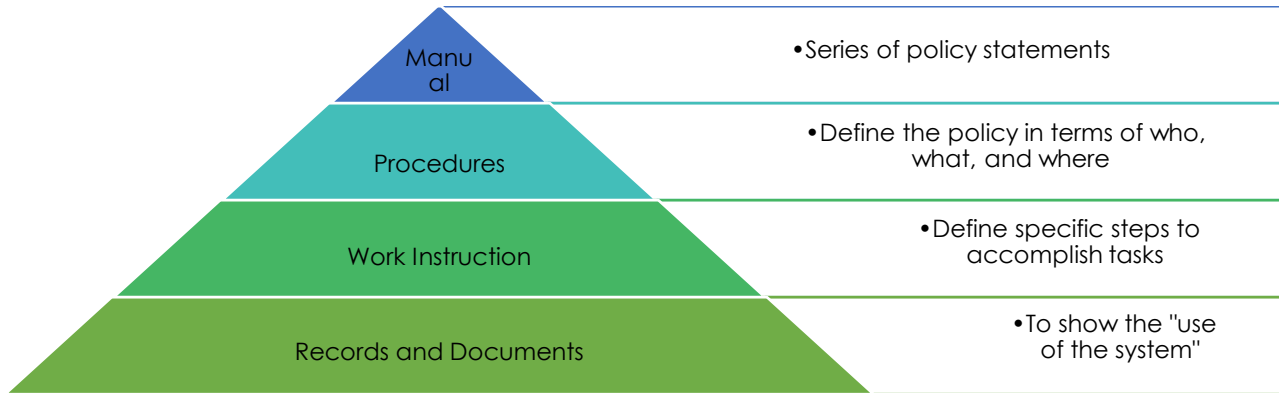


Figure 4: Four levels of QMS documentation

The quality manual includes end user requirements for the output materials. The most important objective is to fulfil the POP's Regulation regarding the HBCD content. Moreover, it includes the waste material inputs procedure. This procedure is very important because the purification process places some limitations on the inputs materials.

The **ROE (recycling organisation exposition)** for early adopters has also been established. This document is based on the POE. The first draft proposed for the structure of this document is contained in the public deliverable 1.4 Analysis of recycling agents' conceptions & beliefs on SLS methodology.

4.3 CREAToR'S LABELLING

CREAToR's label will be attached to the recycling material bags and will summarise important information regarding material specifications that will be useful for the end-users. Figure 5 shows the label skin draft and the specifications that it will contain.



TECHNICAL SPECIFICATIONS

- Density
- Melt -flow rate
- Charpy impact strength
- Tensile modulus
- Tensile strain at break
- Flexural modulus
- Flexural strength
- Flame rating
- Flame retardant content

Figure 5: CREAToR label draft and end-user specifications for labelling

5 CONCLUSION

This document has presented a range of labelling and certification schemes that have significantly advanced the conversation concerning ethical sourcing and environmental sustainability. Nevertheless, it has also shown that there are important challenges in using standards:

- The strictness of a standard
- Problems of scale
- Compliance costs
- Efficiency of transfer of benefits to the end-user.

Furthermore, existing labelling and certification systems have a limited applicability to innovative technologies and processes such as those developed in CREAToR.

The recyclers in the consortium can obtain all the related certifications for this type of companies and of course, the REACH certification is fulfilled by all the CREAToR partners that are in contact with hazardous materials. Coolrec has been certificated by WEEELABEX, ISO 9001, ISO 14001 and 45001¹⁷. Relight has been certificated by ISO 14001 and it is controlled by EMAS¹⁸.

However, of the products developed in CREAToR, only the recycled 3D filament may be a candidate to obtain one of the eco-label certifications, because it is the only product that will enter public hands. This filament is being developed by Centexbel to be used in printing aeronautical components, one of the CREAToR demonstrators. ITRB Group wants to exploit this filament made by recycled ABS at an industrial level, not only in the aeronautical field but also in automotive or general consumer fields.

CREAToR's developed technologies aim to increase the recycling rates. Achieving the purification of plastics containing HBCD (hazards bromine retardants) and improving the sorting of waste are two necessary improvements in the upgrading of recycling technologies. In addition, a level of quality must be maintained in recycling companies that will implement these new technologies. For this, the CREAToR project is developing an **innovative quality assurance system** which, together with the label that is being established for the recycled material, will allow a certification to be proposed. This will be a quality seal for both the company and the recycled material. Moreover, we believe that the introduction of our label could help meet the challenge of waste sorting, since it will speed up the labour of the end-users by knowing in advance the characteristics of the recycled material.

In the public deliverable *1.4 Analysis of recycling agents' conceptions & beliefs on SLS methodology* published at May 2021 too, ITB presents an extensive study on the implementation of certifications and the opinions of recyclers and other stakeholders on certifications. Also, a summary of the quality assurance system and a draft of the label that we have proposed inside CREAToR project is contained in that document. The final demonstrator of the label will be presented in the public deliverable *1.5 Smart labels for the materials utilized within CREAToR*.

¹⁷ <https://www.coolrec.com/en/customer-service>

¹⁸ <https://www.relighitalia.it/en/follow-up/documents-download/category/27-certificates-iso-14000-emas>

6 ANNEX 1: ECOLABELS FROM EUROPEAN STATES



The Blue Angel Label (German Ecolabel)¹⁹

The Blue Angel is an environmental label in Germany awarded to particularly environmentally friendly products and services. The label is from the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. The products labelled with the Blue Angel are more environmentally friendly and healthier than other products that have the same fitness for use and quality in the respective product group.

