
Sustainability criteria for bioenergy

Critères de durabilité pour la bioénergie

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is Project Committee ISO/PC 248, *Sustainability criteria for bioenergy*.

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Introduction

The production and use of bioenergy have potential roles in mitigating climate change, promoting energy security and fostering sustainable development. This International Standard is designed to provide a consistent basis on which the sustainability of bioenergy can be assessed within a defined context and for a specified purpose. This International Standard provides principles, criteria and indicators. The principles reflect aspirational goals while the criteria and indicators address sustainability aspects and the information that is to be provided. However, the indicators in this International Standard might not comprehensively capture all sustainability aspects for all bioenergy processes.

Virtually every country in the world uses some form of bioenergy. Various types of biomass are used for the production of bioenergy through many types and sizes of economic operations. The characteristics of bioenergy production therefore are heterogeneous and depend on several factors, such as geography, climate, level of development, institutions and technologies.

The purpose of this International Standard is to provide a framework for considering environmental, social and economic aspects that can be used to facilitate the evaluation and comparability of bioenergy production and products, supply chains and applications. As part of the development of this International Standard, other relevant sustainability initiatives and International Standards were considered.

This International Standard aims to facilitate the sustainable production, use and trade of bioenergy and will enable users to identify areas for continual improvement in the sustainability of bioenergy. It can be used in several ways. It can facilitate business-to-business communications by providing a standard framework that allows businesses to “speak the same language” when describing aspects of sustainability. Purchasers can use this International Standard to compare sustainability information from suppliers to help identify bioenergy processes and products that meet their requirements. Other standards, certification initiatives and government agencies can use this International Standard as a reference for how to provide information regarding sustainability.

This International Standard does not provide threshold values. Threshold values can be defined by economic operators in the supply chain and/or other organizations (e.g. government). Sustainability information provided through the use of this International Standard can then be compared with defined threshold values.

In International Standards, the following verbal forms are used:

- “shall” indicates a requirement;
- “should” indicates a recommendation;
- “may” indicates a permission;
- “can” indicates a possibility or a capability.

Further details can be found in the ISO/IEC Directives, Part 2.

Sustainability criteria for bioenergy

1 Scope

This International Standard specifies principles, criteria and indicators for the bioenergy supply chain to facilitate assessment of environmental, social and economic aspects of sustainability.

This International Standard is applicable to the whole supply chain, parts of a supply chain or a single process in the supply chain. This International Standard applies to all forms of bioenergy, irrespective of raw material, geographical location, technology or end use.

This International Standard does not establish thresholds or limits and does not describe specific bioenergy processes and production methods. Compliance with this International Standard does not determine the sustainability of processes or products.

This International Standard is intended to facilitate comparability of various bioenergy processes or products. It can also be used to facilitate comparability of bioenergy and other energy options.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 14067:2013, *Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification and communication*

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 allocation

partitioning the input or output flows of a *process* (3.36) or a *product system* (3.38) between the product system under study and one or more other product systems

[SOURCE: ISO 14040:2006, 3.17]

3.2 biodiversity biological diversity

variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic *ecosystems* (3.14) and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems

[SOURCE: United Nations Convention on Biological Diversity^[27]]

3.3 bioenergy

energy derived from *biomass* (3.4)

Note 1 to entry: Biomass can be processed into solid, liquid or gaseous fuels or stored energy in biomass can be directly converted into other forms of energy (e.g. heat, light).

3.4

biomass

raw material (3.40) of biological origin excluding material embedded in geological formations or transformed to fossilized material

[SOURCE: ISO 13833:2013, 3.2, modified — The word “raw” has been added, because “*raw material* (3.40)” is also defined in this International Standard, and “fossil” has been changed to “fossilized material”.]

3.5

book and claim

chain-of-custody (3.7) system where, from the production of *raw material* (3.40) to the final *product* (3.37) for consumption, the information on *sustainability* (3.48) is decoupled from the physical product

Note 1 to entry: The system allows for the product itself and attributes of sustainability to be traded separately.

