



INSPIRE Infrastructure for Spatial Information in Europe

D2.8.1.6 INSPIRE Data Specification on Cadastral Parcels – Guidelines

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Foreword

How to read the document?

This guideline describes the INSPIRE Data Specification on *Cadastral parcels* as developed by the Thematic Working Group Cadastral parcels using both natural and a conceptual schema languages. The data specification is based on the agreed common INSPIRE data specification template.

The guideline contains detailed technical documentation of the data specification highlighting the mandatory and the recommended elements related to the implementation of INSPIRE. The technical provisions and the underlying concepts are often illustrated by examples. Smaller examples are within the text of the specification, while longer explanatory examples are attached in the annexes. The technical details are expected to be of prime interest to those organisations that are/will be responsible for implementing INSPIRE within the field of *Cadastral parcels*.

At the beginning of the document, two executive summaries are included that provide a quick overview of the INSPIRE data specification process in general, and the content of the data specification on *Cadastral parcels* in particular. We highly recommend that managers, decision makers, and all those new to the INSPIRE process and/or information modelling should read these executive summaries first.

The UML diagrams (in Chapter 5) offer a rapid way to see the main elements of the specifications and their relationships. Chapter 5 also contains the Feature Catalogue including the definition of the spatial object types, attributes, and relationships. People having thematic expertise but not familiar with UML can fully understand the content of the data model focusing on the Feature Catalogue. Users might also find the Feature Catalogue especially useful to check if it contains the data necessary for the applications that they run.

The document will be publicly available as a 'non-paper'. It does not represent an official position of the European Commission, and as such can not be invoked in the context of legal procedures.

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Interoperability of Spatial Data Sets and Services – General Executive Summary

The challenges regarding the lack of availability, quality, organisation, accessibility, and sharing of spatial information are common to a large number of policies and activities and are experienced across the various levels of public authority in Europe. In order to solve these problems it is necessary to take measures of coordination between the users and providers of spatial information. The Directive 2007/2/EC of the European Parliament and of the Council adopted on 14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment.

INSPIRE will be based on the infrastructures for spatial information that are created and maintained by the Member States. To support the establishment of a European infrastructure, Implementing Rules addressing the following components of the infrastructure are being specified: metadata, interoperability of spatial data themes (as described in Annexes I, II, III of the Directive) and spatial data services, network services and technologies, data and service sharing, and monitoring and reporting procedures.

INSPIRE does not require collection of new data. However, after the period specified in the Directive¹ Member States have to make their data available according to the Implementing Rules.

Interoperability in INSPIRE means the possibility to combine spatial data and services from different sources across the European Community in a consistent way without involving specific efforts of humans or machines. It is important to note that “interoperability” is understood as providing access to spatial data sets through network services, typically via Internet. Interoperability may be achieved by either changing (harmonising) and storing existing data sets or transforming them via services for publication in the INSPIRE infrastructure. It is expected that users will spend less time and efforts on understanding and integrating data when they build their applications based on data delivered within INSPIRE.

In order to benefit from the endeavours of international standardisation bodies and organisations established under international law their standards and technical means have been referenced, whenever possible.

To facilitate the implementation of INSPIRE, it is important that all stakeholders have the opportunity to participate in its specification and development. For this reason, the Commission has put in place a consensus building process involving data users and providers together with representatives of industry, research, and government. These stakeholders, organised through Spatial Data Interest Communities (SDIC) and Legally Mandated Organisations (LMO)², have provided reference materials, participated in the user requirement and technical³ surveys, proposed experts for the Data Specification Drafting Team⁴ and Thematic Working Groups⁵, expressed their views on the drafts of the technical documents of the data specification development framework⁶; they have reviewed and tested the draft data specifications and have been invited to comment the draft structure of the implementing rule on interoperability of spatial data sets and services.

¹ For Annex I data: within two years of the adoption of the corresponding Implementing Rules for newly collected and extensively restructured data and within 7 years for other data in electronic format still in use.

² The number of SDICs and LMOs on 21/08/2009 was 301 and 176 respectively

³ Surveys on unique identifiers and usage of the elements of the spatial and temporal schema,

⁴ The Data Specification Drafting Team has been composed of experts from Austria, Belgium, Czech Republic, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Switzerland, UK, and the European Environmental Agency

⁵ The Thematic Working Groups of Annex I themes have been composed of experts from Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, UK, the European Commission, and the European Environmental Agency

⁶ Four documents describing common principles for data specifications across all spatial data themes. See further details in the text.

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The development framework elaborated by the Data Specification Drafting Team aims at keeping the data specifications of the different themes coherent. It summarises the methodology to be used for the data specifications and provides a coherent set of requirements and recommendations to achieve interoperability. The pillars of the framework are four technical documents:

- The Definition of Annex Themes and Scope⁷ describes in greater detail the spatial data themes defined in the Directive, and thus provides a sound starting point for the thematic aspects of the data specification development.
- The Generic Conceptual Model⁸ defines the elements necessary for interoperability and data harmonisation including cross-theme issues. It specifies requirements and recommendations with regard to data specification elements of common use, like the spatial and temporal schema, unique identifier management, object referencing, a generic network model, some common code lists, etc. Those requirements of the Generic Conceptual Model that are directly implementable will be included in the Implementing Rule on Interoperability of Spatial Data Sets and Services.
- The Methodology for the Development of Data Specifications⁹ defines a repeatable methodology enabling to arrive from user requirements to a data specification through a number of steps including use-case development, initial specification development and analysis of analogies and gaps for further specification refinement.
- The “Guidelines for the Encoding of Spatial Data”¹⁰ defines how geographic information can be encoded to enable transfer processes between the systems of the data providers in the Member States. Even though it does not specify a mandatory encoding rule it sets GML (ISO 19136) as the default encoding for INSPIRE.

Based on the data specification development framework, the Thematic Working Groups have created the INSPIRE data specification for each Annex I theme. The data specifications follow the structure of “ISO 19131 Geographic information - Data product specifications” standard. They include the technical documentation of the application schema, the spatial object types with their properties, and other specifics of the spatial data themes using natural language as well as a formal conceptual schema language¹¹.

A consolidated model repository, feature concept dictionary, and glossary are being maintained to support the consistent specification development process and potential further reuse of specification elements. The consolidated model consists of the harmonised models of the relevant standards from the ISO 19100 series, the INSPIRE Generic Conceptual Model, and the application schemas¹² developed for each spatial data theme. The multilingual INSPIRE Feature Concept Dictionary contains the definition and description of the INSPIRE themes together with the definition of the spatial object types present in the specification. The INSPIRE Glossary defines all the terms (beyond the spatial object types) necessary for understanding the INSPIRE documentation including the terminology of other components (metadata, network services, data sharing, and monitoring).

By listing a number of requirements and making the necessary recommendations, the data specifications enable full system interoperability across the Member States, within the scope of the application areas targeted by the Directive. They are published as technical guidelines and provide the basis for the content of the Implementing Rule on Interoperability of Spatial Data Sets and Services for data themes included in Annex I of the Directive. The Implementing Rule will be extracted from the data specifications keeping in mind the technical feasibility as well as cost-benefit considerations. The Implementing Rule will be legally binding for the Member States.

⁷ http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.3_Definition_of_Annex_Themes_and_scope_v3.0.pdf

⁸ http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.5_v3.1.pdf

⁹ http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.6_v3.0.pdf

¹⁰ http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.7_v3.0.pdf

¹¹ UML – Unified Modelling Language

¹² Conceptual models related to specific areas (e.g. INSPIRE themes)

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In addition to providing a basis for the interoperability of spatial data in INSPIRE, the data specification development framework and the thematic data specifications can be reused in other environments at local, regional, national and global level contributing to improvements in the coherence and interoperability of data in spatial data infrastructures.

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***Cadastral parcels* – Executive Summary**

Purpose

Cadastral parcels are included in Annex I, which means that they are considered as reference data, i.e. data that constitute the spatial frame for linking and/or pointing at other information that belong to specific thematic field such as environment, soil, land use, and many others.

Process

INSPIRE data specification on cadastral parcels has been prepared following the participative principle of consensus building process. The stakeholders, based on their registration as a Spatial Data Interest Community (SDIC) or a Legally Mandated Organisation (LMO) had the opportunity to bring forward user requirements and reference materials, propose experts for the specification development, and to participate in the review of the data specifications. The Thematic Working Group responsible for the specification development was composed of experts coming from Denmark, Finland, France, Hungary, Netherlands, Norway, Spain, Switzerland, United Kingdom and the European Commission. The specification process took place according to the methodology elaborated for INSPIRE respecting the requirements and the recommendation of the INSPIRE Generic Conceptual Model, which is one of the elements that ensures coherent approach and cross theme consistency with other themes in the Directive.

The Thematic Working Group has established cooperation with other initiatives within the field, such as the Permanent Committee on Cadastre, EuroGeographics, the Working Group III of FIG (International Federation of Surveyors) and ISO TC 211 responsible for standardisation of geographic information.

Scope and description

The cornerstone of the specification development was the definition of the Directive on the cadastral parcels: “areas defined by cadastral parcels or equivalent”. In accordance with the particular legal system each Member State runs a related register under the responsibility of the government. Such registers are often called cadastre, sometimes land or other type of registry. Regardless of the name of the system the basic unit of area is the parcel. Cadastral parcels usually form a continuous partition of the national territory by the exception where some land owned by the governments¹³ is not subject of registration. The generic definition of cadastral parcels has been complemented by the Thematic Working Group to fit better with user requirements in the following way: the cadastral parcels should be, as much as possible, single areas of Earth surface (land and/or water) under homogenous real property rights and unique ownership, where real property rights and ownership are defined by national laws.

INSPIRE does not aim at harmonising the concepts of ownership and rights related to the parcels, but focuses on the geometrical aspects as presented in the national systems of the Member States.

Cadastral parcels in INSPIRE should serve the purpose of generic information locators. Having included the reference to the national registers as a property (attribute) of the INSPIRE parcels national data sources can be reached. Using this two-step approach other information, like rights and owners can be accessed fully respecting the national legislation on data protection. The data model for INSPIRE cadastral parcels has been prepared in a way that supports compatibility with the upcoming international standard on Land Administration Domain Model¹⁴. The Land Administration Domain Model (LADM) provides a wider context for the INSPIRE cadastral parcels because LADM includes additional information on rights (bound to national legislation) and owners, which are outside the direct scope of INSPIRE.

¹³ In some countries such territories are called public domain

¹⁴ ISO/DS 19152 – Geographical Information, Land Administration Domain Model.

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The wide range of use-cases¹⁵ analysed by the Thematic Working Group allows meeting the expectations of various user communities in fields of agriculture, disaster management, soil protection, environmental public right management, public land management, urban planning, utilities, land use, and many others.

Data specification

The core element of the INSPIRE cadastral parcel model is the cadastral parcel. It is described by some mandatory elements such as geometry, unique identifier¹⁶, cadastral reference¹⁷ and the label of the parcels that supports their identification on printed maps. In case of availability Member States are also requested to supply information on the area of the parcel, when the parcel has been created/changed/retired, and the reference point, which is especially useful for visualisation.

The management of cadastral parcels in some countries reflects historical subdivision, i.e. intermediate units such as municipalities, sections, districts, parishes, urban and rural blocks, etc. Very often these units carry information related to all parcels belonging to the same unit, for example information about accuracy of measurements or the scale of original mapping. In order to refer these units with a common name the Thematic Working Group has introduced the notion of the cadastral zoning. Member States should decide about the usage of zonings in INSPIRE according to their organisational structures. Besides of carrying metadata information zonings also support portrayal and data management, especially data search. When the option of using the cadastral zonings is selected they have to be supplied with the same properties under the same conditions as stated for cadastral parcels. When several levels of zonings exist in a Member State it must be ensured that the higher level units are composed of those of lower level.