Nordic Swan²⁰

The Nordic Swan Ecolabel works to reduce the environmental impact from production and consumption of goods – and to make it easy for consumers and professional buyers to choose the environmentally best goods and services.



National Programme of Environmental Assessment and Ecolabelling in the Slovak Republik (NPEHOV)²¹



Its aim is to promote the production and consumption of products with a lower negative impact on the environment, energy consumption and the consumption of raw material and hazardous substances, to improve the knowledge of the public, producers, suppliers and sellers about the environmental performance of products, and to reduce pollution of the environment. This ecolabelling standard is verified by an independent organisation.

Millieukeur²²

The Dutch environmental quality label has an integrated approach to making non-food products and services more sustainable. Milieukeur aims for a healthy balance between the various sustainability themes, so that its criteria relate to the whole life cycle of the product or service. The development and revision of certification schemes and the inspection and certification of the products / services is carried out according to the European standards for product certification.



Umweltzeichen²³

The Austrian Ecolabel addresses itself primarily to consumers but also to manufacturers and public procurement. The ecolabel provides consumers with guidance in order to choose products or services which are least hazardous to the environment or health. The ecolabel draws the consumer's attention to aspects of environment, health and quality (fitness for use). Conformity with Österreichisches Umweltzeichen's standard is verified by an independent organisation (third party).

Good Environmental Choice "Bra Miljöval" ²⁴

This label focuses on fairly widely used products and services that have a major impact on the environment. Before a product or service can display the Good Environmental Choice ecolabel it must meet certain criteria. Since factors such as travel and electricity consumption also have major environmental consequences, the Swedish Society for Nature Conservation has included services in its eco-labelling program. It has criteria for passenger transport, goods transport and electricity supplies.



Bra Miljöval

¹⁹ <https://www.blauer-engel.de/en/our-label-environment>

²⁰ <https://www.nordic-ecolabel.org/why-choose-ecolabelling/>

²¹ <http://old.sazp.sk/public/index/go.php?id=1571>

²² <https://www.milieukeur.com/275/home.html>

²³ <https://www.umweltzeichen.at/de/home/start>

²⁴ <https://www.naturskyddsforeningen.se/in-english>



NF Environnement²⁵

To be issued the NF Environnement mark the product must comply with ecological and fitness for purpose criteria. These criteria are the result of negotiations between representatives of manufacturers, consumer, environmental protection and distributor associations and public authorities. Conformity with NF-Environnement Mark's standard is verified by an independent organisation.

Környezetbarát Termék²⁶

It has been used in Hungary since 1994. It attests the environmentally friendly nature of the products. The aim of the scheme is to encourage companies to use cleaner technologies, develop environmentally friendly products and to promote their demand. It aims to give market preference to products that have been proven to exert less pressure on their environment through life cycle analysis than their rivals.



Ekologicky šetrné výrobky²⁷



As part of the Czech Republic Programme for the Labelling of Environmentally Friendly Products and Services, products that meet the specified environmental performance requirements are eco-labelled as eco-friendly products and eco-friendly services. At present, the Czech ecolabel can be acquired for 41 categories of products and two categories of services.

Prijatelj Okoliša²⁸

For Croatia, the main objective of awarding the Environmental Label is the promotion of products with a reduced adverse environmental impact as compared to other equivalent products. The award was established to promote the development of new technologies, the production and consumption of products less adverse to the environment, pollution reduction and a more economical management of raw materials and energy.



Mark-Znak EKO²⁹

This important Polish mark has been awarded since 1998 by the Polish Research and Certification Centre for detergent, cosmetics, toys and footwear products. These products must meet the criteria for the protection of the health, the environment, and the economic use of natural resources throughout the process of formation and "life" of the product.

AENOR³⁰

The Spanish eco-label Marca Aenor Medio Ambiente was developed by the private and independent Asociación Española de Normalización y Certificación (AENOR) and first awarded in 1994. The AENOR Mark is an ecolabel, compliant with ISO 14024 environmental standards.



The Catalan Eco-label³¹

The Emblem of Guarantee of Environmental Quality is an eco-labelling scheme created under the Catalan Regional Government. It promotes the design, production, marketing, use and consumption of products and services that fulfil certain environmental quality requirements beyond those established as compulsory under current regulations.

²⁵ <https://marque-nf.com/en/>

²⁶ <https://humusz.hu/termekcimkek/kornyezetbarat-termek-vedjegy-magyar-cedrus>

²⁷ <https://ekoznacka.cz/environmentalni-znaci>

²⁸ <https://mingor.gov.hr/o-ministarstvu-1065/djelokrug-4925/okolis/eko-oznake/znak-zastite-okolisa-prijatelj-okolisa/1414>

²⁹ <https://www.pcbc.gov.pl/en/>

³⁰ <https://www.en.aenor.com/certificacion/medio-ambiente>

³¹

http://mediambient.gencat.cat/es/05_ambits_dactuacio/empresa_i_produccio_sostenible/ecoproductes_i_ecoserveis/etiquetatge_ecologic_i_declaracions_ambientals_de_producte/distintiu_de_garantia_de_qualitat_ambiental/