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oSIST prEN ISO 19144-2:2023

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Geografske informacije - Klasifikacijski sistemi - 2. del: Metajezik za pokrovnost (LCML) (ISO/DIS 19144-2:2022)

Geographic information - Classification systems - Part 2: Land Cover Meta Language (LCML) (ISO/DIS 19144-2:2022)

Geoinformation - Klassifizierungssysteme - Teil 2: Meta-Beschreibungssprache für Landbedeckung (ISO/DIS 19144-2:2022)

Titre manque - Partie 2: Métalangage de couverture du sol (LCML) (ISO/DIS 19144-2:2022)

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Geographic information — Classification systems —

Part 2: Land Cover Meta Language (LCML)

ICS: 35.240.70

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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 jointly by the Food and Agriculture Organization of the United Nations (UNFAO) and Technical Committee ISO/TC 211, *Geographic information/Geomatics* under a cooperative agreement between the two organizations.

In accordance with the ISO/IEC Directives, Part 2, 2018, Rules for the structure and drafting of International Standards, in International Standards the decimal sign is a comma on the line. However, the General Conference on Weights and Measures (Conférence Générale des Poids et Mesures) at its meeting in 2003 passed unanimously the following resolution:

“The decimal marker shall be either a point on the line or a comma on the line.”

In practice, the choice between these alternatives depends on customary use in the language concerned. In the technical areas of geodesy and geographic information it is customary for the decimal point always to be used, for all languages. That practice is used throughout this document.

A list of all parts in the ISO 19144 series can be found on the ISO website.

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

Efficient assessment of land cover and the ability to monitor change are fundamental to sustainable management of natural resources, environmental protection, food security and successful humanitarian programmes. Such information is also required to help towards raising levels of nutrition, improving agricultural productivity, enhancing the lives of rural populations and contributing to sustainable growth of the world economy. However, in the past, policymakers and planners have not had access to reliable and comparable land cover data, not only for lower-income countries but sometimes also at the regional and global levels.

Access has been limited by two factors: lack of mapping activities and lack of commonality between systems. The solution has been to carry out separate regional mapping projects using national or regional land cover classification systems. However, it has been difficult to compare or to exchange information between current systems.

The aim of this part of ISO 19144 is to enable the comparison of information from existing classification systems in a meaningful way without replacing them. The aim is to complement the development of future classification systems that can offer more reliable collection methods for particular national or regional purposes by allowing them to be described in a consistent manner.

A critical factor in implementing such global activities is the availability of an international standard for documentation of land cover classification systems. This then provides a reliable basis for interaction without replacing the increasing number of national, regional and global land cover mapping and monitoring activities. This enables comparisons of land cover classes to be made regardless of mapping scale, land cover type, data collection method or geographic location.

Another critical factor is the availability of a common reference for land cover classification systems. This part of ISO 19144 provides a metalanguage expressed as a UML model that allows different land cover classification systems to be described.

This part of ISO 19144 establishes a metalanguage for a set of objects and rules (language) to describe land cover features based on physiognomy that can be part of different land cover legends (nomenclature). This provides a framework for comparing different systems and nomenclatures such as Corine, Africover, Anderson (USGS), Global Map and national systems without replacing them. This is not a description of a nomenclature nor is it a description of a specific set of classes.

An additional part to the ISO 19144 standard series addresses Land Use aspects. Land Use by human activity is different from Land Cover. Land Cover is based on the physiognomic aspects of the plants and other elements covering the observed surface of the earth. Land Use identifies the human activities, such as agriculture, mining or other actions taken by humans to modify the earth cover. Land use is primarily defined in terms of human economic functions which results in a series of different human activities. In this context land cover defines biophysical earth objects on which human activities take place. The two types of classifications are closely related and in some Classification Systems they are sometimes mixed. The Land Use Metalanguage described in a separate part of this standard can be used alone to simply describe Land Use, or it can be combined with the Land Cover Metalanguage to be able to describe classification systems that have mixed aspects of both Land Cover and Land Use.

Another separate part of this ISO 19144 standard series standard is a description of the “*Registration and Implementation aspects for Land Cover Land Use Classification*”. This allows code lists and other details used in the Land Cover and Land Use systems to be registered. Code lists allowed attribute values and other characteristics can be open ended and registration allows these elements to be defined.

