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Table of Abbreviations and Acronyms

BCMS	Business Continuity Management Systems
CFP	Carbon footprint of a product
EMS	Environment Management System
EN	European Norm
EnB	Energy baselines
EnMS	Energy Management System
EnPI	Energy Performance Indicators
EPD	Environmental Product Declaration
GHG	Greenhouse Gases
GRI	Global Reporting Initiative
IEC	International Electrotechnical Commission
IFC	Industry Foundation Classes
IQNet	International Certification Network
ISMS	Information Security Management Systems
ISO	International Organization for Standardization
ITC	Information and communication technologies
KPIs	Key Performance Indicators
LCA	Life Cycle Assessment
M&V	Measurement and verification
MSS	Management System Standards
PDCA	Plan-Do-Check-Act
PNPSE	Energy Service Project Business Plan
QMS	Quality Management System



Executive summary

This document represents the Deliverable D7.2 “Report on framework analysis for sustainable manufacturing certification”, developed within task 7.1 of WP7 “Standardization, certification and regulation of energy efficient manufacturing practices”.

This analysis of the certification landscape includes the information on the relevant standards that can be certified or verified and the standards that can be use with support.

As described in the project plan, WP7 will include an initial analysis of the standardization, certification and regulatory landscapes in order to identify three key factors:

- The need that other WP may have about existing standards;
- The certification schemes and regulatory instruments of current practice in EU manufacturing and
- The role and opportunities from interaction with relevant involved committees and organizations.

In this context, being our role in the project that of certification expert, at this step AENOR is responsible for the identification of the certification schemes in use in the EU manufacturing.



1 Introduction

The scope of this deliverable 7.2 is to provide the project with a diagnosis of the currently available certification schemes that may be applicable to sustainable manufacturing.

The main objective of this early-stage task is to provide information for further tasks in WP7, but also for other tasks in the project, such as WP1 and WP8, providing thus the Consortium with available information for further developments regarding certification or related issues.

This preliminary analysis of the certification background has been performed on a research approach. To develop this task, AENOR taken into account the certification fields of interest identified by ECOFACT, and has also incorporated the inputs from other tasks, mainly the information about the applicable standards identified during the elaboration of deliverable 7.1 "Report on the standardization landscape and applicable standards".

Besides, AENOR has sought the inputs from other organizations that take a part of the certification scheme.

Being aware of the schemes already available in the certification market is a first step to work towards the design of a most effective and customized certification scheme that can satisfy the needs of the industry, identifying potential gaps to be filled.

This deliverable will constitute a basis for AENOR's contribution to task 7.3, since AENOR is to undertake certification activities that will result in the design of certification scheme that will verify the compliance of companies/plants with the defined Best Practices whilst being in line with the existing certification schemes.



2 About AENOR

AENOR Internacional (AENOR) is the leading certification entity in Spain, being evaluation of conformity our core business. The wide experience in third-party evaluations and our focus on helping our clients have made us to, not only obtain and maintain a robust portfolio of accredited certification schemes, but also to develop other schemes.

AENOR's support for good environmental practices encompasses general environmental management systems such as ISO 14001, systems that address areas such as product eco-design and energy management, environmental product declarations or issues concerning specific sectors, such as forestry.

One of our most important lines of action is that related to environment and sustainability, with the following key areas of certification, with clients form all sectors of activity:

- Global Environmental Management
- Circular Economy
- Climate Change
- Management of Resources
- Forestry Sector
- Other Industries

This background provides us with a good understanding of the market and the global situation of the options for sustainable manufacturing certification.



3 Consultation process

With the view in completing the scope, AENOR has run a double consultation process.



The first one was launched to the other **members of Ecofact consortium**, requesting inputs in three fields:

- 1- main certification/verification schemes have been identified by AENOR as the more applicable to sustainable manufacturing;
- 2- other certification/verification that have been identified by AENOR as potentially applicable to sustainable manufacturing;
- 3- any other certification/verification not identified that you know /have implemented and consider applicable to sustainable manufacturing.



Same consultation has been run among members of **IQnet Association**.

IQnet is an international certification network with more than 25 years of activity open to third-party certification bodies which are accredited against ISO/IEC 17021-1 (at least for QMS and EMS).

IQNET Partners worldwide certification activities include more than 360,000 valid management system certificates issued in virtually every country of the world, making IQNET network the most represented and reputable certification bodies network in the world.

Currently the network consists of 37 Partner Certification Bodies. AENOR delegate to IQNET is Chairman of the Standing Committee on Marketing and Development, as well as vice president to the Association.

The inputs received from both consultations have been incorporated to our report.



4 About certification

Certification is the action carried out by an independent body, which manifests that an organisation, product, process or service meets the requirements defined in certain national or international standards or technical specifications.

Certification is intended for any type of company, irrespective of size, location or activity. These do not necessarily have to be large companies and certification may even be more useful for small and medium enterprises that are not so well known on the market, as it is possible that these types of companies will have a greater need to gain the trust of interest groups. Although in some cases it is an essential requirement in order to sell, whether due to legal considerations, or because a product's shoppers always request it, it is an entirely voluntary process.

Therefore, the first step to identify certification schemes has necessarily been identifying standards in force that can be subject to certification. Besides, many of them have related standards that, despite not being certifiable, established general criteria or inputs, and have subsequently being included in this report.

There are numerous horizontal assessments that can be applied to any organisation, irrespective of industry, size, etc. As is the case with certification of the quality management system under ISO 9001, certification of the environmental system under ISO 14001, etc., that we have included in this report as a cornerstone of the certifications that can be applicable to manufacturing industries.

Furthermore, different industries have developed standards that can specifically be applied to their area of activity in response to the requirements of each industry. This includes industries that are important in a country-specific level economy such as the food, energy, construction, civil works, transport, logistics, healthcare and social services industries.

The standard **certification process** includes several steps, such as audit, corrective measures plan, granting, periodic monitoring and renewal.

- Preliminary steps: quotation and contract
- Appointing an audit team and planning the audit
- Audit: The audit team will visit client's offices to assess the strong points, as well as any areas of non-compliance or divergence. The experts from the certification body will use this analysis to determine the scope of the audit in order to "refine" how the management system is applied and to establish the requirements of the assessment. On the last day of the audit, the audit team will draw up an Audit Report, which will be read to the client in a Final Meeting.
- Corrective measures plan: The organisation will have to submit a Corrective Measures Plan in order to address any areas of non-compliance detected during the audit that are included in the Report.



