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Geografske informacije - Klasifikacijski sistemi - 2. del: Metajezik za pokrovnost (LCML)

Geographic information - Classification systems - Part 2: Land Cover Meta Language (LCML)

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Information géographique - Systèmes de classification - Partie 2: Métalangage de couverture végétale (LCML)

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Geographic information — Classification systems —

Part 2:
Land Cover Meta Language (LCML)

Information géographique — Systèmes de classification —

Partie 2: Métalangage de couverture végétale (LCML)

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Foreword

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ISO 19144 consists of the following parts, under the general title *Geographic information — Classification systems*:

— *Part 1: Classification system structure*

— *Part 2: Land Cover Meta Language (LCML)*

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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 aid 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, policy-makers and planners have not had access to reliable and comparable land cover data, not only for lower-income countries but 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 not been possible to compare or to exchange information between current systems.

The aim of this part standard is to enable the ability to compare information from existing classification systems in a meaningful way without replacing them. The aim is to complement the development of future classification systems that may 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 a common, umbrella land cover classification system structure. 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.

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

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This international standard establishes a metalanguage for a set of objects and rules (language) to describe land cover features (based on physiognomy – the general appearance of an object or terrain, without reference to its underlying or scientific characteristics) that may be part of different land cover legends (nomenclature), thus providing 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.

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Geographic information — Classification systems —

Part 2:
Land Cover Meta Language (LCML)

1 Scope

This part of ISO 19144 specifies a Land Cover Meta Language (LCML) expressed as a UML metamodel that allows different land cover classification systems to be described based physiognomic aspects. This part of ISO 19144 also specifies the detailed structure of a register for the extension of LCML but does not specify the maintenance of the register. This International Standard 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 intended to replace those classification systems.

2 Conformance

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2.1 Introduction

Three conformance classes are identified for this part of ISO 19144.

2.2 Conformance of a land cover classification system

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A land cover classification system (LCCS), as defined in accordance with the LCML defined in this part of ISO 19144, shall satisfy the conditions specified in the following Abstract Test Suite to conform:

a) ISO 19144-1 for general conformance of the classification system.

b) A.2.

2.3 Conformance of register for the extension of the metalanguage

The register defined in this part of ISO 19144 shall satisfy all of the conditions specified in the following Abstract Test Suites:

a) ISO 19135 for the general register structure.

b) A.3.1 for the minimum register content

c) A.3.2 for uniqueness of registered metaclass names

d) A.3.3 for backward compatibility.

2.4 Conformance of a comparison process of LCCS

The process of comparison of two LCCS shall be done by developing descriptions of the two LCCS, each in accordance with the Abstract Test Suite (A.2), and then identifying the differences in accordance with the Abstract Test Suite (A.4).

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3 Normative references

The following referenced documents are indispensable for the application 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 19109:2005, *Geographic information — Rules for application schema*

ISO/TS 19103:2005, *Geographic information — Conceptual schema language*

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

ISO 19135:2005, *Geographic information — Procedures for item registration*

4 Terms, definitions, and abbreviations

4.1 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply. The technical terms applying to plant physiognomy, and terms from other disciplines used to establish the classifiers in the classification scheme are not defined in this International Standard.

4.1.1
abstract test suite
abstract test module specifying all the requirements to be satisfied for conformance

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[ISO 19105:2000, definition 3.4]

4.1.2
classification
abstract representation of real world phenomena using **classifiers**

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[ISO 19144-1:2009, definition 4.1.4]

4.1.3
classification system
system for assigning objects to classes

[ISO 19144-1:2009, definition 4.1.5]

4.1.4
classifier
definition used to assign objects to **legend classes**

[ISO 19144-1:2009, definition 4.1.6]

NOTE Classifiers may be algorithmically defined, or defined according to a set of **classification system** specific rules.

4.1.5
feature
abstraction of real world phenomena

[ISO 19101:2002, definition 4.11]

EXAMPLE The phenomenon named “Eiffel Tower” may be classified with other similar phenomena into a feature type named “tower”.

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4.1.6
item class
set of items with common properties

[ISO 19135:2005, definition 4.1.6]

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

4.1.7
land cover
observed (bio)physical cover on the earth's surface

[UNFAO LCCS 2:2005]

NOTE Land cover is distinct from **land use**.

4.1.8
land cover metalanguage
logical general model used to describe **land cover features** from which more specific rules can be describe to create a particular **classification system**

4.1.9
land use
arrangements, activities and inputs people undertake in a certain **land cover** type to maintain it or produce change

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[UNFAO LCCS 2:2005]

NOTE 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 may coexist at the same location (eg forestry and recreation). Contrary to land cover classes that are mutually exclusive.

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EXAMPLE "Recreation area" is a land use term that may be applicable to different land cover types: for instance sandy surfaces, like a beach; a built-up area like a pleasure park; woodlands; etc.

4.1.10
legend
application of a **classification** in a specific area using a defined mapping scale and specific data set

[UNFAO LCCS 2:2005]

4.1.11
legend class
class resultant from the application of a **classification** process

[ISO 19144-1:2009, definition 4.1.16]

NOTE 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 word class is distinct from the word class as used in UML modelling.