Cadastral boundaries as separate spatial objects have to be delivered only in case when information about data accuracy is associated with them.

Member States where national cadastral references are given on basic property units and not on the level of cadastral parcels have to supply them together with their cadastral reference, unique identifier, area, and the related temporal information.

Interoperability is further supported by the requirement that cadastral parcels have to be published in the ETRS89 or (when applicable) the ITRS reference systems, which is commonly used in INSPIRE. When Member States need a common projection system for a cross-border application the selection must be agreed and documented by the interested parties.

Comparable data on top of harmonised specification elements create additional value for achieving interoperability in INSPIRE. For this finality the data specification on cadastral parcels includes recommendations on minimal data quality: on the rate of missing elements, positional accuracy and update frequency. It is highly desirable that Member States consider them when they further develop their cadastral systems. Regardless whether these recommendations are met, the real values of these data quality elements have to be published as metadata usually at dataset level. For delivery of positional accuracy there is a triple choice: statement related to the whole dataset or, as mentioned before, an attribute attached to the cadastral zonings or the cadastral boundaries.

Metadata at dataset level also has to contain information about the lineage, i.e. condition of creation and transformation of data. The Thematic Working Group has provided a template for lineage to help cadastral producers to document the remaining national specificities that are inevitable even when data is published in an interoperable way for INSPIRE.

It is expected that cadastral parcel data fulfilling the related INSPIRE specification allows an easy delivery according to the INSPIRE Implementing Rule on Download services.

¹⁵ The use-cases included EULIS, Land Parcel Identification System, Vineyard registers, Soil protection, Public environmental restrictions, Urban planning, Public land management, Flood risk management, and Infrastructure management.

¹⁶ Identifier required by the INSPIRE Directive; it is defined by the local data provider and completed by a prefix of the country and/or organisation of source.

¹⁷ National cadastral reference which enables to make link with information in the national registers

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For visualisation purposes, simple rules for portrayal are given specifying the layout of the borders of cadastral parcels and the cadastral zonings and the cadastral boundaries together with the related labels. These portrayal rules have been defined for several ranges of scales.

Conclusion

The main value of the INSPIRE *Cadastral parcels* model is its simple, yet flexible structure that allows data providers to publish their existing data in the most convenient way. It is also expected that those INSPIRE themes that are listed in Annex III and are related to cadastral parcels (buildings, soil, land use, utility and governmental services, area management/restriction/regulation zones and reporting units) can re-use and/or further develop the concepts of the current cadastral parcel model.

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1 Scope

This document specifies a harmonised data specification for the spatial data theme *Cadastral parcels* as defined in Annex I of the INSPIRE Directive.

This data specification provides the basis for the drafting of Implementing Rules according to Article 7 (1) of the INSPIRE Directive [Directive 2007/2/EC]. The entire data specification will be published as implementation guidelines accompanying these Implementing Rules.

2 Overview

2.1 Name and acronyms

INSPIRE data specification for the theme *Cadastral Parcels*

2.2 Informal description

Definition:

Areas defined by cadastral registers or equivalent.

[Directive 2007/2/EC]

Description:

The INSPIRE Directive focuses on the geographical part of cadastral data.

In the INSPIRE context, cadastral parcels will be mainly used as locators for geo-information in general, including environmental data.

As much as possible, in the INSPIRE context, cadastral parcels should be forming a partition of national territory. Cadastral parcel should be considered as a single area of Earth surface (land and/or water), national law under homogeneous property rights and unique ownership, property rights and ownership being defined by national law (adapted from UN ECE 2004 and WG-CPI, 2006).

Remark: By unique ownership is meant that the ownership is held by one or several joint owners for the whole parcel.

In the definition given by the INSPIRE directive, "or equivalent" refers to all public agencies and institutions other than the main traditional/nominal cadastre or land registry, that register parts of the Earth's surface such as special domains, urban cadastres, public lands, which spatially complement the registrations by the main cadastre or land registry.

Cadastral parcels are considered in the INSPIRE scope if they are available as vector data.

Rights and owners are out of the INSPIRE scope.

Buildings, land use, addresses are considered in other INSPIRE themes.

The current version of ISO 19152 Land Administration Domain Model (LADM) and of the INSPIRE cadastral parcels model are compatible. The LADM provides a wider context for the INSPIRE cadastral parcels. It includes other spatial object types, such as rights and ownership, which are outside the direct scope of INSPIRE.

2.3 Normative References

[Directive 2007/2/EC] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

[ISO 19107] EN ISO 19107:2005, Geographic Information – Spatial Schema

[ISO 19108] EN ISO 19108:2005, Geographic Information – Temporal Schema

[ISO 19108-c] ISO 19108:2002/Cor 1:2006, Geographic Information – Temporal Schema, Technical Corrigendum 1

[ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

[ISO 19113] EN ISO 19113:2005, Geographic Information – Quality principles

[ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)

[ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)

[ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)

[ISO 19138] ISO/TS 19138:2006, Geographic Information – Data quality measures

[ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation

[OGC 06-103r3] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.0

NOTE This is an updated version of "EN ISO 19125-1:2006, Geographic information – Simple feature access – Part 1: Common architecture". A revision of the EN ISO standard has been proposed.

[Regulation 1205/2008/EC] Regulation 1205/2008/EC implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata

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2.5 Terms and definitions

Terms and definitions necessary for understanding this document are defined in the INSPIRE Glossary¹⁸.

In addition the following terms and definitions are used:

(1) Cadastral gap

Area which is not supposed to be covered by cadastral parcels, due to national regulation.

¹⁸ The INSPIRE Glossary is available from <http://inspire-registry.jrc.ec.europa.eu/registers/GLOSSARY>

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NOTE should not be confused with areas not yet surveyed and registered

EXAMPLE

- in many countries, the sea
- in France, the public domain (roads, rivers)

(2) Cadastral overlap

Area which may be covered by several cadastral parcels, due to national regulation.

EXAMPLE in United Kingdom, overlapping parcels may occur where different rights are registered on the same space e.g. a freehold right and a leasehold one.

(3) Topological gap

Area which is covered by cadastral parcels in the real world but not in the spatial data set.

EXAMPLE topological gaps may occur when assembling cadastral parcels coming from several cadastral sheets or after format conversions.

(4) Topological overlap

Area which is covered by only one cadastral parcel in the real world but by several parcels in the spatial data set.

EXAMPLE topological overlaps may occur when assembling cadastral parcels coming from several cadastral sheets or after format conversions.

2.6 Symbols and abbreviations

FIG	International Federation of Surveyors
GCM	Generic Conceptual Model
LADM	Land Administration Domain Model
MS	Member State
OCL	Object Constraint Language
PCC	Permanent Committee on Cadastre
SDI	Spatial Data Infrastructure
SLD	Style Layer Descriptor
TWG CP	Thematic Working Group Cadastral Parcel
UML	Unified Modelling Language
UN ECE	United Nations – Economic Commission for Europe
UUID	Universal Unique Identifier
WG - CPI	Working Group on Cadastral Parcels in INSPIRE – Group of experts from EuroGeographics and Permanent Committee on Cadastre which conducted a survey about cadastral parcels in INSPIRE in 2005 - 2006

2.7 Notation of requirements and recommendations

To make it easier to identify the mandatory requirements and the recommendations for spatial data sets in the text, they are highlighted and numbered.

Requirement X Requirements are shown using this style.

Recommendation X Recommendations are shown using this style.

2.8 Conformance

Requirement 1 Any dataset claiming conformance with this INSPIRE data specification shall pass the requirements described in the abstract test suite presented in Annex A.

3 Specification scopes

This data specification has only one scope, the general scope.

4 Identification information

Table 1 – Information identifying the INSPIRE data specification *Cadastral Parcels*

Title	INSPIRE data specification <i>Cadastral Parcels</i>
Abstract	Contains mainly the cadastral parcels as closed surfaces with their cadastral reference, which will enable users to use parcels as locators for geographic information and to make links with rights and owners in national cadastral registers or equivalent, when necessary. If appropriate, should also include other spatial objects (auxiliary cadastral zonings, cadastral boundaries and basic property units) and attributes considered as helpful for an easy data management, such as temporal or quality information.
Topic categories	planningCadastre
Geographic description	This INSPIRE data specification covers spatial data sets which relate to an area where a Member State has and/or exercises jurisdictional rights.
Purpose	The purpose of this document is to specify a harmonised data specification for the spatial data theme <i>Cadastral Parcels</i> as defined in Annex I of the INSPIRE Directive. It addresses domains such as agriculture, spatial planning, environment, infrastructure and utilities management, public land management, risk management, socio-economic analysis, cartography. In the INSPIRE context, cadastral parcels will be mainly used as locators for geo-information in general, including environmental data.
Spatial representation type	vector
Spatial resolution	The Local level. Typical scale ranges from 1:500 to 1:10 000.
Supplemental information	none

5 Data content and structure

Requirement 2 Spatial data sets related to the theme *Cadastral Parcels* shall be provided using the spatial object types and data types specified in the application schema in this section.

Requirement 3 Each spatial object shall comply with all constraints specified for its spatial object type or data types used in values of its properties, respectively.

Recommendation 1 The reason for a void value should be provided where possible using a listed value from the VoidValueReason code list to indicate the reason for the missing value.

NOTE The application schema specifies requirements on the properties of each spatial object including its multiplicity, domain of valid values, constraints, etc. All properties have to be reported, if the relevant information is part of the data set. Most properties may be reported as “void”, if the data set does not include relevant information. See the Generic Conceptual Model [INSPIRE DS-D2.5] for more details.

5.1 Basic notions

This section explains some of the basic notions used in the INSPIRE application schemas. These explanations are based on the GCM [DS-D2.5].

5.1.1 Placeholder and candidate types

Placeholder and candidate types are not applicable in *Cadastral parcels* data specification.

5.1.2 Voidable characteristics

If a characteristic of a spatial object is not present in the spatial data set, but may be present or applicable in the real world, the property shall receive this stereotype.

If and only if a property receives this stereotype, the value of *void* may be used as a value of the property. A *void* value shall imply that no corresponding value is contained in the spatial data set maintained by the data provider or no corresponding value can be derived from existing values at reasonable costs, even though the characteristic may be present or applicable in the real world.

It is possible to qualify a value of void in the data with a reason using the VoidValueReason type. The VoidValueReason type is a code list, which includes the following pre-defined values:

- *Unpopulated*: The characteristic is not part of the dataset maintained by the data provider. However, the characteristic may exist in the real world. For example when the “elevation of the water body above the sea level” has not been included in a dataset containing lake spatial objects, then the reason for a void value of this property would be ‘Unpopulated’. The characteristic receives this value for all objects in the spatial data set.
- *Unknown*: The correct value for the specific spatial object is not known to, and not computable by the data provider. However, a correct value may exist. For example when the “elevation of the water body above the sea level” of a *certain lake* has not been measured, then the reason for a void value of this property would be ‘Unknown’. This value is applied on an object-by-object basis in a spatial data set.

NOTE It is expected that additional reasons will be identified in the future, in particular to support reasons / special values in coverage ranges.

The «voidable» stereotype does not give any information on whether or not a characteristic exists in the real world. This is expressed using the multiplicity:

- If a characteristic may or may not exist in the real world, its minimum cardinality shall be defined as 0. For example, an if an Address may or may not have a house number, the multiplicity of the corresponding property shall be 0..1.
- If at least one value for a certain characteristic exists in the real world, the minimum cardinality shall be defined as 1. For example, if an Administrative Unit always has at least one name, the multiplicity of the corresponding property shall be 1..*.

In both cases, the «voidable» stereotype can be applied. A value (the real value or void) only needs to be made available for properties that have a minimum cardinality of 1.