- Extraordinary audit (in some cases). An extraordinary audit may be needed before a decision not to grant a certificate is issued.
- Granting and certification process: If the audit team considers that suitable corrective measures have been applied, it will issue a proposal to grant a certificate. If not, it will ask the organisation to draw up a Corrective Measures Plan Review. The auditor will submit its decision to the Assessment and Decision Team, which will issue a final decision.
- Annual monitoring process: The company must perform internal audits at planned intervals in order to provide information on the management system, maintenance thereof and opportunities to improve it. The experts from the certification body will perform an audit on an annual basis to check that the system implemented complies with applicable regulations and to help the company detect any potential areas of non-compliance.
- Renewal: Renewal audits are generally performed every three years in order to assess requirements in greater depth than in the annual audit.

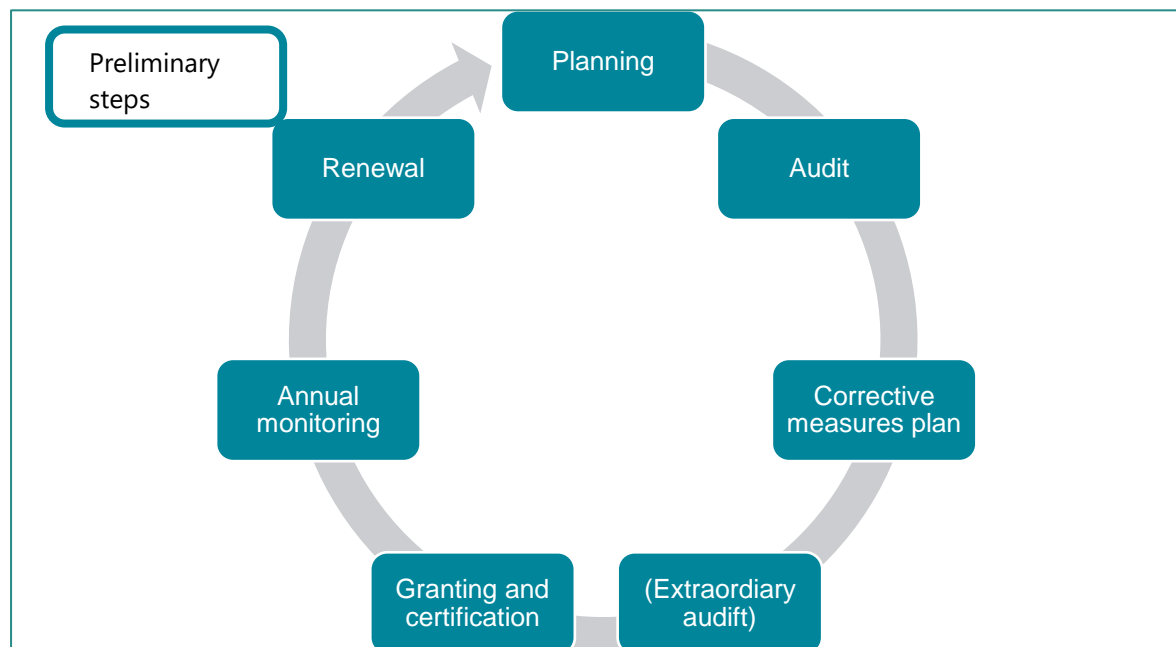


Figure 1 - Certification process

5 Certifications for manufacturing industry

As said above, certification involves checking that products conform to national and international standards. This section of the report includes the most relevant standards related to certification that AENOR has identified as the most applicable to manufacturing industry from sustainability approach. Up to 36 standards have been identified, mostly European or international standards (EN/ISO), but also other technical specifications.

Certification schemes have been classified in the following groups:

1. Energy efficiency
2. Sustainable energy
3. Environmental footprint
4. Manufacturing management
5. Sustainable process/product design
6. Cyber security
7. Life-cycle costs
8. Information technologies (ITC)

Within those categories of certification, the standards have been identified either as standards that can be certified/verified and those that support interpretation or development of the above. Standardization framework is the scope of deliverable 7.1 "Report on the standardization landscape and applicable standards", so the definitions and types of standardization documents will not be included here.

The standards that can be certified/verified are those that have been developed with a view to evaluation of conformity and include mandatory specific requirements the management system, product or service must meet.

There are some other standards that include technical criteria, but have not been developed for later certification purposes. Those have been included in this report as support standards.

Table below includes a general view of the classification of those standards. A description of the scope and main features of each standard is included in the following sections.

Table 1 Classification of standards

Group	Certifiable/verifiable standard	Support standard
Energy efficiency	ISO 50001 EN 16247-1 EN 16247-3 ISO 50015 IPMVP-EVO	EN 17267 IEC 62974-1 ISO 50004 ISO 50006 EN 16231
Sustainable energy	EN 16325	
Environmental footprint	ISO 14064-2 ISO 14064-3 ISO 14067 ISO 14046	



Group	Certifiable/verifiable standard	Support standard
	ISO 14025 EN 15804	
Manufacturing management	ISO 9001 ISO 55001 ISO 22301	ISO 10012 EN15341 EN 13306 EN 16646 ISO 16739-1
Sustainable process/product design	ISO 14001 ISO 14040 ISO 14044 ISO 14006 ISO 26000	
Cyber security	ISO/IEC 27001	ISO/IEC/IEEE 42020
Life-cycle costs		ISO 14008
Information Technologies (ICT) certification	IEC 62264-1 ISO/IEC 20000-1 ISO 22400-2	
Total	24	12

5.1 Energy efficiency

Standards that can be certified or verified

1. ISO 50001: 2018 Energy management systems- Requirements with guidance for use

ISO 50001 is the most used business energy management standard in the world. Certification of an Energy Management System according to ISO 50001 helps organisation to implement an energy policy and properly manage energy aspects derived from their activity, such as services, facilities, products, etc., which translates into real, quantifiable savings of energy costs in organisations. ISO 50001 provides the tools needed to identify the activities that consume most energy, and which represent an 'energetic and economic leakage'. Once identified, organisations activate an action plan to minimise energy consumption in their own installations and systems, whilst maximising their energy efficiency. This contributes to an efficient and more sustainable use of energy, providing maximum assurance in the ISO 50001 management system.

Just like other ISO standards, ISO 50001 has a high-level structure, which improves alignment with other management systems, providing organisations with the integration of these systems.