4.1.12
register
set of files containing identifiers assigned to items with descriptions of the associated items

[ISO 19135:2005, definition 4.1.9]

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4.1.13
registry
information system on which a **register** is maintained

[ISO 19135:2005, definition 4.1.13]

4.2 Abbreviations

CEC	Commission of the European Communities
CORINE	Coordination of Information on the Environment, EU
LCCS	Land Cover Classification System
LCML	Land Cover Meta Language
LC	Prefix used to identify classes in the Land Cover Meta Language
TDS	Total Dissolved Solids
UML	Unified Modelling Language
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFAO	United Nations Food and Agriculture Organization

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5 Notation

The conceptual schema specified in this International Standard is described using the Unified Modelling Language (UML), following the guidance of ISO/TS 19103.

Several model elements used in this schema are defined in other ISO geographic information standards. By convention within ISO/TC 211, names of UML classes, with the exception of basic data type classes, include a two letter prefix that identifies the standard and the UML package in which the class is defined. UML classes defined in this International Standard have the two letter prefix of **LC**. Examples in this International Standard have the two letter prefix **EL**. The classes in the meta model in Annex B use the prefix **LM**. Table 1 lists the other standards and packages in which UML classes used in this International Standard have been defined.

Table 1 — Sources of externally defined UML classes

Prefix	Standard	Package
CL	19144-1	Classification System Structure
RE	19135	Procedures for registration

6 Context

The purpose of this International Standard is to define a common reference structure for the comparison and integration of data for any generic Land Cover Classification System (LCCS). The approach has been to define a Land Cover Meta Language (LCML) expressed as a UML model that allows different land cover classification systems to be described. This approach provides a rigorous logical framework for the description of any LCCS. This will improve the harmonization and integration of spatial data sets defined using different

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land cover classifications and the legends or nomenclatures developed from these systems and allow them to be compared and integrated.

This International Standard defines a Land Cover Meta Language (LCML) for a Land Cover Classification System (LCCS). [1)] It recognizes that there exist a number of land cover classification systems and nomenclatures in a number of countries and regions, and that these systems are well established and cannot be easily changed. In fact, portions of these systems are set in law in some nations with respect to land use legislation. For example, the definition of wetland is of great importance in some nations because there is environmental legislation in many nations to protect wetlands. Yet the definition of wetland varies between jurisdictions, and there is a need to be able to compare this and other types of land cover object. A wide acceptance of an approach to handling the description of land cover depends upon its flexibility to accommodate nomenclatures derived from different systems.

The approach taken in this International Standard is to avoid specific limitations such as fixed value ranges for attributes and the use of specific definitions for classifiers to increase the acceptability to the international community. The Land Cover Meta Language (LCML) defined in this International Standard avoids complex definitions, prefixed ranges of values and specific detailed classification rules. It acts as a method to bring the Land Cover community together to create a common understanding of land cover nomenclatures with the aim to produce global regional and national data sets able to be reconciled at different scales and detail level and geographic places.

One example Land Cover Classification Scheme is the UNFAO LCCS.[34] The purpose of the UNFAO LCCS, which is standardized by the UNFAO, is to give to the international community one possible system to classify Land Cover with a parametric approach that is compliant with the metamodel defined in this International Standard. Other LCCSs may also be defined by other regional or national bodies. The UNFAO LCCS is described as a set of classifiers and rules expressed in terms of the LCML. Any other national or multi-national LCCS can also be described in terms of the LCML. Examples of different national or regional classification systems are given in C.10 – C.15.

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The LCML complies with the general structure for classification systems defined in part 1 of this International Standard in that a LCCS described in the LCML may be created so as to comply with ISO 19144-1. The structure used to represent the classified data may be that of a discrete coverage as described in ISO 19123. The classifiers described in accordance with the LCML may be maintained in a register, compliant with ISO 19135 and with ISO 19144-1; that is, the classes described using the metalanguage defined in this International Standard may populate a register for classifiers as described in ISO 19144-1. Registration within this International Standard is used in a very different way. It is used to allow for extension of the LCML.

The LCML provides a general framework of rules from which more exclusive conditions can be derived to create specific classification systems. It is a language based on physiognomy and stratification of both biotic and abiotic materials. The system may be used to specify any land cover feature anywhere in the world, using a set of independent diagnostic criteria that allow correlation with existing classifications and legends.

Land cover metalanguage descriptor objects are defined by a combination of a set of land cover metalanguage-elements. These land cover metalanguage-elements are divided in two categories “basic metalanguage-elements” the elements that constitutes the main physiognomic aspects of biotic and abiotic cover features, for instance for biotic features trees, shrubs, herbaceous vegetation etc., and “metalanguage-element properties” that further define the physiognomic/structural aspect of the basic objects.

Further definition of the land cover classes may be achieved by adding the metalanguage-element characteristics. The characteristics are of two types: land cover element characteristics and land cover class characteristics. “LC_ClassCharacteristics” and “LC_ElementCharacteristics” are defined as optional descriptive elements not directly related to the physiognomic/structural characterization of the land cover metalanguage-element. “LC_ElementCharacteristics” may be applied to a single basic metalanguage-element.

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1) The LCML is derived from the concepts in the Land Cover Classification System (UNFAO LCCS version 3) established by the Food and Agricultural Organization (FAO) of the United Nations.[20] The UNFAO LCCS classification system is one particular classification system for land cover based on plant physiognomy and does not exclude other classification systems being established for land cover for other purposes

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