
**Soil quality — Use of extracts for the
assessment of bioavailability of trace
elements in soils**

*Qualité du sol — Utilisation d'extraits pour l'évaluation de la
biodisponibilité des éléments traces dans les sols*



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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 190, *Soil Quality*, Subcommittee SC 7, *Soil and site assessment*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

As already mentioned in ISO 17402, laboratory and field studies have demonstrated that biological effects are not related to the total concentration of a contaminant in the soil. Instead, an organism responds only to the fraction that is biologically available (bioavailable) for that organism. In the conservative approach of exposure assessment as typically described in a regulatory context, it is assumed that the total concentration of a contaminant present in a soil or soil-like material is available for uptake by organisms, including man, which will overestimate the risks. Therefore, a risk assessment can be optimised by using an approach that is based on estimated exposure representing the available, effective concentration of the contaminant(s) and on (existing) intrinsic toxicity data.

In standardization of methods for assessing the bioavailability of trace elements a framework of standards is used with the following layering of standards (see [Figure 1](#)). Starting point is ISO 17402 in which chemical and biological methods are distinguished and where guidance for selection of relevant methods is given. If a chemical method is to be used to establish environmental availability, there are the following possibilities:

- a) Extractions based on equilibrium. For this approach standards are available or under development.
- b) Method based on non-equilibrium. For this approach standards are not yet under development. If these standards become available they will also be included in this document (dashed line in [Figure 1](#)).

The methods referred to in this standard are all based on extraction. Extraction can be considered as a model to simulate the pore water concentration. The extraction methods give results that can be used in assessment and this standard gives guidance for that use.

The method for human bioaccessibility (ISO 17924) is not presented in [Figure 1](#). It is an extraction method that simulates the human intestinal system and is specific for assessment of human risks.

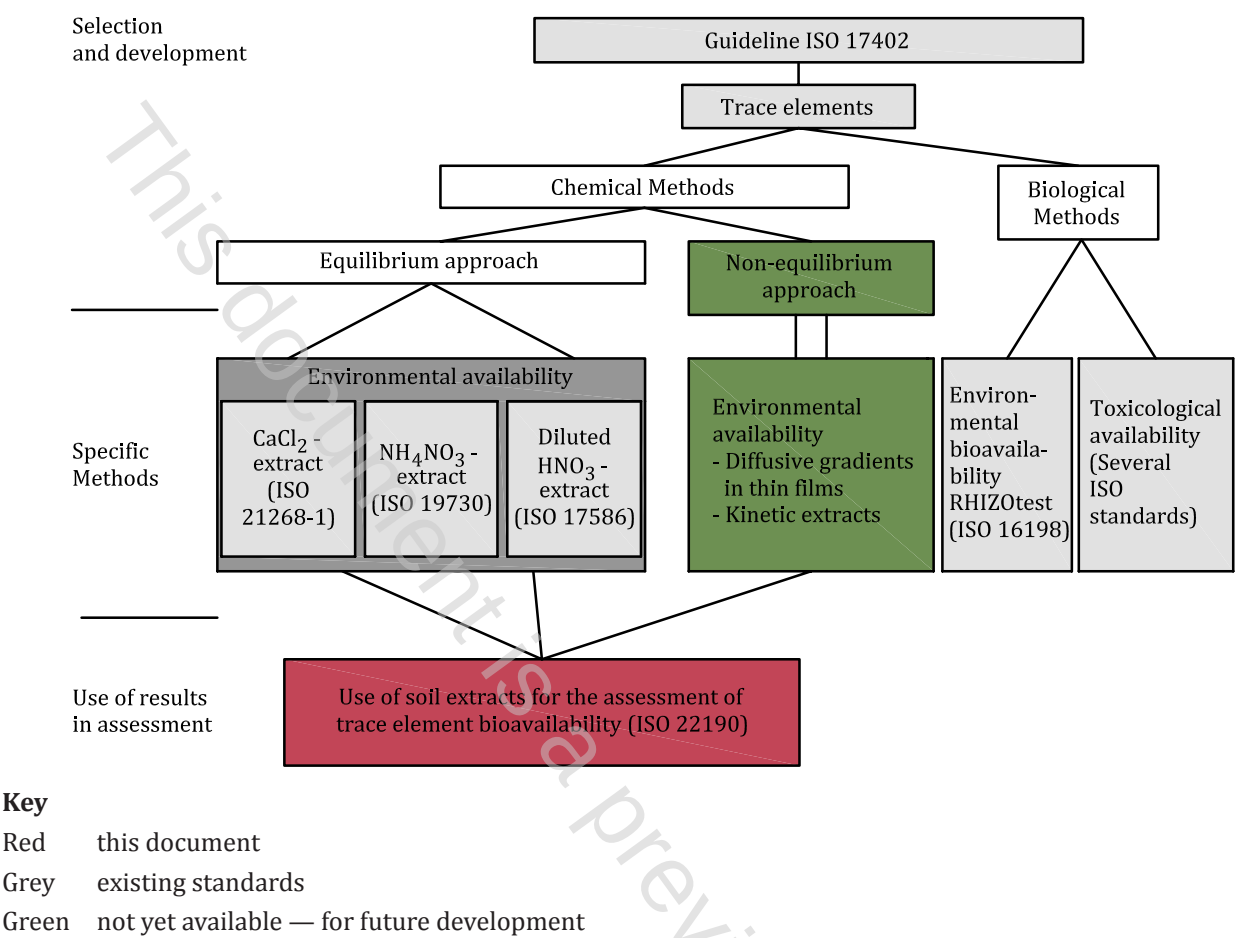


Figure 1 — Layering of standards for bioavailability of trace elements (situation April 2018)

In the scientific research to bioavailability a large number of definitions and concepts are in use, which reflect the discussion in the scientific world. However, for regulatory purposes a more clear and simple approach is necessary. In a regulatory context, contaminants are either bioavailable or non-bioavailable. To support decisions, both should be measurable.

As presented in [Figure 2](#), the bioavailable fraction can be measured using the method described in this document.

Soil quality — Use of extracts for the assessment of bioavailability of trace elements in soils

1 Scope

This document provides guidance on the use of chemical methods establishing the bioavailability of trace elements in soil and soil-like materials and to stimulate the use of bioavailability in assessments. The methods themselves are not subject of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11074, *Soil quality — Vocabulary*

ISO 17402, *Soil quality — Requirements and guidance for the selection and application of methods for the assessment of bioavailability of contaminants in soil and soil materials*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11074, ISO 17402 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

bioavailability

degree to which chemicals present in the soil can be absorbed or metabolised by a human or ecological receptor or are available for interaction with biological systems

Note 1 to entry: The concept of bioavailability is further explained in ISO 17402.

Note 2 to entry: This document follows the approach of Reference [20] as illustrated in Figure 2, in which all defined fractions are measurable as further explained in Clause 4.

Note 3 to entry: In ISO 17924 a definition specific for human uptake through ingestion is defined as the fraction of a substance present in ingested soil that reaches the systemic circulation (blood stream).

[SOURCE: ISO 11074:2015, 5.2.2, modified — Note 2 to entry was added and the following note to entry renumbered.]

3.2

environmental availability

fraction of contaminant physico-chemically driven by desorption processes potentially available to organisms

[SOURCE: ISO 17402:2008, 3.3]