The standard particularly focuses on the need to work on continual improvement as a key factor of an energy management system, whereby this improvement is more clearly linked to the information derived from the analysis and evaluation of the system.



The focus is placed on the business, thanks to the implementation of a more strategic and tactical Energy Planning Process. It also pays attention to comprehension, the organisation and its context.

Better energy performance: It boosts the capacity to improve energy performance, increasing metrics with an energy performance indicator, a reference energy performance indicator, and continual improvements to energy performance.

Plan, Analyse and Act: ISO 50001 particularly deals with data collection, for planning the energy management system and energy processes. It improves energy performance, complies with legal requirements and other requirements, and achieves the energy objectives.

This certification has been identified as very relevant in the consultation made.

2. EN 16247-1:2012 Energy audits - Part 1: General requirements

and

3. EN 16247-3:2014, Energy audits - Part 3: Processes

EN 16247-1 shows the procedure and content of an energy audit.

With an energy audit according to 16247-1 energy saving potential, sustainable cost savings and a reproducible reduction of energy consumption can be demonstrated and implemented.

The part EN 16247-3 applies to sites where the energy use is due to process. It shall be used in conjunction with and is supplementary to EN 16247-1.

The energy Audit in accordance with the standard EN 16247 ensures that the energy Audit has been carried out in compliance with requirements established in said standard, providing confidence in its results.

These standards have been identified as relevant in the consultation made.

4. ISO 50015:2014, Energy management systems — Measurement and verification of energy performance of organizations — General principles and guidance

and

5. IPMVP-EVO “the International Performance Measurement & Verification Protocol”

The purpose of this International Standard is to establish a common set of principles and guidelines to be used for measurement and verification (M&V) of energy performance and energy performance improvement of the organization. M&V adds value by increasing the credibility of energy performance and energy performance improvement results. Credible results can contribute to the pursuit of energy performance improvement.

It can be used regardless the type of energy used, and in several organizational contexts: by organizations with or without existing energy management systems, such as ISO 50001; for the M&V of energy performance or energy performance improvement; for all or part of an organization.

Can be used by organizations of any size, M&V practitioners, or any interested parties, in order to apply M&V to the reporting of energy performance results. The principles and guidance in this International Standard can be used independently or in conjunction with



other standards and protocols. The principles and guidance in this International Standard are not required by ISO 50001, but can be applied by organizations using ISO 50001.

This International Standard does not specify calculation methods; rather, it establishes a common understanding of M&V and how M&V could be applied to different calculation methods. These principles and guidelines are applicable irrespective of the M&V method used.

This International Standard establishes general principles and guidelines for the process of M&V of energy performance of an organization or its components. This International Standard can be used independently, or in conjunction with other standards or protocols, and can be applied to all types of energy.

Certification that attests to all the requirements of an Energy Service Project Business Plan (PNPSE), enabling it to be used as a benchmark that drives the promotion of savings and energy efficiency measures from an economic-financial viewpoint, based on proposals for technical improvements of an energy audit.

An Energy Service Project Business Plan confers transparency and rigour to the possibilities of executing savings measures in order to, among others aims, generate the trust necessary to gain public or private grants or financing facilities for these improvements.

It comprises a document that includes the procedures, strategies and long-term progress for economic-financial components that ensure the feasibility of an Energy Service Project.

This standard has been identified as very relevant in the consultation made.

Support standards

6. EN 17267:2019 Energy measurement and monitoring plan. Design and implementation. Principles for energy data collection

This document specifies the requirements and principles for the design and implementation of an energy measurement and monitoring plan for an organization in order to improve its energy performance. The measurement and monitoring plan defines a measurement system for monitoring and analysing the energy performance of an organization, taking into account its influencing factors.

This document applies to all forms of energy, to all energy uses and to all types of organizations. It does not apply to domestic dwellings.

7. IEC 62974-1:2017 Monitoring and measuring systems used for data collection, gathering and analysis — Part 1: Device requirements.

This document specifies product and performance requirements for devices that fall under the heading of "monitoring and measuring systems used for data collection, gathering and analysis", for industrial, commercial and similar use rated below or equal to 1 kV AC and 1,5 kV DC.



These devices are fixed and are intended to be used indoors as panel-mounted devices, or as modular devices fixed on a DIN rail, or as housing devices fixed on a DIN rail, or as devices fixed by other means inside a cabinet.

These devices are used to upload or download information (energy measured on loads, power metering and monitoring data, temperature information...).

8. ISO 50004:2020, Energy management systems — Guidance for the implementation, maintenance and improvement of an energy management system

This standard provides practical guidance when implementing the requirements of an energy management system (EnMS) based on ISO 50001. It shows the organization how to take a systematic approach to achieve continual improvement in the EnMS and energy performance. This document is not prescriptive. Each organization can determine the best approach to adopt the requirements of ISO 50001. The user is advised to use this document with ISO 50001 and its annexes.

Provides guidance to users with different levels of energy management, energy consumption and EnMS experience. Each clause explains how an organization can approach a part of an EnMS. Practical tools, methods, strategies and examples are provided to help organizations implement an EnMS and to continually improve energy performance.

Energy management is sustainable and most effective when it is integrated with an organization's overall business processes (e.g. operations, finance, quality, maintenance, human resources, procurement, health and safety, and environmental policy).

ISO 50001 can be integrated with other management system standards (MSS), such as ISO 9001, ISO 14001, ISO 45001 and ISO 55001. Integration can have a positive effect on business culture and business practice, embedding energy management into daily practice, improving operational efficiency and reducing the operational costs related to the management system.

This standard gives practical guidelines and examples for establishing, implementing, maintaining and improving an EnMS in accordance with the systematic approach of ISO 50001:2018. The guidance in this document is applicable to any organization.

9. ISO 50006: 2014, Energy management systems — Measuring energy performance using energy baselines(EnB) and energy performance indicators (EnPI) -- General principles and guidance

This International Standard provides organizations with practical guidance on how to meet the requirements of ISO 50001 related to the establishment, use and maintenance EnPIs and EnBs in measuring energy performance and energy performance changes. EnPIs and EnBs are two key interrelated elements of ISO 50001 that enable the measurement, and therefore management of energy performance in an organization. Energy performance is a broad concept which is related to energy consumption, energy use and energy efficiency.