5.1.3 Code lists and Enumerations

5.1.3.1 Style

All code lists and enumerations use the following modelling style:

- No initial value, but only the attribute name part is used.
- The attribute name conforms to the rules for attributes names, i.e. is a lowerCamelCase name. Exceptions are words that consist of all uppercase letters (acronyms).

5.1.3.2 Governance

Two types of code lists can be distinguished:

- code lists that shall be managed centrally in the INSPIRE code list register and only values from that register may be used, and
- code lists that may be extended by data providers.

All code lists that are centrally managed have received the tagged value "codeList" with the preliminary value "urn:x-inspire:def:codeList:INSPIRE:<name of the class>".

5.1.4 Stereotypes

In the application schemas in this sections several stereotypes are used that have been defined as part of a UML profile for use in INSPIRE [INSPIRE DS-D2.5]. These are explained in Table 2 below.

Table 2 – Stereotypes (adapted from [INSPIRE DS-D2.5])

Stereotype	Model element	Description
applicationSchema	Package	An INSPIRE application schema according to ISO 19109 and the Generic Conceptual Model.
featureType	Class	A spatial object type.
Type	Class	A conceptual, abstract type that is not a spatial object type.
dataType	Class	A structured data type without identity.
Union	Class	A structured data type without identity where exactly one of the properties of the type is present in any instance.
Enumeration	Class	A fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.
codeList	Class	A flexible enumeration that uses string values for expressing a list of potential values.
Placeholder	Class	A placeholder class (see definition in section 5.1.1).
Voidable	Attribute, association role	A voidable attribute or association role (see definition in section 5.1.1).
lifeCycleInfo	Attribute, association role	If in an application schema a property is considered to be part of the life-cycle information of a spatial object type, the property shall receive this stereotype.
Version	Association role	If in an application schema an association role ends at a spatial object type, this stereotype denotes that the value of the property is meant to be a specific version of the spatial object, not the spatial object in general.

5.2 Application schema Cadastral Parcels

5.2.1 Description

5.2.1.1 Narrative description

General attributes for all spatial object types:

Each spatial object type has an INSPIRE identifier and a set of temporal attributes:

- beginLifespanVersion and endLifeSpanVersion are related to the life of the spatial object in the spatial data set (geographic/dataset point of view)
- validFrom and validTo are related to the life of the entity in the real world (legal point of view).

Feature type CadastralParcel (core):

Cadastral parcels are defined by the INSPIRE Directive as “areas defined by cadastral registers or equivalent”. As much as possible, in the INSPIRE context, cadastral parcels should be forming a partition of national territory. Cadastral parcel should be considered as a single area of Earth surface (land and/or water), under homogeneous real property rights and unique ownership, real property rights and ownership being defined by national law.

Cadastral parcels have the following additional attributes:

- a geometry
- a national cadastral reference
- an area value
- portrayal attributes: reference point and label

Feature type CadastralZoning (auxiliary):

Cadastral zonings are the intermediary areas (such as municipalities, sections, blocks, ...) used in order to divide national territory into cadastral parcels. In the INSPIRE context, cadastral zonings are to be used to carry metadata information and to facilitate portrayal and search of data.

Cadastral zonings have the following additional attributes:

- a geometry
- a national cadastral zoning reference
- a name, if any
- a level in the national cadastral hierarchy and the name of this level
- portrayal attributes : reference point and label
- metadata attributes : original map scale denominator and estimated accuracy

If cadastral zonings are provided, cadastral parcels shall belong to one cadastral zoning of lowest level. When several levels of zonings exist in a Member State, it must be ensured that the higher level units are composed of that of lower level.

Feature type CadastralBoundary (auxiliary):

In the INSPIRE context, cadastral boundaries are to be made available by Member States where absolute positional accuracy information is recorded for the cadastral boundary (attribute estimated accuracy).

Cadastral boundaries have the following additional attributes:

- a geometry
- metadata attribute: estimated accuracy

Feature type BasicPropertyUnit (auxiliary)

Basic property units are the basic units of ownership that are recorded in the land books, land registers or equivalent. They are defined by unique ownership and homogeneous real property rights, and may consist of one or more adjacent or geographically separate parcels. In the INSPIRE context, basic property units are to be used by countries where unique cadastral references are given only for basic property units and not for parcels. Basic Property units allow these countries to provide information about area or about temporal validity in the cadastral register.

Basic property units have the following additional attributes:

- a national cadastral reference
- an area value

Requirement 4 To be compliant with INSPIRE data specification on theme Cadastral Parcels, a data set shall provide the core feature type CadastralParcel.

The core data aims to fulfil the general use case for the theme Cadastral Parcels which is the use of cadastral parcels as locators for geographic information. It is the cadastral data to be supplied, if available, by all Member States. Core data is represented in figure 2.

Requirement 5 To be compliant with INSPIRE data specification on theme Cadastral Parcels, if one or several of the auxiliary feature types are supplied, each instance of these feature type(s) shall comply with all constraints specified for its spatial object type.

Auxiliary data aims to be helpful for users and to enable some data producers to provide the required information in the most suitable way. Auxiliary feature types do not have to be provided by each Member State but under the conditions and guidelines given in this document. Core and auxiliary data are represented in figure 1.

5.2.1.2 UML Overview

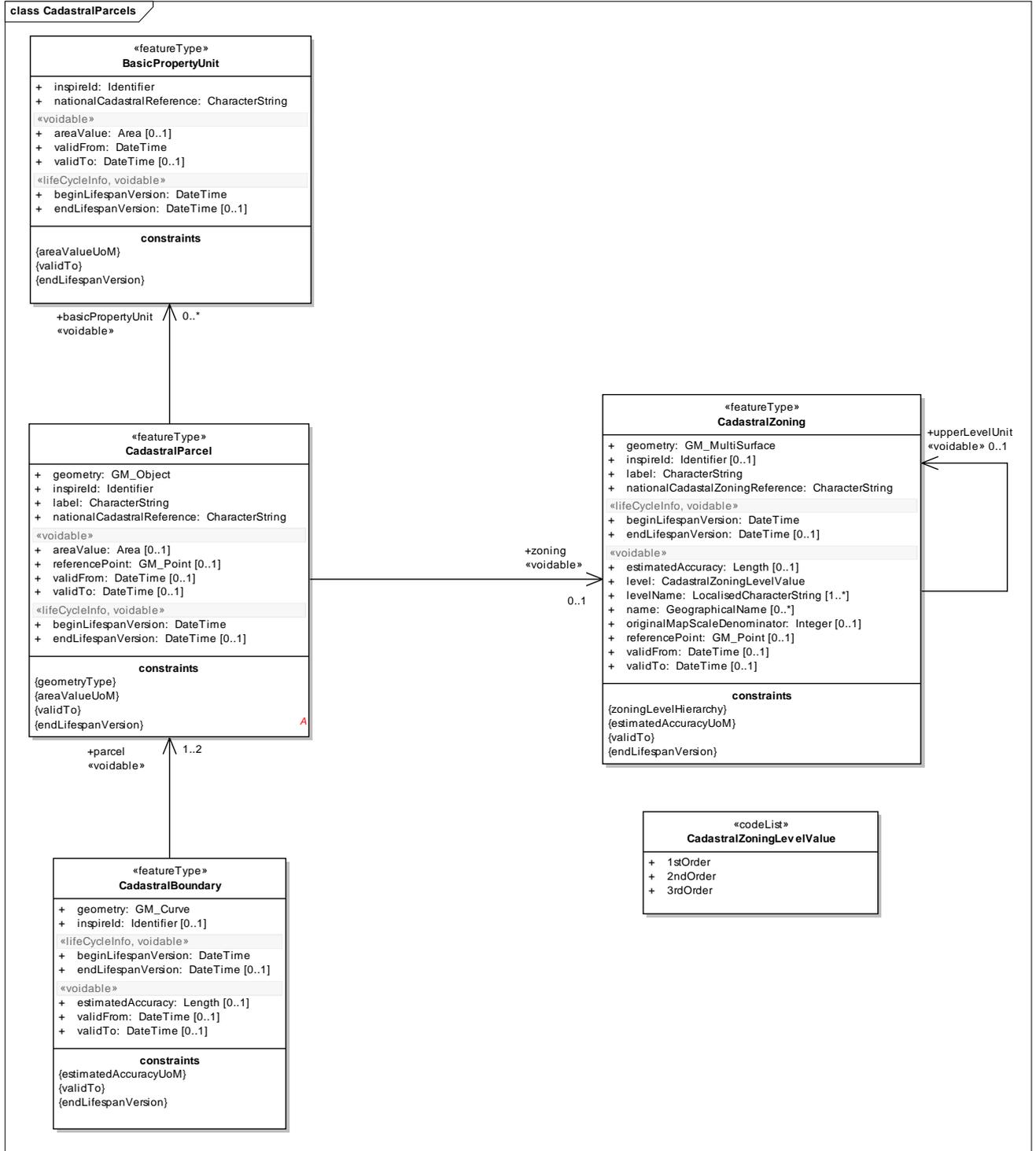


Figure 1 – UML class diagram: Overview of the *Cadastral parcels* application schema

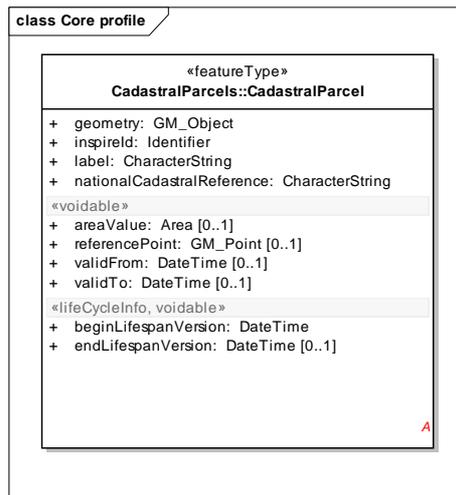


Figure 2 – UML class diagram: Overview of the *Cadastral parcels* application schema with only core data

5.2.1.3 Consistency between spatial data sets

Consistency across borders

Recommendation 2 Edge-matching between cadastral parcels in adjacent data sets should be done. Ideally, there should be no topological gaps or topological overlaps between cadastral parcels in adjacent data sets. Status of edge-matching should be reported as metadata, under lineage element (see annex D).

NOTE This recommendation applies both for borders within a country and for borders between two countries.

Consistency with other themes:

Cadastral parcels will very likely be used in conjunction with data coming from other INSPIRE themes (e.g. transport, buildings, land use, addresses, orthoimage).

Cadastral parcels should be considered as reference data and geometric consistency with other themes may be achieved if these other themes use cadastral parcels as background data during the production or the validation of their own data.

Currently, no consistency rule between cadastral parcels and other spatial datasets has been identified.

5.2.1.4 Identifier management

Requirement 6 All cadastral parcels published for INSPIRE in theme Cadastral Parcels shall carry a unique identifier: the attribute inspireId. This attribute must have the characteristics defined in the Generic Conceptual Model.

The characteristics defined in the Generic Conceptual Model are the following:

- be unique in the INSPIRE context
- be persistent (life-cycle rules being up to each Member State)
- give a way to find the download service where the spatial object is available
- be compliant with the lexical rules:
 - composed of a namespace and a local identifier
 - the namespace must begin by the 2 letter country code
 - the namespace and the local identifier can include only the limited set of characters allowed by the Generic Conceptual Model.

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NOTE 1 More detailed explanations about the characteristics of attribute inspireId may be found in clause 14 of the Generic Conceptual Model (e.g. how to define namespaces).

NOTE 2 More detailed explanations about how to provide this attribute can be found in clause 10.3.2.

5.2.1.5 Modelling of object references

Reference to other information in national registers

Requirement 7 All instances of feature type CadastralParcel shall carry as a thematic identifier the attribute nationalCadastralReference. This attribute must enable users to make the link with rights, owners and other cadastral information in national cadastral registers or equivalent.