EXAMPLE Soil types can make use of the UN FAO soil classification list of soil types, or the more recent World Reference Base for Soil Resources, or the USDA soil taxonomy.

Appropriate references to externally managed lists or listed established particularly for the ISO 19144 series of standards can be registered. In addition, whole classification systems described using the Land Cover or Land Use parts of the ISO 19144 series can be registered.

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Geographic information — Classification systems —

Part 2: Land Cover Meta Language (LCML)

1 Scope

Document specifies a Land Cover Meta Language (LCML) expressed as a UML metamodel that allows different land cover classification systems to be described based on the physiognomic aspects. This document recognizes that there exist a number of land cover classification systems. It provides a common reference structure for the comparison and integration of data for any generic land cover classification system but does not intend to replace those classification systems.

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 19109:2015, *Geographic information — Rules for application schema*

ISO/TS 19103:2015, *Geographic information — Conceptual schema language*

ISO/DIS 19123-1,¹⁾ *Geographic information — Schema for coverage geometry and functions — Part 1: Fundamentals*

ISO 19144-1:2009, *Geographic information — Classification systems — Part 1: Classification system structure*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

NOTE 1 The technical terms applying to plant physiognomy, and terms from other disciplines used to establish the classifiers in the classification system are not defined in this part of ISO 19144.

NOTE 2 The term class is used in the ISO 19144 series of standards to represent a construct in a classification system; however, the term has several meanings in other contexts, including in the UML modelling language. Where possible attributes or other identifiers are needed to distinguish the various use of the term class.

1) Under preparation. (Stage at the time of publication ISO/DIS 19123-1).

ISO/DIS 19144-2:2022(E)**3.1.1****abstract test suite**

ATS

set of conformance classes that define tests for all requirements of a specification evidence of conformance to all or part of a standard, awarded for passing one or more of the conformance test classes specified in that standard

[SOURCE: ISO 19105:2022, 3.3]

3.1.2**area of incidence**

substratum area entirely topped by the entire LCML basic element itself or by its canopy effect

3.1.3**area of pertinence**

area where a specific LCML elements extends

3.1.4**characteristic**

<classification> distinguishing qualitative attribute of a metalanguage basic element

3.1.5**class**

<UML> description of a set of objects that share the same attributes, operations, methods, relationships, and semantics

[SOURCE: ISO/TS 19103:2005, 4.7]

3.1.6**class**

<classification> result of a classification process as part of a classification system which subdivides concepts within a given topic area.

3.1.7**classification**

abstract representation of real world phenomena using classifiers

[SOURCE: ISO 19144-1:2009, 4.1.4]

3.1.8**classification system**

system for assigning objects to classes

[SOURCE: ISO 19144-1:2009, 4.1.5]

3.1.9**classifier**

<classification> definition used to assign objects to legend classes

Note 1 to entry: Classifiers can be algorithmically defined or defined according to a set of classification system specific rules.

[SOURCE: ISO 19144-1:2009, 4.1.6]

3.1.10**cover**

<classification> area of incidence of an LCML basic element over the substratum in the area of pertinence of the basic element

3.1.11 coverage

feature that acts as a function to return values from its range for any direct position within its domain

[SOURCE: ISO/DIS 19123-1, 3.1.8]

3.1.12 discrete coverage

coverage that returns the same feature attribute values for every direct position within any object in its domain

Note 1 to entry: The domain of a discrete coverage consists of a finite set of spatial, temporal, or spatio-temporal objects.

Note 2 to entry: Discrete coverages have values only where they are defined, whereas continuous coverages can be interpolated thereby providing intermediate values.

[SOURCE: ISO/DIS 19123-1, 3.1.15]

3.1.13 element portioning

<classification> percent value of the area of pertinence of a single LCML basic element when two or more LCML basic elements are considered in the same stratum.

Note 1 to entry: The sum of the whole portioning values for all elements considered within a stratum must be always equal to 100 %.

Note 2 to entry: Element portioning is distinct from strata portioning.

3.1.14 feature

abstraction of real world phenomena

EXAMPLE <http://standards.iteh.ai> The phenomenon named “Eiffel Tower” can be classified with other similar phenomena into a feature type named “tower”.