In order to effectively manage the energy performance of their facilities, systems, processes and equipment, organizations need to know how energy is used and how much is consumed over time. An EnPI is a value or measure that quantifies results related to energy efficiency,



use and consumption in facilities, systems, processes and equipment. Organizations use EnPIs as a measure of their energy performance.

The EnB is a reference that characterizes and quantifies an organization's energy performance during a specified time period. The EnB enables an organization to assess changes in energy performance between selected periods. The EnB is also used for calculation of energy savings, as a reference before and after implementation of energy performance improvement actions.

Organizations define targets for energy performance as part of the energy planning process in their energy management systems.

This International Standard provides guidance to organizations on how to establish, use and maintain energy performance indicators and energy baselines as part of the process of measuring energy performance.

The guidance in this International Standard is applicable to any organization, regardless of its size, type, location or level of maturity in the field of energy management.

10. EN 16231:2012, Energy efficiency benchmarking methodology

This standard specifies requirements and provides recommendations for energy efficiency benchmarking methodology. The purpose of energy efficiency benchmarking is to establish the relevant data and indicators on energy consumption, both technical and behavioural, qualitative and quantitative in comparing performance between or within entities.

Energy efficiency benchmarking can be either internal (within a specific organisation) or external (between organisations including competitors). This standard describes how to establish the boundaries of what is being benchmarked, including for example facilities, activities, processes, products, services and organisations.

This European Standard provides guidance on the criteria to be used in order to choose the appropriate level of detail for the data collection, processing and reviewing which suits the objective of the benchmarking. This Standard does not itself state specific performance requirements with respect to energy use.



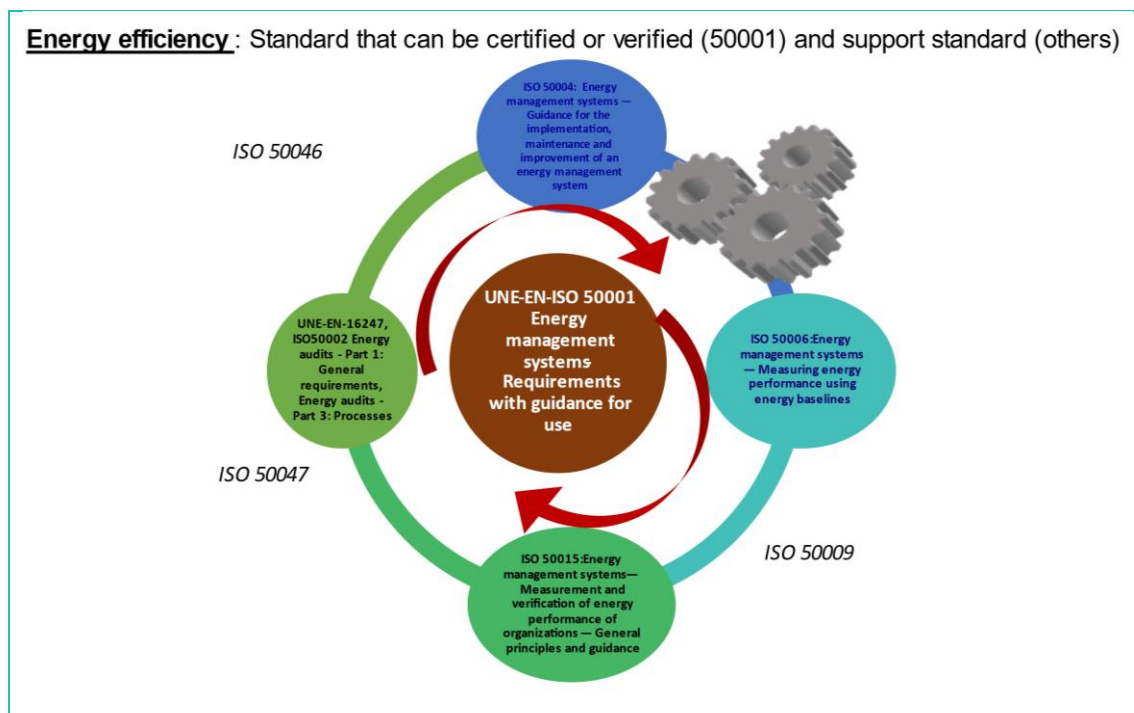


Figure 2 - ISO 50000 family standards 1

5.2 Sustainable energy

Standards that can be certified or verified

11. EN 16325:2013+A1:2015. Guarantees of Origin related to energy. Guarantees of Origin for Electricity.

This European Standard specifies requirements for Guarantees of Origin of Electricity from all energy sources. This standard will establish the relevant terminology and definitions, requirements for registration, issuing, transferring and cancellation in line with the RES, Energy Efficiency and IEM Directives. This standard will also cover measuring methods and auditing procedures.

These Guarantees of Origin may be traded and/or used for Disclosure/Labelling.

The content of this standard can, for example, be applied, after necessary modifications, to heating, cooling, and gas (including biogas). These modifications are not part of this standard.

This European Standard will not establish any sustainability criteria, this work is done elsewhere.

This standard is suitable for certification purposes.

5.3 Environmental footprint



Standards that can be certified or verified

12. ISO 14064-2:2019. Greenhouse gases. Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancement.

And

13. ISO 14064-3:2019. Greenhouse gases -- Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions

Carbon footprint of organisation/events: calculation, reduction and compensation.

Climate change has been identified as one of the greatest challenges facing nations, governments, industries and the public in the next few decades. In response, international, national, regional and local initiatives are being developed and implemented to limit concentrations of greenhouse gases (GHG) in the earth's atmosphere. These initiatives addressing GHG are based on quantifying, monitoring, reporting and the verifying emissions and/or removing GHG.

The Carbon Footprint of an organisation/event is an instrument for determining, assessing and communicating the effect of products, services and organisations on climate change.

Currently, there are several standards, references and guides for calculating the Carbon Footprint of organisation/event, both in general and industry-wide, which are supported by various well-known public and private institutions. For example, GHG Protocol, ISO 14064, etc.

The object of verification is to provide independent assurance that the information submitted concerning greenhouse gas emissions, via the emissions report, is complete, i.e. accurate, coherent, transparent, and does not contain any significant discrepancies,...