NOTE 1 In some countries, there are basic property units including several parcels and the attribute nationalCadastralReference applies in fact to the basic property unit. In this case, the nationalCadastralReference does not need to be unique for cadastral parcels (but for the basic property unit it belongs to).

NOTE 2 For instance, in addition to rights and owners, the information to be found in national cadastral registers or equivalent may be the history or the valuation of the cadastral parcel.

Reference as geography providers

Cadastral parcels are spatial objects that may be commonly used to serve as providers of geography for spatial objects in other INSPIRE data themes.

Recommendation 3 If cadastral parcels are used as providers of geography for spatial objects in other INSPIRE data themes, these reference should be done using the unique external object identifier (the attribute inspireId).

5.2.1.6 Geometry representation

Recommendation 4 The value domain of spatial properties defined in this Regulation should be restricted to the Simple Feature spatial schema as defined by EN ISO 19125-1.

NOTE 1 The specification restricts the spatial schema to 0-, 1-, 2-, and 2.5-dimensional geometries where all curve interpolations are linear.

NOTE 2 The topological relations of two spatial objects based on their specific geometry and topology properties can in principle be investigated by invoking the operations of the types defined in ISO 19107 (or the methods specified in OGC 06-103r3).

NOTE 3 Some countries have cadastral boundaries defined as circular arcs or as circular interpolations. These kinds of curves may also be provided for INSPIRE if their transformation into linear interpolations is not considered as relevant by the Member State.

Recommendation 5 Cadastral parcels should be provided, as much as possible, as GM_Surface.

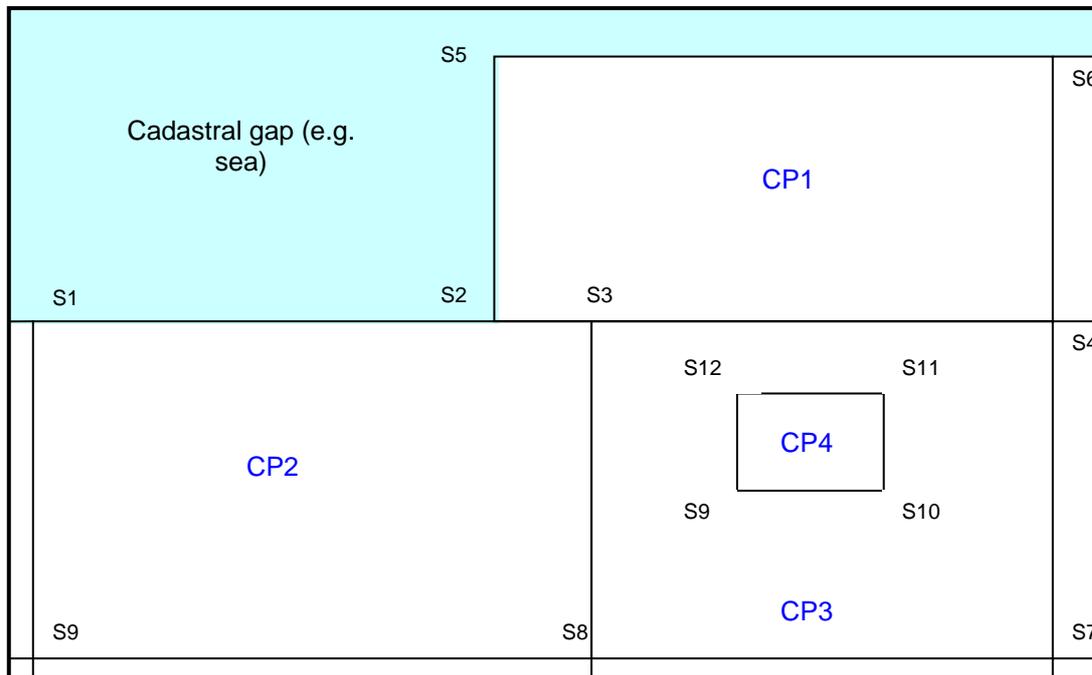
NOTE Some countries (e.g. Germany, Spain, France) have a few percentage of multi-surface parcels. These parcels may be provided as GM_MultiSurface.

Recommendation 6 There should be no topological overlaps between cadastral parcels.

Recommendation 7 There should be no topological gaps between cadastral parcels.

Requirement 8 If cadastral boundaries are provided, the cadastral boundaries corresponding to the outline of a cadastral parcel shall form closed ring(s).

EXAMPLE



Cadastral parcel CP1 has four cadastral boundaries:

- line S2 S5 S6
- line S6 S4
- line S4 S3
- line S3S2

Cadastral parcel CP2 has 5 cadastral boundaries:

- line S1 S2
- line S2 S3
- line S3 S8
- line S8 S9
- line S9 S1

Cadastral parcel CP3 has five cadastral boundaries:

- outer ring composed of:
 - o line S3 S4
 - o line S4 S7
 - o line S7 S8
 - o line S8 S3
- inner ring composed of line S9 S10 S11 S12 S9

Cadastral parcel CP4 has one cadastral boundary: line S9 S10 S11 S12 S9

5.2.1.7 Temporality representation

The application schema uses the derived attributes "beginLifespanObject" and "endLifespanObject" to record the lifespan of a spatial object.

The attributes "beginLifespanVersion" specifies the date and time at which this version of the spatial object was inserted or changed in the spatial data set. The attribute "endLifespanVersion" specifies the date and time at which this version of the spatial object was superseded or retired in the spatial data set.

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NOTE 1 The attributes specify the beginning of the lifespan of the version in the spatial data set itself, which is different from the temporal characteristics of the real-world phenomenon described by the spatial object. This lifespan information, if available, supports mainly two requirements: First, knowledge about the spatial data set content at a specific time; second, knowledge about changes to a data set in a specific time frame. The lifespan information should be as detailed as in the data set (i.e., if the lifespan information in the data set includes seconds, the seconds should be represented in data published in INSPIRE) and include time zone information.

NOTE 2 Changes to the attribute "endLifespanVersion" does not trigger a change in the attribute "beginLifespanVersion".

Recommendation 8 If life-cycle information is not maintained as part of the spatial data set, all spatial objects belonging to this data set should provide a void value with a reason of "Unpopulated".

NOTE 3 A spatial object may change in a way where it is still considered to be the same spatial object; in this case, there will be several versions of the same object.

EXAMPLE On 01/01/2008, there has been new delineation of a cadastral parcel (A) and a new value for attribute *areaValue* has been computed. Two cases may occur, depending on the life-cycle information management at national level:

- It is considered that it is a new cadastral parcel (B) with a new identifier
- It is considered that it is a new version of the same object (A) with unchanged identifier.

(For instance, in France, the first case occurs when there is a new survey of cadastral data on a whole area. The second case occurs when there is a new survey for an individual cadastral parcel).

In first case:

- the spatial object "parcel A" will get for attribute *endLifespanVersion* the value 01/01/2008.
- a new spatial object "parcel B" will be created; it will get a new identifier and this new spatial object "parcel B" will also get for attribute *beginLifespanVersion* the value 01/01/2008.

In second case,

- the spatial object "parcel A" will get for attribute *endLifespanVersion* the value 01/01/2008.
- a new version of the spatial object "parcel A" will be created and will get for attribute *beginLifespanVersion* the value 01/01/2008.

This new version of the spatial object "parcel A" will be identified by a new value for *objectIdentifier.version*.

Recommendation 9 Life-cycle rules are up to each data provider. They should be documented as metadata, under lineage element

The application schema also includes a set of two attributes *validFrom* and *validTo* which are related to the lifespan in the real world.

EXAMPLE 2: In the Netherlands, the change (and update) process starts with the registration of a deed in the public registers. For example describing the transfer of a part of a parcel. From that date, e.g. 25/06/2009 24:00:00 (whole day granularity), the part-of-parcel is legally valid. The next phase is surveying the boundary splitting the old parcel into two or more new parts. This is documented in a field sheet, and from this date, onwards the boundary does exist. The last step of the process is the update of the cadastral map on, e.g. 03/07/2009 13:25:33 (hour:minute:second granularity), from this moment onwards the parcel and the boundary exist in the spatial data sets.

In summary, for splitting a parcel the new parcels will get:

- *validFrom*: 25/06/2009 24:00:00 (legal validity)
- *beginLifespanVersion*: 03/07/2009 13:25:33 (cadastral map)

The old (retired) parcel will get:

- *validTo*: 25/06/2009 24:00:00 (legal validity)
- *endLifespanVersion*: 03/07/2009 13:25:33 (cadastral map)

Recommendation 10 Association roles should be provided only for current versions of spatial objects, but not for superseded or retired versions.

Recommendation 11 From temporal point of view, cadastral parcels should be published for INSPIRE if and only if they are published in national register. Cadastral parcels under internal updating process should not be published for INSPIRE.

EXAMPLE In most countries, there are parcels under dispute for which a provisory solution has been adopted in national register. These parcels should be published for INSPIRE. There are also parcels under splitting process; this splitting process is generally internally managed, new provisory parcels are created but these new parcels are published in national register only once all operations (survey, checking, validation, registration) have been achieved. In this case, the provisory parcels should not be published for INSPIRE but only the new definitive, validated ones.

5.2.2 Feature catalogue

Table 3 – Feature catalogue metadata

Feature catalogue name	INSPIRE feature catalogue CadastralParcels
Scope	CadastralParcels
Version number	3.0.1
Version date	2010-04-26
Definition source	INSPIRE data specification CadastralParcels

Table 4 – Types defined in the feature catalogue

Type	Package	Stereotypes	Section
BasicPropertyUnit	CadastralParcels	«featureType»	5.2.2.1.1
CadastralBoundary	CadastralParcels	«featureType»	5.2.2.1.2
CadastralZoningLevelValue	CadastralParcels	«codeList»	5.2.2.2.1
CadastralParcel	CadastralParcels	«featureType»	0
CadastralZoning	CadastralParcels	«featureType»	5.2.2.1.4

