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Soil quality — Guidance on the establishment and maintenance of monitoring programmes

Qualité du sol — Lignes directrices pour l'établissement et l'entretien de programmes de surveillance

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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 on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 7, *Impact 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.

This second edition cancels and replaces the first edition (ISO 16133:2004), which has been technically revised. The main changes compared to the previous edition are as follows:

— Clause 2 has been updated;

— Clause 3 has been updated, definitions that were not used in the document have been deleted;

— new subclauses have been introduced regarding sampling designs (5.2.4), sampling in space (5.2.5) and in time (5.2.6);

— all examples of monitoring programmes described in Annex A have been deleted as part were outdated.

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Introduction

Monitoring is the process of repetitive observation, for defined purposes, of one or more components of the environment according to pre-arranged schedules in space and time using comparable methods for environmental sensing and data collection[14][15]. Monitoring schemes are used all over the world for a large number of purposes. Soil monitoring, particularly, is a long-term undertaking. The quality and the utility of the information from the monitoring is to a large degree determined by the choice of monitoring sites and by their maintenance over the years, and by appropriate quality control at all stages of the process.

Monitoring associated with industrial (contaminated) sites can involve many specific considerations, including legal requirements. The guidance in this document is not designed or intended to cover such situations.

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Soil quality — Guidance on the establishment and maintenance of monitoring programmes

1 Scope

This document gives general guidance on the selection of procedures for the establishment and maintenance of programmes for long-term monitoring of soil quality. It takes into account the large number of objectives for soil-monitoring programmes.

This document is intended to help provide a basis for dialogue between parties which might be involved in a monitoring scheme.

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 15903, *Soil quality — Format for recording soil and site information*

ISO 18400 (all parts), *Soil quality — Sampling*

ISO 25177, *Soil quality — Field soil description*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11074 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
anthropogenic change
change in soil properties caused by human activities

[SOURCE: ISO 11074:2015, 5.1.1, modified — “influence on” has been replaced by “change in”]

3.2
background concentration
concentration of an element or a substance characteristic of a soil type in an area or region arising from both natural sources and anthropogenic diffuse sources such as atmospheric deposition

[SOURCE: ISO 11074:2015, 3.5.1, modified — in the definition, “an element or” has been introduced before “a substance” and “anthropogenic” has replaced “non-natural”. Note 1 to entry has been removed.]

3.3
habitat
sum of the environment of a particular species or community (e.g. in terms of soil properties, land use, climate)

[SOURCE: ISO 23611-6:2012, 3.2.2]

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3.4
monitoring site
area in which investigations take place

Note 1 to entry: Such an area is usually chosen to be relatively homogenous.

[SOURCE: ISO 11074:2015, 5.1.5 modified — the following part of the definition "such an area is usually chosen to be relatively homogenous" has been moved to Note 1 to entry]

4 Monitoring objectives

4.1 General

Monitoring programmes provide baseline soil information and help in deriving soil quality values for managing soils (e.g. to verify soil quality after the implementation of remediation actions in contaminated sites).

Monitoring is also an important tool for the early detection of changes in soil properties and soil processes[16]. It, thus, has a major role in the prevention or minimization of environmental damage or the detection of environmental improvement. By the early detection of environmental impact, or the potential for such impact, a monitoring programme could help to reduce or remove the costs of reaching or maintaining a given level of environmental management, protection or quality.

Monitoring programmes can also be used to evaluate the outcome of environmental policies, to assist in the development of strategies for soil protection and environmental management. They can also serve as research platforms for the development and validation of field and analytical methods and of models of soil and related environmental processes.

The range of purposes for which soil-monitoring programmes can be designed encompasses such a vast range of time scales, variables and processes that it is not possible to give specific guidance on the design of a monitoring programme to meet all the objectives which might be covered by this diversity. The selection of sites, sampling schemes, etc. should be made following consideration of the specific objectives of the particular monitoring programme. This document identifies the principles underlying such programmes.

4.2 Examples of monitoring purposes

Some examples of monitoring purposes might include the need to establish one or more of the following:

— short-, intermediate- and long-term environmental impacts varying in magnitude, importance, duration and probability;

— changes in chemical, biological and physical soil properties (e.g. pH, adsorption processes, toxic element accumulation, radiation, compaction, erosion) and the dynamics of changes in such properties;

— effects of human impacts;

— differentiation of human impacts from inter-annual variability and longer-term climate change;

— differentiation of local contamination from long-range transport;

— evaluation of productivity;

— assessment of biological diversity;

— input of elements into the soil environment and output of elements from the soil environment;

— transport processes in the soil profile (gases; particles; elements or compounds in solution);

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