Verifying the Carbon Footprint of an organisation/event can be done three different ways:

- Calculated CO₂: the carbon footprint is calculated based on internationally recognised references, and the right to use the verification is granted on a yearly basis.
- Reduced CO₂: the carbon footprint is calculated based on internationally recognised references, and the organisation has to demonstrate that it has reduced its emissions.
- Offset CO₂: the carbon footprint is calculated based on internationally recognised references, and the resulting tons of CO₂ emissions are compensated with the most commonly used certificates of emission reductions or other actions (for example, effective fixations of CO₂).

Internal benefits for the organisations:

- Handling GHG risks and identifying opportunities for reduction.
- Public reporting and participation in voluntary GHG Programmes (for example, existing national registers).
- Participation in compulsory reporting programmes.
- Participation in GHG markets.



Benefits for clients:

- Increasing the credibility, coherence and transparency of the quantitative assessment, monitoring and the GHG report.
- Recognition for early activity.
- Strengthening of the organisation as socially responsible.

These standards have been identified as very relevant in the consultation made.

14. ISO 14067:2018. Greenhouse gases. Carbon footprint of products. Requirements and guidelines for quantification.

This document specifies principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product (CFP), in a manner consistent with International Standards on life cycle assessment (LCA) (ISO 14040 and ISO 14044).

Requirements and guidelines for the quantification of a partial CFP are also specified.

This document is applicable to CFP studies, the results of which provide the basis for different applications.

This document addresses only a single impact category: climate change. Carbon offsetting and communication of CFP or partial CFP information are outside the scope of this document.

This document does not assess any social or economic aspects or impacts, or any other environmental aspects and related impacts potentially arising from the life cycle of a product.

15. ISO 14046:2014. Environmental management — Water footprint — Principles, requirements and guidelines

Water is a scarce resource and in certain activities and areas of the world water shortages pose a threat. For this reason, there is increasing awareness of the need to improve water management. The verification of the Water Footprint by an independent third party, in accordance with globally accepted benchmarks, allows for the accurate calculation of how much water is needed to produce a product or provide a service, ensuring that the information is exact, coherent and transparent.

The Water Footprint is a global indicator of the appropriation of freshwater resources. For products, a water footprint is defined as the volume of water consumed both directly during the manufacturing process and indirectly throughout the supply chain. In order to manage water correctly, it must be known exactly how much water is needed to manufacture a product, provide a service or for an organisation to perform an activity.

There are different reference schemes for calculating and managing the Water Footprint (ISO14046, Water Footprint Network, etc). The first of these schemes focuses on measuring the amount of water consumed, while the second assesses the associated environmental impacts. Both the above schemes focus on analysing life cycles. The objective of verifying



water footprints is to provide interested parties with a professional and independent opinion on the information and data obtained under the chosen scheme.

16. ISO 14025:2006. Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures

and

17. EN 15804:2012+A2:2019. Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

Those two standards are the basis for the Environmental Product Declaration (EPD) programme.

Companies possess various mechanisms to prove and communicate the environmental excellence of their products and services, such as Environmental Product Declarations (EPD), in accordance with International Standard ISO 14025, which establishes the requirements that must be met by these Environmental Declarations, including third-party verification.

Building products and services use European Standard EN 15804, which recognises the environmental information of construction products in Europe, as it is a harmonised and recognised standard.

These EPD provide a reliable, relevant, transparent, comparable and verifiable environmental profile and highlight environmentally friendly products based on life cycle assessments (LCA), in accordance with international standards and quantifiable environmental data.

The LCA forming the basis of the EPDs must be conducted in accordance with specific Product Category Rules (PCR) published as technical standards or by a recognised programme. These PCRs guarantee a set of coherent criteria for a family of products with equivalent functions.

5.4 Manufacturing management

Standards that can be certified or verified

18. ISO 9001:2015. Quality management systems — Requirements

The strongest ally to improve a company's ability to compete.

ISO 9001:2015 specifies requirements for a quality management system when an organization:

- a) needs to demonstrate its ability to consistently provide products and services that meet customer and applicable statutory and regulatory requirements, and
- b) aims to enhance customer satisfaction through the effective application of the system, including processes for improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements.



All the requirements of ISO 9001:2015 are generic and are intended to be applicable to any organization, regardless of its type or size, or the products and services it provides.

Quality is a strategic factor in order to be able to access markets in all geographic and industrial areas. ISO 9001 is the model on which hundreds of thousands of organisations throughout the world base their quality management systems.

Certification by an accredited entity with highly qualified technical personnel, adds more value to a company's ability to compete than adopting the ISO model alone 9001 already provided with its requirements.

A consequence and proof of the success of the ISO model 9001 as a global benchmark, it is the adaptation that has been made to specific sectors: automotive, railways, aerospace, health products, medical transport, information technology services, etc. These industries have their own certifiable standards for quality management systems that have a specific approach and additional requirements to ISO9001.

19. ISO 55001:2014. Asset management. Management systems. Requirements.

An asset is any aspect of an organisation's activity that adds potential or actual value. This value can vary between different organisations and the interested parties thereof and may be tangible or intangible, financial or non-financial.

Asset management includes the balancing of costs, opportunities and risks for all assets considered throughout their life cycle.

The objective of the Standard UNE-ISO 55001:2015 is to introduce the policy, Management's responsibilities, resources and implementation, operational, measurement, analysis and improvement guidelines, which include the requirements an asset management system must comply with, in a manner similar to other organisational management methodologies.

Benefits for the organisation and users

- Improved financial performance (better returns on investments in assets, more control and optimisation of asset value, greater asset profitability, more sustainable use of capital)
- Asset investment decisions based on information (life cycle and long-term)
- Managed asset risk
- Better results and services (direction of strategies, operations and maintenance planning)
- Demonstrated social responsibility
- Proven compliance with legal requirements
- Better assessment of performance and control
- Improved reputation
- Better organisational sustainability
- More effective and efficient



20. ISO 22301:2020 Business continuity management systems

ISO 22301 is the new international standard to manage business continuity, which, through continual improvement (the PDCA cycle), establishes the requirements for planning, establishing, implementing, operating, supervising, reviewing, testing, maintaining and improving a documented BCMS, taking into account the management of the overall risks of each organisation and their capacity for resilience.

Suitable business continuity management allows organisations to:

Have the ability to resist the effects of an incident (resilience) in addition to preventing or avoiding the possible scenarios caused by a crisis situation.

Manage the interruption of their activities minimising the deriving consequences of an economic, image or public liability nature.