[SOURCE: ISO 19101-1:2014, 4.1.11]

3.1.15 grid

nonempty, ordered set of axes with a set of positions along each axis acting as reference point for connected compact smooth hypersurfaces at whose intersections direct positions are defined

[SOURCE: ISO/DIS 19123-1]

3.1.16 item class

set of items with common properties

Note 1 to entry: Class is used in this context to refer to a set of instances, not the concept abstracted from that set of instances.

[SOURCE: ISO 19135-1:2015, 4.1.7]

3.1.17 land cover

observed (bio)physical cover on the Earth’s surface

Note 1 to entry: Land cover is distinct from land use.

[SOURCE: [44]]

ISO/DIS 19144-2:2022(E)**3.1.18****land cover metalanguage**

LCML

logical general model used to describe the characteristics of land cover features used as classifiers and the more specific rules that constitute a particular classification system

3.1.19**land use**

arrangements, activities and inputs people undertake in a certain land cover type to maintain it or produce change

EXAMPLE “Recreation area” is a land use term that can be applicable to different land cover types, e.g. sandy surfaces such as a beach; a built-up area such as a pleasure park; woodlands etc.

Note 1 to entry: The definition of land use in this way establishes a direct link between land cover and the actions of people in their environment. Multiple land uses can coexist at the same location (e.g., forestry and recreation), contrary to land cover classes that are mutually exclusive.

[SOURCE: [44]]

3.1.20**legend**

application of a classification in a specific area using a defined mapping scale and specific data set

[SOURCE: ISO 19144-1:2009, 4.1.15]

3.1.21**legend class**

class resultant from the application of a classification process

Note 1 to entry: In order to avoid confusion with respect to the term “class”, the result of a classification process will be termed a “legend class”. This use of the term “class” is distinct from the term “class” as used in UML modelling.

[SOURCE: ISO 19144-1:2009, 4.1.16] <https://standards.iteh.ai/catalog/standards/sist/0c2eaba6-3e5f-4a52-89b1-17c9b125c2/osist-pren-iso-19144-2-2023>

3.1.22**point cloud**

collection of data points in 3D space

[SOURCE: ISO/TS 19130-2:2014, 4.51]

3.1.23**physiognomy**

general appearance of an object or terrain, without reference to its underlying or scientific characteristics

3.1.24**property**

distinguishing additional physiognomic attribute of a metalanguage basic element

3.1.25**register**

set of files containing identifiers assigned to items with descriptions of the associated items

[SOURCE: ISO 19135-1:2015, 4.1.9]

3.1.26**registry**

information system on which a register is maintained

[SOURCE: ISO 19135-1:2015, 4.1.13]

3.1.27**strata portioning**

the percent value expressing the portion by which a stratum comprises a part of the whole, where the aggregate of multiple related strata is constrained so that the sum of all of the related strata (projected in orthogonal plane) equals 100 %.

Note 1 to entry: this allows one to express the situation where one cannot see elements that are obscured by other elements, such as not being able to see beneath the tree canopy in views from some types of satellite imagery.

Note 2 to entry: strata portioning is distinct from element portioning.

3.1.28**triangulated irregular network**

TIN

tessellation composed of triangles

[SOURCE: ISO/DIS 19123-1]

3.2 Abbreviated terms

ATS	Abstract Test Suite
CEC	Commission of the European Communities
CORINE	Coordination of Information on the Environment, EU
LC	Prefix used to identify classes in the land cover metalanguage
LCCS	Land Cover Classification System
TDS	Total Dissolved Solids
UML	Unified Modelling Language
UNFAO	United Nations Food and Agriculture Organization
UNFAO LCCS	UNFAO Land Cover Classification System

4 Conformance**4.1 Conformance requirements and testing**

Conformance to this part of the ISO 19144 series on Classification Standards consists of alignment with the requirements established in [clauses 4.2, 4.3, 4.4, 9.2](#) and [9.3](#) in this document. The Abstract Test Suite given in [Annex A](#) describes a methodology for testing conformance to these requirements.

4.2 Conformance classes

Two conformance classes are identified in this part of ISO 19144, one for the description of a land cover classification system and the other for the comparison between two or more land cover classification systems.

4.3 Conformance class 1 — Description of a land cover classification system

Requirement 1: The description of Legends or Land Cover Application Schem using this part (part 2) of ISO 19144 LCML shall consist of a set of UML classes with associated attributes that correspond to