5.2.2.1 Spatial object types

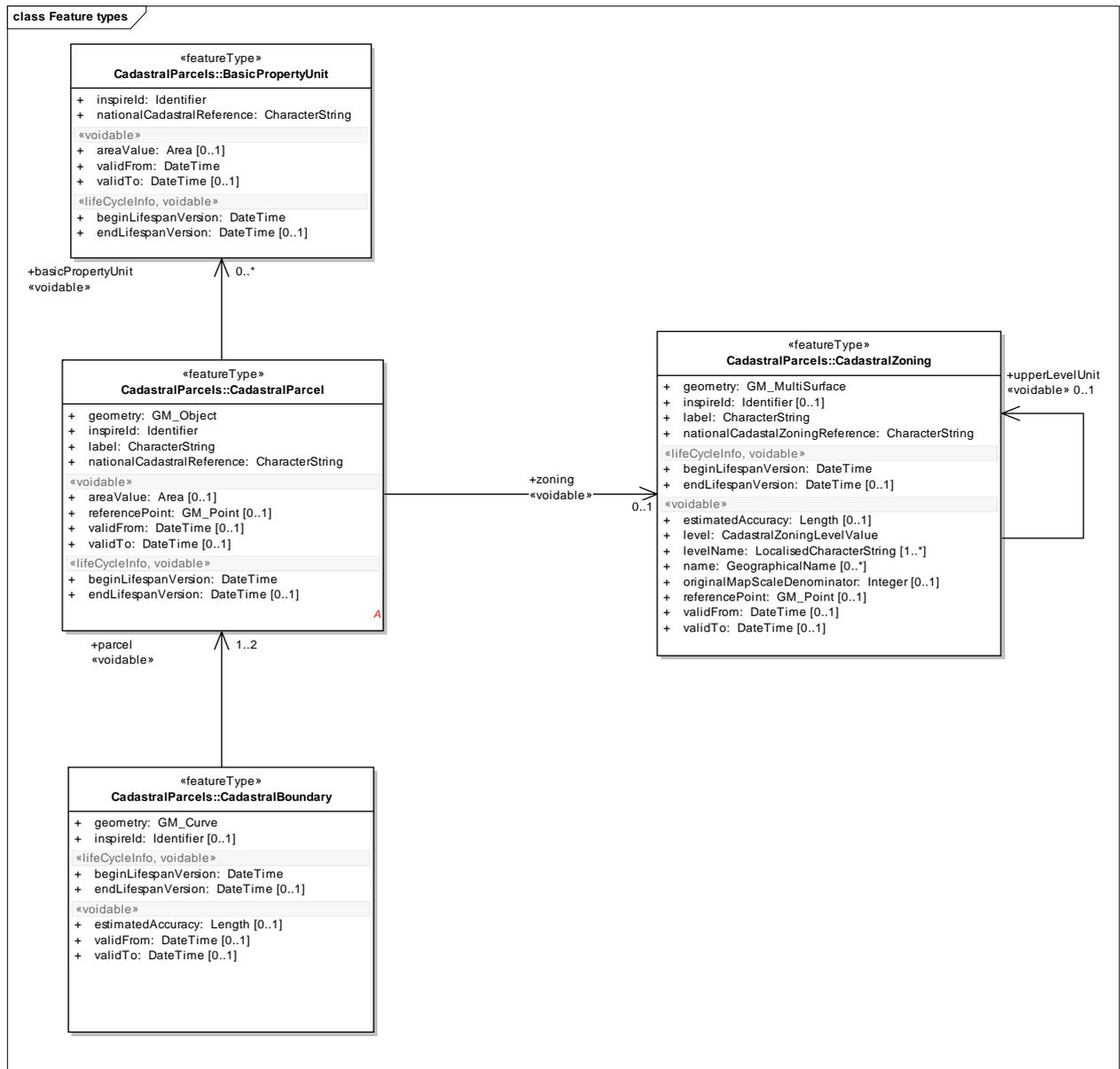


Figure 3– UML class diagram: Spatial object types

5.2.2.1.1 BasicPropertyUnit

BasicPropertyUnit	
Definition:	The basic unit of ownership that is recorded in the land books, land registers or equivalent. It is defined by unique ownership and homogeneous real property rights, and may consist of one or more adjacent or geographically separate parcels.

BasicPropertyUnit

Description: SOURCE Adapted from UN ECE 2004.

NOTE 1 In the INSPIRE context, basic property units are to be made available by Member States where unique cadastral references are given only for basic property units and not for parcels.

NOTE 2 In many (but not all) countries, the area of the basic property unit corresponds to the cadastral parcel itself.

NOTE 3 Some countries, such as Finland, may also register officially basic property units without any area. These basic property units are considered out of the INSPIRE scope.

NOTE 4 Some countries, such as Norway, may have parcels which belong to several basic property units.

Status: Proposed

Stereotypes: «featureType»

Attribute: areaValue

Value type: Area

Definition: Registered area value giving quantification of the area projected on the horizontal plane of the cadastral parcels composing the basic property unit.

Multiplicity: 0..1

Stereotypes: «voidable»

Attribute: beginLifespanVersion

Value type: DateTime

Definition: Date and time at which this version of the spatial object was inserted or changed in the spatial data set.

Multiplicity: 1

Stereotypes: «lifeCycleInfo,voidable»

Attribute: endLifespanVersion

Value type: DateTime

Definition: Date and time at which this version of the spatial object was superseded or retired in the spatial data set.

Multiplicity: 0..1

Stereotypes: «lifeCycleInfo,voidable»

Attribute: inspireId

Value type: Identifier

Definition: External object identifier of the spatial object.

Description: NOTE An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.

Multiplicity: 1

Attribute: nationalCadastralReference

Value type: CharacterString

Definition: Thematic identifier at national level, generally the full national code of the basic property unit. Must ensure the link to the national cadastral register or equivalent.

Description: The national cadastral reference can be used also in further queries in national services.

Multiplicity: 1

Attribute: validFrom

Value type: DateTime

Definition: Official date and time the basic property unit was/will be legally established.

Description: NOTE This is the date and time the national cadastral reference can be used in legal acts.

Multiplicity: 1

BasicPropertyUnit

Stereotypes: «voidable»

Attribute: validTo

Value type: DateTime

Definition: Date and time at which the basic property unit legally ceased/will cease to be used.

Description: NOTE This is the date and time the national cadastral reference can no longer be used in legal acts.

Multiplicity: 0..1

Stereotypes: «voidable»

Association role: administrativeUnit

Value type: AdministrativeUnit

Definition: The administrative unit of lowest administrative level containing this basic property unit.

Multiplicity: 0..1

Stereotypes: «voidable»

Constraint: areaValueUoM

Natural language: Value of areaValue has to be given in square meters

OCL: inv: self.areaValue.uom.uomSymbol='m2'

Constraint: endLifespanVersion

Natural language: If set, the date endLifespanVersion must be later than beginLifespanVersion.

language:

OCL: inv: self.endLifespanVersion .isAfter(self.beginLifespanVersion)

Constraint: validTo

Natural language: If set, the date validTo shall be equal or later than validFrom.

language:

OCL: inv: self.validTo .isEqual(self.validFrom) or self.validTo .isAfter(self.validFrom)

5.2.2.1.2 CadastralBoundary

CadastralBoundary

Definition: Part of the outline of a cadastral parcel. One cadastral boundary may be shared by two neighbouring cadastral parcels.

Description: NOTE In the INSPIRE context, cadastral boundaries are to be made available by Member States where absolute positional accuracy information is recorded for the cadastral boundary (attribute estimated accuracy).

Status: Proposed

Stereotypes: «featureType»

Attribute: beginLifespanVersion

Value type: DateTime

Definition: Date and time at which this version of the spatial object was inserted or changed in the spatial data set.

Multiplicity: 1

Stereotypes: «lifeCycleInfo,voidable»

Attribute: endLifespanVersion

Value type: DateTime

Definition: Date and time at which this version of the spatial object was superseded or retired in the spatial data set.

Multiplicity: 0..1

Stereotypes: «lifeCycleInfo,voidable»

Attribute: estimatedAccuracy

Value type: Length

CadastralBoundary

Definition: Estimated absolute positional accuracy of the cadastral boundary in the used INSPIRE coordinate reference system. Absolute positional accuracy is the mean value of the positional uncertainties for a set of positions, where the positional uncertainties are the distance between a measured position and what is considered as the corresponding true position.

Description: NOTE This mean value may come from quality measures on a homogeneous population of cadastral boundaries or from an estimation based on the knowledge of the production processes and of their accuracy.

Multiplicity: 0..1

Stereotypes: «voidable»

Attribute: geometry

Value type: GM_Curve

Definition: Geometry of the cadastral boundary.

Multiplicity: 1

Attribute: inspireId

Value type: Identifier

Definition: External object identifier of the spatial object

Description: NOTE An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.

Multiplicity: 0..1

Attribute: validFrom

Value type: DateTime

Definition: Official date and time the cadastral boundary was/will be legally established.

Multiplicity: 0..1

Stereotypes: «voidable»

Attribute: validTo

Value type: DateTime

Definition: Date and time at which the cadastral boundary legally ceased/will cease to be used.

Multiplicity: 0..1

Stereotypes: «voidable»

Association role: parcel

Value type: CadastralParcel

Definition: The cadastral parcel(s) outlined by this cadastral boundary. A cadastral boundary may outline one or two cadastral parcels.

Multiplicity: 1..2

Stereotypes: «voidable»

Constraint: endLifespanVersion

Natural language: If set, the date endLifespanVersion must be later than beginLifespanVersion.

OCL: inv: self.endLifespanVersion .isAfter(self.beginLifespanVersion)

Constraint: estimatedAccuracyUoM

Natural language: Value of estimatedAccuracy has to be given in meters.

OCL: inv: self.estimatedAccuracy.uom.uomSymbol='m'

Constraint: validTo

Natural language: If set, the date validTo shall be equal or later than validFrom.

OCL: inv: self.validTo .isEqual(self.validFrom) or self.validTo .isAfter(self.validFrom)

5.2.2.1.3 CadastralParcel

CadastralParcel	
Definition:	Areas defined by cadastral registers or equivalent.
Description:	SOURCE [INSPIRE Directive:2007]. NOTE As much as possible, in the INSPIRE context, cadastral parcels should be forming a partition of national territory. Cadastral parcel should be considered as a single area of Earth surface (land and/or water), under homogeneous real property rights and unique ownership, real property rights and ownership being defined by national law (adapted from UN ECE 2004 and WG-CPI, 2006). By unique ownership is meant that the ownership is held by one or several joint owners for the whole parcel.
Status:	Proposed
Stereotypes:	«featureType»
Attribute: areaValue	
Value type:	Area
Definition:	Registered area value giving quantification of the area projected on the horizontal plane of the cadastral parcel.
Multiplicity:	0..1
Stereotypes:	«voidable»
Attribute: beginLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
Multiplicity:	1
Stereotypes:	«lifeCycleInfo,voidable»
Attribute: endLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
Multiplicity:	0..1
Stereotypes:	«lifeCycleInfo,voidable»
Attribute: geometry	
Value type:	GM_Object
Definition:	Geometry of the cadastral parcel.
Description:	As much as possible, the geometry should be a single area.
Multiplicity:	1
Attribute: inspireId	
Value type:	Identifier
Definition:	External object identifier of the spatial object.
Description:	NOTE An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.
Multiplicity:	1
Attribute: label	
Value type:	CharacterString
Definition:	Text commonly used to display the cadastral parcel identification.
Description:	NOTE 1 The label is usually the last part of the national cadastral reference. NOTE 2 The label can be used for label in portrayal.
Multiplicity:	1

CadastralParcel

Attribute: nationalCadastralReference

Value type: CharacterString
Definition: Thematic identifier at national level, generally the full national code of the cadastral parcel. Must ensure the link to the national cadastral register or equivalent.
Description: The national cadastral reference can be used also in further queries in national services.
Multiplicity: 1

Attribute: referencePoint

Value type: GM_Point
Definition: A point within the cadastral parcel.
Description: EXAMPLE The centroid of the cadastral parcel geometry.
Multiplicity: 0..1
Stereotypes: «voidable»

Attribute: validFrom

Value type: DateTime
Definition: Official date and time the cadastral parcel was/will be legally established.
Description: NOTE This is the date and time the national cadastral reference can be used in legal acts.
Multiplicity: 0..1
Stereotypes: «voidable»

Attribute: validTo

Value type: DateTime
Definition: Date and time at which the cadastral parcel legally ceased/will cease to be used.
Description: NOTE This is the date and time the national cadastral reference can no longer be used in legal acts.
Multiplicity: 0..1
Stereotypes: «voidable»

Association role: administrativeUnit

Value type: AdministrativeUnit
Definition: The administrative unit of lowest administrative level containing this cadastral parcel.
Multiplicity: 0..1
Stereotypes: «voidable»

Association role: basicPropertyUnit

Value type: BasicPropertyUnit
Definition: The basic property unit(s) containing this cadastral parcel.
Multiplicity: 0..*
Stereotypes: «voidable»

Association role: zoning

Value type: CadastralZoning
Definition: The cadastral zoning of lowest level containing this cadastral parcel.
Multiplicity: 0..1
Stereotypes: «voidable»

Constraint: areaValueUoM

Natural language: Value of areaValue has to be given in square meters.
OCL: inv: self.areaValue.uom.uomSymbol='m2'

Constraint: endLifespanVersion

Natural language: If set, the date endLifespanVersion must be later than beginLifespanVersion.
OCL: inv: self.endLifespanVersion .isAfter(self.beginLifespanVersion)

CadastralParcel

Constraint: geometryType

Natural language: Type of geometry has to be GM_Surface or GM_MultiSurface

OCL: inv: geometry.ocllsKindOf(GM_Surface) or geometry.ocllsKindOf(GM_MultiSurface)

Constraint: validTo

Natural language: If set, the date validTo shall be equal or later than validFrom.