- Acquire greater flexibility in response to the interruption of activities.
- Reduce the costs associated with the interruption.
- Avoid penalties for the non-compliance of contracts as the supplier of products or services.
- Have a structured methodology to resume their activities after an interruption.
- Increase their prestige among clients and stakeholders.
- Gain potential economic advantages when taking out business insurance policies.

A business continuity management system in accordance with the ISO standard 22301 is suitable for any public or private organisation of any size and sector. And especially for those organisations (companies in public service, finance, telecommunications, and transportation, etc.) in a high-risk working environment, where being able to continue working is of vital importance for the businesses, clients and stakeholders.

Support standards

21. ISO 10012:2003. Measurement Management

The reliability of measurement equipment and processes reduces the probability of making wrong decisions and improves the performance results of an organisation

The Standard UNE-EN-ISO 10012:2003 specifies general requirements and provides guidance for the management of measurement processes and for the metrological confirmation of the measurement equipment used to support and demonstrate compliance with metrological requirements.

Interested parties can agree to use this standard to start fulfilling requirements for the measurement management system with respect to certification activities.



Benefits for the company:

- Reduction in development costs and not quality.
- Greater control and knowledge of product performance processes.
- Easy integration with other management systems due to similar structures.
- Source for implementing improvements.
- Demonstrate clear understanding of customers' requirements.

22. EN15341:2019. Maintenance. Maintenance Key Performance Indicators

This document lists Key Performance Indicators (KPIs) of the Maintenance Function and gives guidelines to define a set of suitable indicators, to appraise and to improve effectiveness, efficiency and sustainability in the maintenance of the existing physical assets either industrial, infrastructures, facilities, civil buildings or transportation systems, etc. in the framework of the external and internal influencing factors.

23. EN 13306:2017. Maintenance. Maintenance terminology.

This Standard gives agreed definitions for the most commonly used generic terms found in other European maintenance standards.

It will be a useful tool for anyone working in maintenance as it will help them understand and use other European standards in technical, administrative and managerial maintenance. (The standard does not include terms used in software maintenance.)

24. EN 16646:2014. Maintenance. Maintenance within physical asset Management.

This European Standard introduces physical asset management as a framework for maintenance activities. It also introduces the relationship between organizational strategic plan and maintenance management system and describes the interrelations between maintenance process and all the other physical asset management processes. It addresses the role and importance of maintenance within physical asset management system during the whole life cycle of an item.

This European Standard can be applied to production organizations of all sizes. However, if specific standards exist for a particular application or field of industry, those documents should also be considered.

This European Standard consists of guidance and recommendations and is not intended to be used for certification, regulatory, or contractual use.

25. ISO 16739-1:2020. Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries. Data schema

The Industry Foundation Classes, IFC, are an open international standard for Building Information Model (BIM) data that are exchanged and shared among software applications used by the various participants in the construction or facility management industry sector. The standard includes definitions that cover data required for buildings over their life cycle.



This release, and upcoming releases, extend the scope to include data definitions for infrastructure assets over their life cycle as well.

The Industry Foundation Classes specify a data schema and an exchange file format structure. The data schema is defined in:

- EXPRESS data specification language, defined in ISO 10303-11,
- XML Schema definition language (XSD), defined in XML Schema W3C Recommendation,

Whereas the EXPRESS schema definition is the source, and the XML schema definition is generated from the EXPRESS schema according to the mapping rules defined in ISO 10303-28. The exchange file formats for exchanging and sharing data according to the conceptual schema are:

- Clear text encoding of the exchange structure, defined in ISO 10303-21,
- Extensible Markup Language (XML), defined in XML W3C Recommendation.

Alternative exchange file formats may be used if they conform to the data schemas.

ISO 16739-1:2017 of IFC consists of the data schemas, represented as an EXPRESS schema and an XML schema, and reference data, represented as definitions of property and quantity names, and formal and informative descriptions.

A subset of the data schema and referenced data is referred to as a Model View Definition (MVD). A particular MVD is defined to support one or many recognized workflows in the construction and facility management industry sector. Each workflow identifies data exchange requirements for software applications. Conforming software applications need to identify the model view definition they conform to.

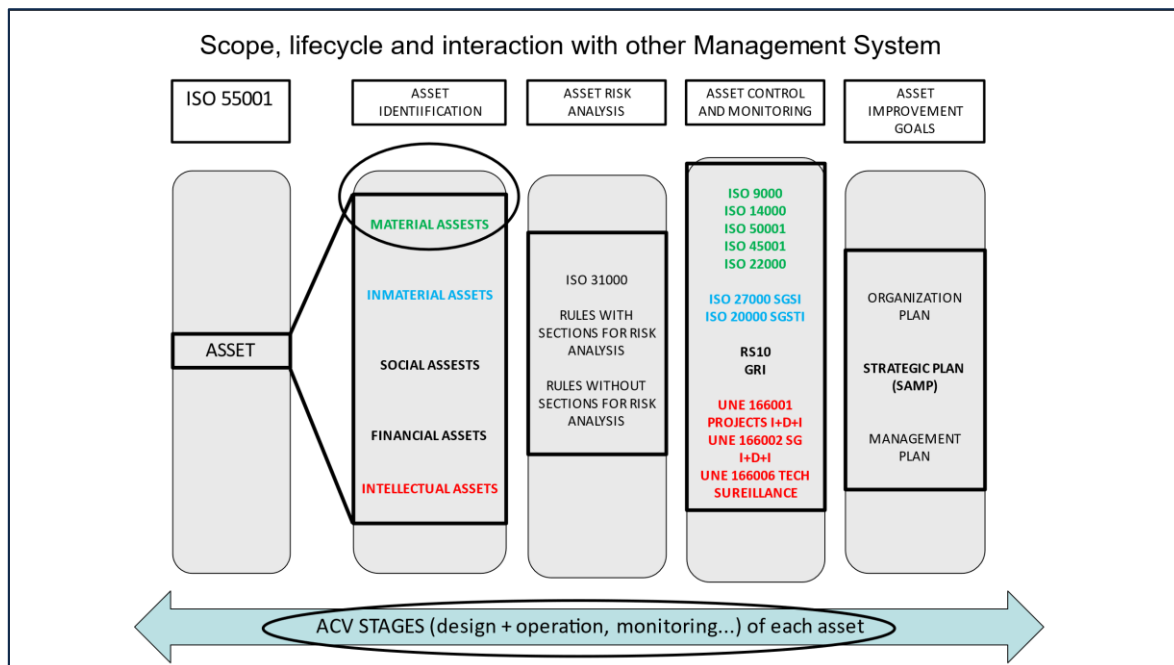


Figure 3 - ISO 55001 lifecycle 1

5.5 Sustainable process/product design

Standards that can be certified or verified

26. ISO 14001:2015. Environmental management systems — Requirements with guidance for use.

The central pillar of environmental management

Organisations, regardless of their activity, size or physical location, are increasingly required to comply with a growing number of environmental demands imposed by the Administration, clients and the general public. For this reason, the use of tools that integrate the environment into the company's overall management is essential.