3.6

carbon dioxide equivalent

CO₂ equivalent

CO₂e

unit for comparing the radiative forcing of a *greenhouse gas* (3.21) to that of carbon dioxide

Note 1 to entry: Mass of a greenhouse gas is converted into CO₂ equivalents using global warming potentials.

[SOURCE: ISO/TS 14067:2013, 3.1.3.2, modified — Original Note 2 to entry has been omitted.]

3.7

chain-of-custody

chain of responsibility for or control of materials as they move through each step of the *process* (3.36) or *product system* (3.38) under assessment

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3.8

child labour

work that deprives children of their childhood, their potential and their dignity, and that is harmful to their physical and mental development

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Note 1 to entry: This is a frequently used definition according to the International Labour Organization (ILO).

[SOURCE: International Labour Organization, “What is child labour”[22], modified]

3.9

competent national authority

applicable national regulatory body or authority designated or otherwise recognized as such by the national regulatory body for any purpose in connection with the requirements, recommendations and *principles* (3.34), *criteria* (3.11) and *indicators* (3.27) in this International Standard

[SOURCE: ISO 16883:2007, 3.1, modified — The word “national” has been added to term, “any” has been changed to “applicable”, “by the national regulatory body” has been added and “regulations specified” has been changed to “requirements, recommendations and principles, criteria and indicators”.]

3.10

co-product

any of two or more *products* (3.37) coming from the same *unit process* (3.51) or *product system* (3.38)

[SOURCE: ISO 14040:2006, 3.10]

3.11

criterion

requirement that describes what is to be assessed

Note 1 to entry: A criterion adds meaning and operability to a *principle* (3.34) without itself being a direct measure of performance.

Note 2 to entry: A criterion is characterized by a set of related *indicators* (3.27).

3.12 direct effects

measurable environmental, social and economic effects under the direct control of the *economic operator* (3.13) and caused by the *process* (3.36) being analysed

Note 1 to entry: Activities under direct control are defined as activities conducted by or subcontracted by the economic operator.

Note 2 to entry: Subcontracted activities are activities undertaken by a subcontractor, being an *organization* (3.33) that undertakes aspects of the processing, handling, storage, transport or distribution of the *products* (3.37), *co-products* (3.10) or *waste* (3.52) on behalf of the *economic operator* (3.13), on a contractual basis, either paid or non-paid.

Note 3 to entry: Direct effects within the scope of this International Standard are considered under the *criteria* (3.11) and *indicators* (3.27) in [Clause 5](#).

Note 4 to entry: *Processes* (3.36) inside the defined *system boundaries* (3.50) are included based on International Standards (e.g. ISO 14040 and 14044) even if they are outside the direct control of the economic operator.

Note 5 to entry: Other potential effects may be added to the consideration when an international consensus standard is established for the effect.

3.13 economic operator

individual or *organization* (3.33) that has ownership or control of one or more *processes* (3.36) of the bioenergy supply chain

3.14 ecosystem

system of complex interactions between *communities* of plants, animals, microorganisms and their *environment* (3.16), which functions as a unit

3.15 ecosystem services

benefits people obtain from *ecosystems* (3.14) including provisioning, regulating, supporting, and cultural services

[SOURCE: Millennium Ecosystem Assessment: Ecosystems and Human Well-being Synthesis^[26]]

3.16 environment

surroundings in which an *organization* (3.33) operates, including air, water, land, natural resources, flora, fauna, humans and their interrelations

[SOURCE: ISO 14001:2015, 3.2.1, modified — Original Notes 1 and 2 to entry have been omitted.]

3.17 food security

physical and economic access, at all times, to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life

[SOURCE: Food and Agriculture Organization of the United Nations (FAO)^[18]]

3.18 forced or compulsory labour

work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily

[SOURCE: International Labour Organization (ILO): Forced Labour Convention (No. 29)^[21]]

**3.19
forest**

land spanning more than 0,5 ha with trees higher than 5 m and a canopy cover of more than 10 percent or trees able to reach these thresholds *in situ*, not including land that is predominantly under agricultural or urban land use

Note 1 to entry: According to FAO, stands in agricultural production systems, such as agroforestry systems when crops are grown under tree cover, fruit tree plantations and oil palm plantations, are excluded. FAO provides additional explanation about what a forest includes (see Reference [19]).