OCL: inv: self.validTo .isEqual(self.validFrom) or self.validTo .isAfter(self.validFrom)

5.2.2.1.4 CadastralZoning

CadastralZoning

Definition: Intermediary areas used in order to divide national territory into cadastral parcels.

Description: NOTE 1 In the INSPIRE context, cadastral zonings are to be used to carry metadata information and to facilitate portrayal and search of data.

NOTE 2 Cadastral zonings have generally been defined when cadastral maps were created for the first time.

EXAMPLE Municipality, section, parish, district, block.

Status: Proposed

Stereotypes: «featureType»

Attribute: beginLifespanVersion

Value type: DateTime

Definition: Date and time at which this version of the spatial object was inserted or changed in the spatial data set.

Multiplicity: 1

Stereotypes: «lifeCycleInfo,voidable»

Attribute: endLifespanVersion

Value type: DateTime

Definition: Date and time at which this version of the spatial object was superseded or retired in the spatial data set.

Multiplicity: 0..1

Stereotypes: «lifeCycleInfo,voidable»

Attribute: estimatedAccuracy

Value type: Length

Definition: The estimated absolute positional accuracy of cadastral parcels within the cadastral zoning in the used INSPIRE coordinate reference system. Absolute positional accuracy is the mean value of the positional uncertainties for a set of positions, where the positional uncertainties are the distance between a measured position and what is considered as the corresponding true position.

Description: NOTE This mean value may come from quality measures on a homogeneous population of cadastral parcels or from an estimation based on the knowledge of the production processes and of their accuracy.

Multiplicity: 0..1

Stereotypes: «voidable»

Attribute: geometry

Value type: GM_MultiSurface

Definition: Geometry of the cadastral zoning.

Multiplicity: 1

CadastralZoning

Attribute: inspireId

Value type: Identifier
Definition: External object identifier of spatial object.
Description: NOTE
An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.
Multiplicity: 0..1

Attribute: label

Value type: CharacterString
Definition: Text commonly used to display the cadastral zoning identification.
Description: NOTE 1 The label is usually the last part of the national cadastral zoning reference or that reference itself or the name.
NOTE 2 The label can be used for label in portrayal.
Multiplicity: 1

Attribute: level

Value type: CadastralZoningLevelValue
Definition: Level of the cadastral zoning in the national cadastral hierarchy.
Multiplicity: 1
Stereotypes: «voidable»

Attribute: levelName

Value type: LocalisedCharacterString
Definition: Name of the level of the cadastral zoning in the national cadastral hierarchy, at least in one official language of the European Union.
Description: EXAMPLE For Spain, level name might be supplied as "municipio" (in Spanish) and as "municipality" (in English).
Multiplicity: 1..*
Stereotypes: «voidable»

Attribute: name

Value type: GeographicalName
Definition: Name of the cadastral zoning.
Description: NOTE 1 Cadastral zonings which are also administrative units have generally a name.
EXAMPLE Bordeaux, Copenhagen.
NOTE 2 The language of the name should be filled in most cases, except if the data producer does not know in which language the names are.
Multiplicity: 0..*
Stereotypes: «voidable»

Attribute: nationalCadastralZoningReference

Value type: CharacterString
Definition: Thematic identifier at national level, generally the full national code of the cadastral zoning.
Description: EXAMPLE 03260000AB (France), 30133 (Austria), APD00F (Netherlands).
Multiplicity: 1

Attribute: originalMapScaleDenominator

Value type: Integer
Definition: The denominator in the scale of the original paper map (if applicable) to whose extent the cadastral zoning corresponds.
Description: EXAMPLE 2000 means that original cadastral map was designed at scale 1:2000.
Multiplicity: 0..1
Stereotypes: «voidable»

CadastralZoning	
Attribute: referencePoint	Value type: GM_Point Definition: A point within the cadastral zoning. Description: EXAMPLE The centroid of the cadastral parcel geometry. Multiplicity: 0..1 Stereotypes: «voidable»
Attribute: validFrom	Value type: DateTime Definition: Official date and time the cadastral zoning was/will be legally established. Multiplicity: 0..1 Stereotypes: «voidable»
Attribute: validTo	Value type: DateTime Definition: Date and time at which the cadastral zoning legally ceased/will cease to be used. Multiplicity: 0..1 Stereotypes: «voidable»
Association role: upperLevelUnit	Value type: CadastralZoning Definition: The next upper level cadastral zoning containing this cadastral zoning. Multiplicity: 0..1 Stereotypes: «voidable»
Constraint: endLifespanVersion	Natural language: If set, the date endLifespanVersion must be later than beginLifespanVersion. OCL: inv: self.endLifespanVersion .isAfter(self.beginLifespanVersion)
Constraint: estimatedAccuracyUoM	Natural language: Value of estimatedAccuracy has to be given in meters. OCL: inv: self.estimatedAccuracy.uom.uomSymbol='m'
Constraint: validTo	Natural language: If set, the date validTo shall be equal or later than validFrom. OCL: inv: self.validTo .isEqual(self.validFrom) or self.validTo .isAfter(self.validFrom)
Constraint: zoningLevelHierarchy	Natural language: Defines the hierarchy of cadastral zonings - a lower level cadastral zoning is part of an upper level zoning. OCL: inv: self.nationalLevel <> '1stOrder' implies self.level < self.upperLevelUnit.level

5.2.2.2 Enumerations and code lists

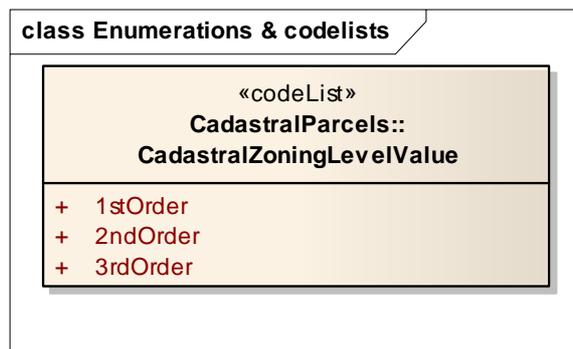


Figure 4 – UML class diagram: Enumerations and code lists

5.2.2.2.1 CadastralZoningLevelValue

CadastralZoningLevelValue	
Definition:	Levels of hierarchy of the cadastral zonings.
Description:	NOTE The higher levels in the administrative units theme (province, state) are not repeated in this code list.
Status:	Proposed
Stereotypes:	«codeList»
Governance:	Centrally managed in INSPIRE code list register. URN: urn:x-inspire:def:codeList:INSPIRE:CadastralZoningLevelValue
Value: 1stOrder	
Definition:	Uppermost level (largest areas) in the hierarchy of cadastral zonings, equal or equivalent to municipalities.
Value: 2ndOrder	
Definition:	Second level in the hierarchy of cadastral zonings.
Value: 3rdOrder	
Definition:	Third level in the hierarchy of cadastral zonings.

5.2.2.3 Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

5.2.2.3.1 AdministrativeUnit

AdministrativeUnit	
Package:	AdministrativeUnits [see DS-D.2.8.1.4]
Definition:	Unit of administration where a Member State has and/or exercises jurisdictional rights, for local, regional and national governance.

5.2.2.3.2 GeographicalName

GeographicalName	
Package:	Geographical Names [see DS-D.2.8.1.3]
Definition:	Proper noun applied to a real world entity.

5.2.2.3.3 Identifier

Identifier	
Package:	Base Types [see DS-D2.5]
Definition:	Unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object.
Description:	NOTE1 External object identifiers are distinct from thematic object identifiers.
	NOTE 2 The voidable version identifier attribute is not part of the unique identifier of a spatial object and may be used to distinguish two versions of the same spatial object.
	NOTE 3 The unique identifier will not change during the life-time of a spatial object.

6 Reference systems

6.1 Coordinate reference systems

6.1.1 Datum

Requirement 9 For the coordinate reference systems used for making available the INSPIRE spatial data sets, the datum shall be the datum of the European Terrestrial Reference System 1989 (ETRS89) in areas within its geographical scope, and the datum of the International Terrestrial Reference System (ITRS) or other geodetic coordinate reference systems compliant with ITRS in areas that are outside the geographical scope of ETRS89. Compliant with the ITRS means that the system definition is based on the definition of the ITRS and there is a well established and described relationship between both systems, according to EN ISO 19111.

6.1.2 Coordinate reference systems

Requirement 10 INSPIRE spatial data sets shall be made available using one of the three-dimensional, two-dimensional or compound coordinate reference systems specified in the list below.

Other coordinate reference systems than those listed below may only be used for regions outside of continental Europe. The geodetic codes and parameters for these coordinate reference systems shall be documented, and an identifier shall be created, according to EN ISO 19111 and ISO 19127.

1. Three-dimensional Coordinate Reference Systems
 - Three-dimensional Cartesian coordinates
 - Three-dimensional geodetic coordinates (latitude, longitude and ellipsoidal height), using the parameters of the GRS80 ellipsoid
2. Two-dimensional Coordinate Reference Systems
 - Two-dimensional geodetic coordinates, using the parameters of the GRS80 ellipsoid
 - Plane coordinates using the Lambert Azimuthal Equal Area projection and the parameters of the GRS80 ellipsoid
 - Plane coordinates using the Transverse Mercator projection and the parameters of the GRS80 ellipsoid
3. Compound Coordinate Reference Systems
 - For the horizontal component of the compound coordinate reference system, one of the two-dimensional coordinate reference systems specified above shall be used
 - For the vertical component on land, the European Vertical Reference System (EVRS) shall be used to express gravity-related heights within its geographical scope
 - Other vertical reference systems related to the Earth gravity field shall be used to express gravity-related heights in areas that are outside the geographical scope of EVRS. The geodetic codes and parameters for these vertical reference systems shall be documented and an identifier shall be created, according to EN ISO 19111 and ISO 19127

Recommendation 12 Based on the INSPIRE horizontal coordinate reference system, each Member State should define a projection or a set of projections suitable for working with cadastral parcels on national territory and on cross-border areas. A projection is suitable if it offers small scale deviation and so enable users to measure distances and surfaces in meaningful way. This projection or set of projections has to be defined in agreement with neighbour countries. This projection or set of projections should be offered to users through the Coordinate Transformation services. This projection or set of projections must be well documented to allow the conversion from and to the common Coordinate Reference System. The documentation shall be provided according to ISO 19111, which states how a projected coordinate reference system must be described.

6.1.3 Display

Requirement 11 For the display of the INSPIRE spatial data sets with the View Service specified in D003152/02 Draft Commission Regulation implementing Directive 2007/2/EC of the European Parliament and of the Council as regards Network Services, at least the two dimensional geodetic coordinate system shall be made available.

6.1.4 Identifiers for coordinate reference systems

Requirement 12 For referring to the non-compound coordinate reference systems listed in this Section, the identifiers listed below shall be used.

For referring to a compound coordinate reference system, an identifier composed of the identifier of the horizontal component, followed by a slash (/), followed by the identifier of the vertical component, shall be used.

- ETRS89-XYZ for Cartesian coordinates in ETRS89
- ETRS89-GRS80h for three-dimensional geodetic coordinates in ETRS89 on the GRS80 ellipsoid
- ETRS89-GRS80 for two-dimensional geodetic coordinates in ETRS89 on the GRS80
- EVRS for height in EVRS
- ETRS89-LAEA for ETRS89 coordinates projected into plane coordinates by the Lambert Azimuthal Equal Area projection
- ETRS89-TMzn for ETRS89 coordinates projected into plane coordinates by the Transverse Mercator projection

6.2 Temporal reference system

Requirement 13 The Gregorian Calendar shall be used for as a reference system for date values, and the Universal Time Coordinated (UTC) or the local time including the time zone as an offset from UTC shall be used as a reference system for time values.