The implementation of an Environmental Management System in accordance with the standard UNE-EN-ISO 14001 allows for easy standardisation of the environmental factors arising from each activity that takes place in organisation. It also promotes environmental protection and prevents pollution while maintaining a balance with socio-economic factors.

The implementation of an Environmental Management System in accordance with the international standard ISO 14001, the organisation is positioned as socially responsible, distinguishing itself from the competition, and strengthening its image with customers and consumers.

Among other environmental benefits, this will optimise the management of resources and waste, reduce the negative environmental impacts of their activity, and reduce any risks associated with accidental situations.

With respect to financial advantages, as well as strengthening innovation and productivity, the organisation will be able to reduce waste management costs or insurance premiums, remove exporting barriers, reduce the risk of litigation and sanctions, have better access to subsidies and other lines of funding, or reduce the occupational risks, thus motivating staff.

27. ISO 14040:2006/AMD 1:2020 Environmental management – Life cycle assessment – Principles and framework – Amendment 1

ISO 14040:2006 describes the principles and framework for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements.

This Standard covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies. It does not describe the LCA technique in detail, nor does it specify methodologies for the individual phases of the LCA.

28. ISO 14044:2006/AMD 2:2020 Environmental management – Life cycle assessment – Requirements and guidelines – Amendment 2



ISO 14044:2006 specifies requirements and provides guidelines for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, relationship between the LCA phases, and conditions for use of value choices and optional elements.

This Standard covers life cycle assessment (LCA) studies and life cycle inventory (LCI) studies.

29. ISO 14006:2020. Environmental management systems — Guidelines for incorporating ecodesign

Sustainable management begins with the design process.

The purpose of ecodesign is to identify during the planning stage how each of the phases of a product or service life cycle will impact on the environment in order to try to reduce said impact to a minimum without compromising the quality and application of the product or service.

The Ecodesign certificate accredits that the organisation has adopted a management system to identify, monitor and constantly improve its products' and/or services' environmental aspects, providing information to its clients on products that have incorporated environmental improvements in their design, in accordance with the standard UNE-EN-ISO 14006.

Internal benefits for the organisation:

- It is a guarantee that the organisation complies with the environmental legislation that applies to it, including the legal environmental requirements referring to its products and/or services.
- It is a guarantee that the organisation manages the design and development of its products and/or services in such a way that they continue to improve as regards their impact on the environment.
- Cost reductions (consumption of materials, improvements to containers and packaging, etc.)

Benefits for the clients:

- Product innovation leading to differentiation within the relevant market.
- Responding to clients' needs and expectations. For example, in bidding for tenders.
- Improving the image of the product and of the organisation itself.

30. ISO 26000:2010. Social responsibility

Transparency and Accountability are two of the fundamental principles of Social Responsibility set out in the international standard ISO 26000.

The GRI (Global Reporting Initiative) is the leading international sustainability reports institute. Sustainability reports are documents in which organisations provide information on the economic, environmental and social aspects of their activities, products and services.

The independent verification proves that a sustainability report complies with the principles and directives specified by the GRI and that the information contained therein is accurate.



Verification also improves the quality, usability and credibility of information and management processes. The independent verification states that a sustainability report complies with the principles and directives specified by the GRI and that the information contained therein is accurate, rendering this the most effective communication tool for an organisation's commitment to Sustainable Development, capable of providing the organisation's stakeholders with useful, reliable, comparable and material information on the management of the organisation's significant environmental, social and economic impacts.

Benefits for the organisation:

- Market positioning : Communicating to gain the trust of investors, clients, suppliers, public institutions and society.
- Delivers confidence in an organization's sustainability.
- Uses a common reference language known to everyone: Credibility from honest communication and transparency.
- Communication tool for managing social responsibility: Effectiveness in managing relationships with stakeholders and leveraging improvement of internal efficiency.
- Improves an organization's competitive position: Sustainability reports are an effective tool for managing the Brand Image and the Reputation of the organisation.

5.6 Cybersecurity

Standards that can be certified or verified

31. ISO/IEC 27001:2015. Information security Management

The key to security and privacy for your information systems

Information is one of an organisation's most important assets. The protection of its security and privacy is a fundamental task to ensure the correct development of the business, transmitting trust to its stakeholders, customers and users.

The greater the value of the information, the greater the risks associated with its loss, deterioration, improper or malicious use as a result of an incident or breach of security and/or privacy.

Information Security Management Systems (ISMS) are the most effective means to minimise risks, as they ensure that business processes and/or IT services, assets and associated risks are identified and assessed, taking into account the impact on the organisation and also its continuous improvement, and that the most effective controls and procedures are adopted that are consistent with the business strategy.

Effective management of information security guarantees:

- confidentiality, ensuring that only those who are authorised can access the information,
- integrity, ensuring that the information and its processing methods are accurate and complete, and
- availability, ensuring that authorised users have access to the information and to related assets when they need it.



Information Security Management System certification, in accordance with UNE-ISO/IEC 27001, contributes to promoting data protection activities in organisations, improving image and generating trust with respect to third parties.

The new Privacy Information Management System (PIMS) certification according to the international standard ISO/IEC 27701, as an extension of the ISO/IEC 27001 Information Security certification.

It is aimed at any public or private organisation, specifically those that work with personal data, are concerned about the management of data privacy and security, and particularly if they employ a Data Protection Officer (DPO).

The ISO/IEC 27701 certification, considering the principle of proactive responsibility, is a tool that helps organisations to comply with the principles and obligations imposed by the law on Data Protection and Privacy, such as the European Data Protection Regulations (GDPR) and the Organic Law of Data Protection and Guarantee of Digital Rights (LOPDGDD).

Prior to ISO 27701 certification, organisations must have implemented and certified ISO 27001.

This standard has been identified as relevant in the consultation made.