[SOURCE: FAO Forestry Paper 163[19], modified — Additional explanation about what a forest includes has been omitted and Note 1 to entry has been added.]

**3.20
global warming potential
GWP**

characterization factor describing the radiative forcing *impact* (3.26) of one mass-based unit of a given *greenhouse gas* (3.21) relative to that of carbon dioxide over a given period of time

Note 1 to entry: “Characterization factor” is defined in ISO 14040:2006, 3.37.

[SOURCE: ISO/TS 14067:2013, 3.1.3.4, modified — Original Note 1 to entry has been omitted, because this is addressed in Note 1 to definition of “greenhouse gas”.]

**3.21
greenhouse gas
GHG**

natural or anthropogenic gaseous constituent of the atmosphere that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the earth’s surface, the atmosphere, and clouds

Note 1 to entry: A list of greenhouse gases with their recognized *global warming potentials* (3.20) is provided in ISO/TS 14067:2013, Annex A.

Note 2 to entry: Water vapour and ozone are anthropogenic as well as natural greenhouse gases but are not included as recognized greenhouse gases due to difficulties, in most cases, in isolating the human-induced component of global warming attributable to their presence in the atmosphere.

[SOURCE: ISO/TS 14067:2013, 3.1.3.1, modified — The qualifier “both natural and anthropogenic” has been changed to “natural or anthropogenic” and moved to beginning of definition.]

**3.22
greenhouse gas emission
GHG emission**

release of a *greenhouse gas* (3.21) to the atmosphere

[SOURCE: ISO/TS 14067:2013, 3.1.3.5, modified — The verb “released” has become the subject of the definition as “release”, replacing “mass”, and the original source reference has been omitted.]

**3.23
greenhouse gas removal
GHG removal**

removal of a *greenhouse gas* (3.21) from the atmosphere

[SOURCE: ISO/TS 14067:2013, 3.1.3.6, modified — The verb “removed” has become the subject of the definition as “removal”, replacing “mass”, and the original source reference has been omitted.]

3.24**hazardous work**

work which by its nature or the circumstances in which it is carried out is likely to harm the health, safety or morals of persons

Note 1 to entry: This definition refers specifically to hazardous work by persons as defined in [Table G.1](#).

3.25**human rights**

rights inherent to all human beings, whatever their nationality, place of residence, sex, national or ethnic origin, colour, religion, language or any other status

Note 1 to entry: Universal human rights are often expressed and guaranteed by law in the form of treaties, customary international law, general principles and other sources of international law. International human rights law lays down obligations of governments to act in certain ways or to refrain from certain acts in order to promote and protect human rights and fundamental freedoms of individuals or groups.

[SOURCE: United Nations Office of the High Commissioner for Human Rights^[29], modified]

3.26**impact**

change, adverse or beneficial, caused by the *process* ([3.36](#)) being assessed

[SOURCE: ISO 15392:2008, 3.13, modified — The words “any” and “that may be” have been omitted and “caused by the process being assessed” has been added.]

3.27**indicator**

quantitative, qualitative or binary variable that can be measured or described, in response to a defined *criterion* ([3.11](#))

3.28**land use change**

change in the use or management of land by humans, which can lead to a change in land cover

Note 1 to entry: A *rotation period* ([3.43](#)) in a management cycle does not constitute land use change.

[SOURCE: IPCC Fourth Assessment Report^[24], modified]

3.29**land use rights**

form of land tenure, whether formal or informal, including customary rights or traditions

Note 1 to entry: There is great variability in land use rights in different parts of the world as they relate to systems of ownership and property rights.

3.30**life cycle**

consecutive and interlinked stages of a *product system* ([3.38](#)), from *raw material* ([3.40](#)) acquisition or generation from natural resources to final disposal

[SOURCE: ISO 14040:2006, 3.1]

3.31**light work**

work that is not likely to be harmful to a person's health or development and does not interfere with a child's attendance at school or participation in vocational orientation or training programmes or a person's capacity to benefit from the instruction received

Note 1 to entry: This definition refers specifically to light work by persons as defined in [Table G.1](#).