7 Data quality

This section includes a description of data quality elements and sub-elements as well as the associated basic data quality measures to be used to describe data related to the spatial data theme *Cadastral Parcels* (see Table 5).

NOTE Additional guidance documents on procedures and methods that can be used to implement the basic data quality measures introduced in this section will be provided at a later stage.

In addition, recommendations on minimum data quality are included for specific elements.

Data quality information can be described at level of spatial object (feature), spatial object type (feature type), dataset or dataset series. Data quality information at spatial object level is modelled directly in the application schema (Chapter 5).

Recommendation 13 Aggregated data quality information should ideally be collected at the level of spatial object types and included in the dataset (series) metadata.

Chapter 8 describes the corresponding metadata elements to report about this data quality information.

Table 5 – List of all data quality elements used in the spatial data theme *Cadastral Parcels*

Section	Data quality element	Data quality sub-element	Scope(s)
7.1.1	Completeness	Omission	spatial object type
7.2.1	Positional accuracy	Absolute or external accuracy	spatial object type

7.1 Completeness

7.1.1 Omission

Omission should be documented using the rate of missing items.

Name	Rate of missing items
Alternative name	–
Data quality element	Completeness
Data quality sub-element	Omission
Data quality basic measure	Error rate
Definition	Number of missing items in the dataset in relation to the number of items that should have been present.
Description	–
Parameter	–
Data quality value type	Real, percentage, ratio (example: 0,0189 ; 98,11% ; 11:582)
Data quality value structure	–
Source reference	–
Example	–
Measure identifier	7 (ISO 19138)

NOTE: Clause 10.1 of this document gives guidelines about which items should be present in an INSPIRE data set on theme cadastral parcels. However, it is to each data producer to define more in detail its capture rules for the INSPIRE theme cadastral parcels. These capture rules should be documented in the template for lineage (see 8.2.3 and annex D). Then, completeness shall be provided against these capture rules.

Recommendation 14 Rate of missing items should be 0% for cadastral parcels and cadastral zonings (if any).

7.2 Positional accuracy

7.2.1 Absolute or external accuracy

Absolute or external accuracy should be documented using Mean value of positional uncertainties (1D, 2D)

Name	Mean value of positional uncertainties (1D, 2D)
Alternative name	
Data quality element	Positional accuracy
Data quality sub-element	Absolute external accuracy
Data quality basic measure	Not applicable
Definition	
Description	
Parameter	
Data quality value type	
Data quality value structure	
Source reference	
Example	
Measure identifier	28

NOTE A cadastral data provider may give information about absolute accuracy:

- at spatial object level, as attribute "estimatedAccuracy" on CadastralZoning or on CadastralBoundary
- at spatial object type, as metadata element "positional accuracy".

In case none of these solutions are feasible, the cadastral data provider should give information about positional accuracy under the "lineage" metadata element (see clause 8.3 and annex D).

This may occur, for instance, if the information about positional accuracy does not provide from quality measures but is just estimated from the knowledge of source data and of production processes.

Recommendation 15 Mean value of positional uncertainties should be 1 metre or better in urban areas and 2,5 metres or better in rural/agricultural areas. Cadastral data may be less accurate in unexploited areas.

NOTE 1 More generally, absolute positional accuracy should be function of the density of human activities. This recommendation may be adapted to the specific context of each Member State.

NOTE 2 Absolute positional accuracy shall be given for cadastral data as they are published in INSPIRE and, so, in the Coordinate Reference System mandated by INSPIRE (ETRS89 or ITRS). For more detail, see clause 10.4.

8 Dataset-level metadata

Metadata can be reported for each individual spatial object (spatial object-level metadata) or once for a complete dataset or dataset series (dataset-level metadata). Spatial object-level metadata is fully described in the application schema (section 5). If data quality elements are used at spatial object level, the documentation shall refer to the appropriate definition in section 7. This section only specifies dataset-level metadata elements.

For some dataset-level metadata elements, in particular on data quality and maintenance, a more specific scope can be specified. This allows the definition of metadata at sub-dataset level, e.g. separately for each spatial object type. When using ISO 19115/19139 to encode the metadata, the following rules should be followed:

- The scope element (of type DQ_Scope) of the DQ_DataQuality subtype should be used to encode the scope.
- Only the following values should be used for the level element of DQ_Scope: Series, Dataset, featureType.
- If the level is featureType the levelDescription/MDScopeDescription/features element (of type Set< GF_FeatureType>) shall be used to list the feature type names.

NOTE The value featureType is used to denote spatial object type.

Mandatory or conditional metadata elements are specified in Section **Error! Reference source not found.** Optional metadata elements are specified in Section 8.2. The tables describing the metadata elements contain the following information:

- The first column provides a reference to a more detailed description.
- The second column specifies the name of the metadata element.
- The third column specifies the multiplicity.
- The fourth column specifies the condition, under which the given element becomes mandatory (only for Table 6 and Table 7).

8.1 Mandatory and conditional metadata elements

Requirement 14 The metadata describing a spatial data set or a spatial data set series related to the theme *Cadastral Parcels* shall comprise the metadata elements required by Regulation 1205/2008/EC (implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata) for spatial datasets and spatial dataset series (Table 6) as well as the metadata elements specified in Table 7.

Table 6 – Metadata for spatial datasets and spatial dataset series specified in Regulation 1205/2008/EC (implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata)

Metadata Regulation Section	Metadata element	Multiplicity	Condition
1.1	Resource title	1	
1.2	Resource abstract	1	
1.3	Resource type	1	
1.4	Resource locator	0..*	Mandatory if a URL is available to obtain more information on the resource, and/or access related services.
1.5	Unique resource identifier	1..*	
1.7	Resource language	0..*	Mandatory if the resource includes textual information.
2.1	Topic category	1..*	
3	Keyword	1..*	
4.1	Geographic bounding box	1..*	
5	Temporal reference	1..*	
6.1	Lineage	1	

6.2	Spatial resolution	0..*	Mandatory for data sets and data set series if an equivalent scale or a resolution distance can be specified.
7	Conformity	1..*	
8.1	Conditions for access and use	1..*	
8.2	Limitations on public access	1..*	
9	Responsible organisation	1..*	
10.1	Metadata point of contact	1..*	
10.2	Metadata date	1	
10.3	Metadata language	1	

Table 7 – Mandatory and conditional theme-specific metadata for the theme *Cadastral parcels*

INSPIRE Data Specification <i>Cadastral Parcels</i> Section	Metadata element	Multiplicity	Condition
8.1.1	Coordinate Reference System	1	
8.1.2	Temporal Reference System	0..*	Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time.
8.1.3	Encoding	1	

8.1.1 Coordinate Reference System

Metadata element name	Coordinate Reference System
Definition	Description of the coordinate reference system used in the dataset.
ISO 19115 number and name	13. referenceSystemInfo
ISO/TS 19139 path	referenceSystemInfo
INSPIRE obligation / condition	mandatory
INSPIRE multiplicity	1
Data type(and ISO 19115 no.)	189. MD_CRS
Domain	Either the referenceSystemIdentifier (RS_Identifier) or the projection (RS_Identifier), ellipsoid (RS_Identifier) and datum (RS_Identifier) properties shall be provided.
Implementing instructions	
Example	referenceSystemIdentifier: code: ETRS_89 codeSpace: INSPIRE RS registry
Example XML encoding	
Comments	

8.1.2 Temporal Reference System

Metadata element name	Temporal Reference System
Definition	Description of the temporal reference systems used in the dataset.
ISO 19115 number and name	13. referenceSystemInfo
ISO/TS 19139 path	referenceSystemInfo
INSPIRE obligation / condition	Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time.
INSPIRE multiplicity	0..*
Data type (and ISO 19115 no.)	186. MD_ReferenceSystem
Domain	No specific type is defined in ISO 19115 for temporal reference systems. Thus, the generic MD_ReferenceSystem element and its reference SystemIdentifier (RS_Identifier) property shall be provided.
Implementing instructions	
Example	referenceSystemIdentifier: code: GregorianCalendar codeSpace: INSPIRE RS registry
Example XML encoding	
Comments	

8.1.3 Encoding

Metadata element name	Encoding
Definition	Description of the computer language construct that specifies the representation of data objects in a record, file, message, storage device or transmission channel
ISO 19115 number and name	271. distributionFormat
ISO/TS 19139 path	distributionInfo/MD_Distribution/distributionFormat
INSPIRE obligation / condition	mandatory
INSPIRE multiplicity	1
Data type (and ISO 19115 no.)	284. MD_Format
Domain	See B.2.10.4. The following property values shall be used for default and alternative encodings specified in section 9.2: <u>Default Encoding</u> <ul style="list-style-type: none"> - name: Cadastral Parcels GML application schema - version: Version 3.0, GML version 3.2.1 - specification: D2.8.1.6 Data Specification on Cadastral Parcels – Draft Guidelines <u>Alternative Encoding</u> <ul style="list-style-type: none"> - -
Implementing instructions	
Example	name: Cadastral Parcels GML application schema version: version 3.0, GML, version 3.2.1 specification: D2.8.1.6 Data Specification on Cadastral Parcels - Draft Guidelines
Example XML encoding	
Comments	

8.2 Optional metadata elements

Recommendation 16 The metadata describing a spatial data set or a spatial data set series related to the theme *Cadastral Parcels* should comprise the theme-specific metadata elements specified in Table 8.

Table 8 – Optional theme-specific metadata for the theme *Cadastral Parcels*

INSPIRE Data Specification <i>Cadastral Parcels</i> Section	Metadata element	Multiplicity
8.2.1	Maintenance Information	0..1
8.2.2	Data Quality – Completeness – Omission	0..*
8.2.3	Data Quality - Positional accuracy – Absolute or external accuracy	0..*

8.2.1 Maintenance Information

Metadata element name	Maintenance information
Definition	information about the scope and frequency of updating
ISO 19115 number and name	30. resourceMaintenance
ISO/TS 19139 path	identificationInfo/MD_Identification/resourceMaintenance
INSPIRE obligation / condition	optional
INSPIRE multiplicity	0..1
Data type(and ISO 19115 no.)	142. MD_MaintenanceInformation
Domain	<p>This is a complex type (lines 143-148 from ISO 19115). At least the following elements should be used (the multiplicity according to ISO 19115 is shown in parentheses):</p> <ul style="list-style-type: none"> – maintenanceAndUpdateFrequency [1]: frequency with which changes and additions are made to the resource after the initial resource is completed / domain value: MD_MaintenanceFrequencyCode: – updateScope [0..*]: scope of data to which maintenance is applied / domain value: MD_ScopeCode – maintenanceNote [0..*]: information regarding specific requirements for maintaining the resource / domain value: free text
Implementing instructions	
Example	
Example XML encoding	
Comments	

Recommendation 17 Frequency with which changes are made for INSPIRE should be as close as possible to the frequency with which changes are made in national cadastral register or equivalent. Moreover, frequency with which changes are made for INSPIRE should be one year or better.

NOTE Typically, frequency with which changes are made will vary from daily basic for data providers publishing on-line continuous updating of cadastral data to yearly basis for data providers publishing annual updated editions of cadastral data.

8.2.2 Data Quality – Completeness – Omission

Metadata element name	Data Quality – Completeness – Omission
Definition	data absent from the dataset, as described by the scope
ISO 19115 number and name	18. dataQualityInfo
ISO/TS 19139 path	dataQualityInfo
INSPIRE obligation / condition	optional
INSPIRE multiplicity	0..*
Data type (and ISO 19115 no.)	110. DQ_CompletenessOmission
Domain	Lines 100-107 from ISO 19115
Implementing instructions	
Example	
Example XML encoding	
Comments	See clause 7.2.1 in Chapter 7 for detailed information.