Support standards

32. ISO/IEC/IEEE 42020:2019. Software, systems and enterprise – Architecture processes

This document establishes a set of process descriptions for the governance and management of a collection of architectures and the architecting of entities. This document also establishes an enablement process description that provides support to these other architecture processes.

The processes defined in this document are applicable for a single project, as well as for an organization performing multiple projects. These processes are applicable throughout the life of an architecture or a collection of architectures. These processes are applicable for managing and performing the activities within any stage in the life cycle of the architecture entities.

Annex D describes the relationships between this document and other standards.”



5.7 Life-cycle costs

Support standards

33. ISO 14008:2019. Monetary valuation of environmental impacts and related environmental aspects

This document specifies a methodological framework for the monetary valuation of environmental impacts and related environmental aspects. Environmental impacts include impacts on human health, and on the built and natural environment. Environmental aspects include releases and the use of natural resources.

The monetary valuation methods in this document can also be used to better understand organizations' dependencies on the environment.

During the planning of the monetary valuation, the intended use of the results is considered but the use itself is outside the scope of this document.

In this document, monetary valuation is a way of expressing value in a common unit, for use in comparisons and trade-offs between different environmental issues and between environmental and other issues. The monetary value to be determined includes some or all values reflected in the concept of total economic value. An anthropocentric perspective is taken, which asserts that natural environment has value in so far as it gives utility (well-being) to humans. The monetary values referred to in this document are economic values applied in trade-offs between alternative resource allocations, and not absolute values.

This document does not include costing or accounting, although some valuation methods have the term "cost" in their name. This document does not include the development of models linking environmental aspects to environmental impacts.

NOTE In this document, what is valued in monetary terms is either environmental impacts or environmental aspects. When valuing environmental impacts of an organization, it is important that links between environmental aspects and environmental impacts are established.

5.8 Information Technologies (ICT) certification

Standards that can be certified or verified

34. IEC 62264-1:2013 Enterprise-control system integration — Part 1: Models and terminology:

This standard describes the manufacturing operations management domain (Level 3) and its activities, and the interface content and associated transactions within Level 3 and between Level 3 and Level 4. This description enables integration between the manufacturing operations and control domain (Levels 3, 2, 1) and the enterprise domain (Level 4).



Its goals are to increase uniformity and consistency of interface terminology and reduce the risk, cost, and errors associated with implementing these interfaces. IEC 62264-1 can be used to reduce the effort associated with implementing new product offerings. The second edition published in 2013 cancels and replaces the first edition published in 2003. It constitutes a technical revision and includes the significant technical changes with respect to the previous edition.

35. ISO/IEC 20000-1:2018 Information technology — Service management — Part 1: Service management system requirements

Standard ISO/IEC 20000-1:2018 promotes the adoption of an integrated process approach for the effective provision of managed IT services, which satisfies the requirements of the business and its clients through continuous improvement.

The implementation of the ISO/IEC 20000-1 ensures that the services IT are aimed at the business, in other words, the basic and fundamental objective of the operation/ production department is to provide a service with the utmost quality and security either to the organisation itself or to its external clients, considering IT risks.

The Code of Good Practices is the second part of ISO/IEC 20000-2 Standard and represents the set of best practices adopted and accepted by the industry in this regard.

The standard applies to any organisation of any sector whose IT department provides services IT either to the organisation itself or to external organisations. In other words, all business sectors that have an internal or external Data Processing Centre. (on-premise; outsourcing/cloud). Version 2018 includes changes consisting of in:

It has been adapted to the high-level ISO structure used for all management system standards.

- Emerging market trends have been taken into account in services management,
- There are changes in the denomination of certain concepts; for instance "service provider" for "organisation"; Configurations Database (CMDB) as "configuration information".
- The previously combined sections on incident management, service requests, service continuity, service availability, service levels, service catalogue, capacity and demand have been separated.
- Certain requirements have been simplified and the required information documented, leaving only key documents on the Management System.

Benefits for the company:

- Aligning IT services to business needs.
- Providing adequate management of the quality of the IT service offered.
- Maximising the quality and efficiency of the IT service.
- Reducing the risks associated to IT services.
- Reducing costs and increasing customer and supplier satisfaction
- Suitable management of multiple external or internal suppliers; as well as value for stakeholders.
- Clear vision of the capacity of IT departments.



- Minimise the time of the incident and change cycle and improve metric-based results.
- Decision-making based on key performance and IT indicators.
- Provide an added value of trust, improving its image amongst other companies, becoming a factor of distinction from the competition.
- The standard is a commodity for the IT production/operations areas because it is a pragmatic and industrialisable methodology.
- It takes into account new trends, such as Cloud, Agile-Devops, servitisation, etc.

36. ISO 22400-2:2014. Automation systems and integration — Key performance indicators (KPIs) for manufacturing operations management - Part 2: Definitions and descriptions.

ISO 22400 defines key performance indicators (KPIs) used in manufacturing operations management.

ISO 22400-2: specifies a selected number of KPIs in current practice. The KPIs are presented by means of their formula and corresponding elements, their time behaviour, their unit/dimension and other characteristics. ISO 22400-2 also indicates the user group where the KPIs are used, and the production methodology to which they correspond.

With reference to equipment, the KPIs in ISO 22400-2 relate to work units, as specified in IEC 62264.”



6 Conclusions

Sustainability is a key issue for manufacturing industries and can be reached from several approaches such as management systems, specific environmental aspects, product design or cybersecurity, among others.

Therefore, the general certification framework includes a variety of certifications and other related standards that jointly cover these multiple approaches.

The certifications presented in this report are often compatible and can be integrated with other management systems of other standards as they share the specific tools of the continuous improvement cycle management systems (PDCA).

The main conclusion that can be drawn from the contents of this framework analysis is that ECOFACT project can benefit from a wide number of certification schemes based on European and international standards. However, there is not a unique and specific certification scheme covering all potential sustainability issues to be applied for the purposes of the Project.

Nonetheless, the analysis of available references in the identified framework allows us to detect different documents that can be significantly useful in the development of a conformity assessment scheme.

Related next steps in Task 7.3 are to propose an adapted scheme that structure provision of a written guarantee by an independent body (Certificate) if a given product/production process meets a set of specific requirements aligned with T7.2 outcomes. Such conformity assessment shall be accompanied by a certification label or symbol indicating that compliance with scheme has been verified.