3.32

mass balance

chain-of-custody (3.7) system where, from the production of a *raw material* (3.40) to the final *product* (3.37) for consumption, the information on *sustainability* (3.48) can be traced to a specific production quantity

Note 1 to entry: The system allows for mixing of products with differing information on sustainability or with no information on sustainability.

3.33

organization

company, corporation, firm, enterprise, cooperative, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration

Note 1 to entry: For organizations with more than one operating unit, a single operating unit may be defined as an organization.

[SOURCE: ISO 14064-1:2006, 2.22, modified — The word “cooperative” has been added to the definition and Note 1 to entry has been added.]

3.34

principle

aspirational goal that governs decisions or behaviour

3.35

procedure

specified way to carry out an activity or a *process* (3.36)

Note 1 to entry: Procedures can be documented or not.

Note 2 to entry: When a procedure is documented, the term “written procedure” or “documented procedure” is frequently used. The document that contains a procedure can be called a “procedure document”.

[SOURCE: ISO 9000:2015, 3.4.5, modified — Note 2 to entry has been added.]

3.36

process

set of interrelated or interacting activities which transforms inputs into outputs

Note 1 to entry: Inputs to a process are generally outputs of other processes.

Note 2 to entry: Processes in an *organization* (3.33) are generally planned and carried out under controlled conditions to add value.

[SOURCE: ISO 9000:2015, 3.4.1, modified — The words “that use inputs to deliver an intended result” have been changed to “which transforms inputs into outputs” and Notes to entry have been modified.]

3.37

product

goods or service

[SOURCE: ISO 14040:2006, 3.9, modified — The word “any” has been omitted from the definition and the original Notes to entry have been omitted.]

3.38

product system

collection of *unit processes* (3.51) with elementary and product flows, performing one or more defined functions, and which models the *life cycle* (3.30) of a *product* (3.37)

[SOURCE: ISO 14040:2006, 3.28]

3.39**protected area**

clearly defined geographical space, recognized, dedicated and managed, through legal means, to achieve the long-term conservation of nature with associated *ecosystem services* (3.15) and cultural values

[SOURCE: International Union for Conservation of Nature (IUCN)[25], modified]

3.40**raw material
feedstock**

primary or secondary material that is used to produce a *product* (3.37)

Note 1 to entry: Secondary material includes recycled, reused or recovered material.

Note 2 to entry: Raw material/feedstock also includes agricultural, forest and processing residues.

[SOURCE: ISO 14040:2006, 3.15, modified — Feedstock has been added as a second term, the words “reused or recovered” have been added to Note 1 to entry, and Note 2 to entry has been added.]

3.41**regular work**

work with the condition that the health, safety and morals of the persons concerned are fully protected and that the persons have received adequate specific instruction or training in the relevant branch of activity

Note 1 to entry: This definition refers specifically to regular work by persons as defined in [Table G.1](#).

3.42**riparian zone**

area bordering on streams, lakes and wetlands that links water to land

[SOURCE: Government of British Columbia, Ministry for Environment[20], modified]

3.43**rotation period**

amount of time required to complete a full management cycle associated with the growth and harvesting of *raw material(s)* (3.40) to be used in the *process* (3.36) being analysed

Note 1 to entry: In forestry, the rotation period is the time required to establish and grow the forest to merchantable size including fallow periods.

Note 2 to entry: In agriculture, the rotation period can vary between a single, annual crop rotation and more complex rotations involving several annual and perennial crops and/or fallow periods.

3.44**segregation**

chain-of-custody (3.7) system where, from the production of a *raw material* (3.40) to the final *product* (3.37) for consumption, the information on *sustainability* (3.48) remains traceable to the physical product

Note 1 to entry: The system does not permit mixing other products with differing information on sustainability or with no information on sustainability with the segregated product.

3.45**social security**

access to health care and income security, particularly in cases of old age, unemployment, sickness, invalidity, work injury, maternity or loss of a main income earner

Note 1 to entry: Social security can vary from one country to another.

[SOURCE: International Labour Organization, “Social protection”[23], modified].

3.46

stakeholder

individual, group or *organization* (3.33) that can affect or be directly affected by the *process* (3.36) under assessment within the *supply chain* (3.47)

Note 1 to entry: Stakeholders may include regulatory bodies, customers, neighbours, local communities, employees, suppliers, etc.

[SOURCE: ISO 13824:2009, 3.20, modified — Wording aligned to the context of this International Standard instead of general principles on risk assessment of systems involving structures, and Note 1 to entry has been added.]

3.47

supply chain

linked set of resources and *processes* (3.36) that begins with the sourcing of *raw material* (3.40) (including *biomass* (3.4) production where applicable) and extends through transport and storage of *products* (3.37) to the end user

Note 1 to entry: The supply chain may include raw material producers, vendors, manufacturing facilities, logistics providers, internal distribution centres, distributors, wholesalers and other entities that lead to the end user.

[SOURCE: ISO 28000:2007, 3.9, modified — The words “including biomass production where applicable”, “and including” and “raw material producers” have been added; “the delivery” has been changed to “transport and storage”, and “or services” and “across the modes of transport” have been omitted.]

3.48

sustainability

goal of sustainable development which encompasses environmental, social and economic aspects, in which the needs of the present are met without compromising the ability of future generations to meet their needs

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Note 1 to entry: Environmental, social and economic aspects interact and are interdependent. They are referred to as the three pillars of sustainability.

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Note 2 to entry: Sustainability is a comparative concept, not a state or absolute value.

3.49

sustainability aspect

element of activities or *products* (3.37) of an *economic operator* (3.13) that can have environmental, social and economic *impacts* (3.26)

3.50

system boundary

set of criteria specifying which *unit processes* (3.51) are part of a *product system* (3.38)

[SOURCE: ISO 14040:2006, 3.32, modified — Original Note to entry has been omitted.]

3.51

unit process

smallest element considered in the life cycle inventory analysis for which input and output data are quantified

[SOURCE: ISO 14040:2006, 3.34]

3.52

waste

substances or objects which the holder intends or is required to dispose of

[SOURCE: ISO 14040:2006, 3.35, modified — Original Note to entry has been omitted.]

3.53**water-scarce country**

country where annual water supplies drop below 1 000 m³ per person

[SOURCE: United Nations Department of Economic and Social Affairs, Freshwater availability in the world, on a country basis, in 2007]

4 General requirements and recommendations**4.1 General**

[Clause 4](#) contains overarching elements that are applicable to the indicators in this International Standard. This clause includes requirements that need to be fulfilled when providing information in accordance with [Clause 5](#) and recommendations as well as guidance to help the user to better understand this International Standard.

The effort expended to respond to the indicators in [Clause 5](#) should not impose undue administrative or economic burden for the economic operator. This International Standard therefore offers flexibility, allowing the economic operator to deal with the sustainability aspects that are relevant and significant to the operator's activities (see [4.5](#)) and to use aggregated data and information (see [4.9](#)).

4.2 Purpose and context

The purpose of conducting the assessment using this International Standard shall be clearly documented. The context shall also be documented including geographic areas, level of aggregation and affected stakeholders. The purpose and context are necessary to determine the scope of assessment (see [4.3](#)) relevance and significance (see [4.5](#)) and methods for data representation (see [4.9](#)).

4.3 Scope of assessment

The scope of assessment describing the bioenergy process(es) and products, resources and business units to be included, shall be documented. Processes under direct control include activities conducted by or subcontracted by the economic operator (see [3.12](#)). Any exclusion of a process or part of a process under the direct control of the economic operator (e.g. raw material selection, processing or waste disposal) shall be documented and justified.

The economic operator should consider the ability to facilitate comparability (see [4.11](#)).

4.4 Stakeholder involvement

Stakeholders can have concerns related to the economic operator's activities.

Where required in this International Standard, the economic operator shall document how stakeholders were engaged.

NOTE "Engaged" means both that stakeholders were informed and provided opportunity to comment and that the economic operator provided a documented response to legitimate grievance presented by stakeholders.

The economic operator:

- shall identify stakeholders that are relevant to achieving the outcomes of this International Standard;
- should identify relevant concerns (e.g. requirements) of these stakeholders;
- should identify which of these concerns will be dealt with by legal requirements.