8.2.3 Data Quality – Positional Accuracy – Absolute or external accuracy

Metadata element name	Data Quality - Positional accuracy - Absolute external accuracy
Definition	closeness of reported coordinate values to values accepted as or being true
ISO 19115 number and name	18. dataQualityInfo
ISO/TS 19139 path	dataQualityInfo
INSPIRE obligation / condition	optional
INSPIRE multiplicity	0..*
Data type (and ISO 19115 no.)	117. DQ_AbsoluteExternalPositionalAccuracy
Domain	Lines 100-107 from ISO 19115
Implementing instructions	
Example	
Example XML encoding	
Comments	See clause 7.3.1 in Chapter 7 for detailed information.

8.3 Guidelines on using metadata elements defined in Regulation 1205/2008/EC

8.3.1 Conformity

The *Conformity* metadata element defined in Regulation 1205/2008/EC allows to report the conformance with the Implementing Rule for interoperability of spatial data sets and services or another specification. The degree of conformity of the dataset can be *Conformant* (if the dataset is fully conformant with the cited specification), *Not Conformant* (if the dataset does not conform to the cited specification) or *Not evaluated* (if the conformance has not been evaluated).

Recommendation 18 In order to report conceptual consistency with this INSPIRE data specification, the *Conformity* metadata element should be used. The value of Conformant should be used for the Degree element only if the dataset passes all the requirements described in the abstract test suite presented in Annex A. The Specification element should be given as follows:

- title: "INSPIRE Data Specification on Cadastral parcels –Guidelines"
- date:
 - dateType: publication
 - date: 2010-04-26

8.3.2 Lineage

Following the ISO 19113 Quality principles, if a data provider has a procedure for quality validation of their spatial data sets then the data quality elements listed in the Chapter 8 should be used. If not, the *Lineage* metadata element (defined in Regulation 1205/2008/EC) should be used to describe the overall quality of a spatial data set.

According to Regulation 1205/2008/EC, lineage “is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and whether it has legal validity. The value domain of this metadata element is free text”.

Recommendation 19 Apart from describing the process history, if feasible within a free text, the overall quality of the dataset (series) should be included in the *Lineage* metadata element. This statement should contain any quality information required for interoperability and/or valuable for use and evaluation of the data set (series).

Recommendation 20 Main specificities of cadastral data should be published in the element “description of a data set”, using the template for lineage provided in annex D.

8.3.3 Temporal reference

According to Regulation 1205/2008/EC, at least one of the following temporal reference metadata elements shall be provided: temporal extent, date of publication, date of last revision, date of creation.

Recommendation 21 If feasible, the date of the last revision of a spatial data set should be reported using the *Date of last revision* metadata element.

9 Delivery

9.1 Delivery medium

Requirement 15 Data conformant to this INSPIRE data specification shall be made available through an INSPIRE network service.

Requirement 16 All information that is required by a calling application to be able to retrieve the data through the used network service shall be made available in accordance with the requirements defined in the Implementing Rules on Network Services.

EXAMPLE 1 Through the Get Spatial Objects function, a download service can either download a pre-defined data set or pre-defined part of a data set (non-direct access download service), or give direct access to the spatial objects contained in the data set, and download selections of spatial objects based upon a query (direct access download service). To execute such a request, some of the following information might be required:

- the list of spatial object types and/or predefined data sets that are offered by the download service (to be provided through the Get Download Service Metadata operation),
- and the query capabilities section advertising the types of predicates that may be used to form a query expression (to be provided through the Get Download Service Metadata operation, where applicable),
- a description of spatial object types offered by a download service instance (to be provided through the Describe Spatial Object Types operation).

EXAMPLE 2 Through the Transform function, a transformation service carries out data content transformations from native data forms to the INSPIRE-compliant form and vice versa. If this operation is directly called by an application to transform source data (e.g. obtained through a download service) that is not yet conformant with this data specification, the following parameters are required:

Input data (mandatory). The data set to be transformed.

- Source model (mandatory, if cannot be determined from the input data). The model in which the input data is provided.
- Target model (mandatory). The model in which the results are expected.
- Model mapping (mandatory, unless a default exists). Detailed description of how the transformation is to be carried out.

9.2 Encodings

9.2.1 Encoding for application schema *Cadastral parcels*

Requirement 17 Data conformant to the application schema *Cadastral Parcels* shall be encoded using the encoding specified in section 9.2.1.1.

9.2.1.1 Default Encoding: GML Application Schema *Cadastral parcels*

Format name: *Cadastral Parcels* GML Application Schema
 Version of the format: V3.0, GML, version 3.2.1
 Reference to the specification of the format: ISO 19136:2007
 Character set: UTF-8

The GML Application Schema is distributed in a zip-file separately from the data specification document.

10 Data Capture

10.1 Spatial object types

10.1.1 CadastralParcel

Requirement 18 All cadastral parcels which are under the INSPIRE scope shall be published

Cadastral parcels are considered as under the INSPIRE scope if:

- they fit with the definition given by the Directive “areas defined in cadastral registers or equivalent”
- they fit as much as possible with the description given in this document “single area on Earth surface under homogeneous real property rights and unique ownership, forming a partition of national territory”
- they are available as vector data.

EXAMPLE 1: France

In France, there are two kinds of “areas defined in cadastral registers or equivalent”:

- parcels (single areas on Earth surface under unique or homogeneous property right)
- sub-parcels (division of parcels based on official land use for taxation purposes)

Only the first one “parcels” have to be published for INSPIRE.

EXAMPLE 2: Finland

In Finland, basic units "in cadastral registers or equivalent" are called basic property units. Areas of basic property units are called parcels (single areas on Earth surface under unique or homogenous property rights). Notice: in Finland, one basic property unit can be composed from 0 to many parcels. The parcels will be published for INSPIRE as cadastral parcels. Basic property units composed of 1 to many parcels may also be published for INSPIRE.

EXAMPLE 3: United Kingdom

In United Kingdom, cadastral parcels represent the extent (in 2D) of titles, they may overlap in case two titles own the same space, e.g. due to different kinds of title (leasehold, freehold) or due to titles applying at different heights.

These parcels are compliant with the definition given by the Directive "areas defined in cadastral registers or equivalent" but not with the description given in this document "single areas on Earth surface under unique or homogeneous property right, forming as much of possible a partition of territory" because some parcels are not really at Earth surface and because some parcels overlap.

The Land Registry of United Kingdom should publish only cadastral parcels which are on ground/Earth surface, as in INSPIRE understanding, "parcels" at other heights are not really parcels but rather building units.

Concerning the overlapping parcels due to different titles applying to same piece of land (or water), United Kingdom should decide which titles define the INSPIRE cadastral parcels, taking into account the recommendation about partition of territory but also the current use of cadastral parcels for the use cases aimed by INSPIRE.

EXAMPLE 4: Hungary

In national regulation:

(1) Cadastral parcels are

- (a) single areas on Earth surface, which are not cut off by administrative or built-up area boundary, under unique or homogenous ownership or trusteeship rights.
- (b) shaped building lots independently of ownership or trusteeship rights.

(2) Cadastral parcels must be subdivided into sub-parcels based on land use categories

(3) Objects must be registered together with cadastral parcels, if the ownership rights are the same like the cadastral parcel

- (a) buildings and structures within the cadastral parcel
- (b) in case of condominium the common parts and chambers of the building, which are under joint ownership rights

In Hungary only the cadastral parcels under case (a) will be published for INSPIRE.

Recommendation 22 The selection rules for INSPIRE cadastral parcels should be decided by each Member State, based on the guidelines given in this document and then documented as metadata, under lineage element.

NOTE Cadastral parcels should form, as much as possible, a partition of national territory. However, it won't be possible in every country, due to national regulations. These gaps and overlaps due to national regulations have been called respectively "cadastral gaps" and "cadastral overlaps" and information about them has also to be given in metadata (lineage information).

10.1.2 CadastralZoning

Recommendation 23 All cadastral zonings which are under the INSPIRE scope should be published.

Cadastral zonings are considered under the INSPIRE scope:

- a) if they are available as vector data
- b) if they include cadastral parcels also published for INSPIRE
- c) if Member State considers them as helpful for users
- d) if the extent of cadastral zonings is equivalent or smaller than the extent of cadastral data generally required by users.

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EXAMPLE 1 (about condition b): France

In some parts of its territory, France has cadastral parcels as raster data (so cadastral parcels outside the INSPIRE scope) but has cadastral zonings as vector data. In this case, it won't be relevant to supply cadastral zonings for INSPIRE.

NOTE 1 (about condition c)

Cadastral zonings should be considered as helpful for users at least in the following cases:

- when they carry metadata attributes (estimated accuracy and/or original map scale denominator)
- when the current practice for portrayal of cadastral parcels is to display only the last part of national cadastral reference (in this case, cadastral zonings will be required to display the first part of this attribute).
- when cadastral zonings are generally used to make easier data management in the users database (e.g. for queries).

NOTE 2 (about condition d)

Most users will very likely require cadastral parcels only to work at local level, e.g. on a municipality or a set of municipalities. So, generally, cadastral zonings should not have an extent significantly bigger than municipalities (the lowest level in administrative hierarchy).

Recommendation 24 If in a Member State, municipalities are used as cadastral zonings, municipalities should be considered as the upper level of cadastral zonings.

NOTE 3 In case a Member State uses other administrative levels than municipalities as cadastral zonings, these upper levels of administrative units should not be duplicated in theme Cadastral Parcels.

EXAMPLE 2

In the Netherlands there is nationwide coverage of the cadastral parcels, which are organised in a hierarchical structure: the top levels of this hierarchical structure coincide with the administrative boundaries of municipality, province, nation. In the INSPIRE context, the cadastral zoning levels will be:

- Cadastral section (lowest level = 3)
- Cadastral municipality (level = 2)
- Civil municipality (upper level= 1 and also lowest level of administrative unit).

Cadastral municipalities are the old (original) municipalities, which are in many cases now grouped to larger units in the current actual (civil) municipalities. The old cadastral municipalities are still there - as their code is part of the parcel identifier. And they do form a part of a proper hierarchy.

NOTE 4 In case a Member State does not use municipalities as cadastral zoning, it is up to this Member State to decide which cadastral zonings shall be published in INSPIRE, taking into account that the extent of cadastral zonings shall be equivalent or smaller than the extent of cadastral data generally required by users.

EXAMPLE 4

In Denmark, there is only one level of cadastral zoning, called cadastral district (corresponding to old towns with local cadastral maps). This level should be published for INSPIRE.

NOTE 5 This spatial object type is considered as optional; it may happen that some countries (e.g. United Kingdom) do not have this spatial object type or do not consider it as helpful (e.g. Finland).

10.1.3 CadastralBoundary

Recommendation 25 Cadastral boundaries have to be published for INSPIRE only if available as vector data and if carrying the information about estimated accuracy.

NOTE In case a Member State provides for INSPIRE the spatial object type CadastralBoundary, all instances of this spatial object type have to be published (even if some instances do not carry any information about estimated accuracy), i.e. all cadastral boundaries of all parcels have to be published.

EXAMPLE Cadastral boundaries will have to be provided by countries such as Norway or Netherlands which consider convenient to supply the information about accuracy at the boundary level.

10.1.4 BasicPropertyUnit

Recommendation 26 Basic property units should be published for INSPIRE only when cadastral references are given to basic property units and not for parcels.

EXAMPLE In countries as Norway and Finland the basic unit in registration is basic property unit.

10.2 nationalCadastralReference

The structure of cadastral reference is different for every country and it is outside the scope/ambition of INSPIRE to make this uniform.

Every country has different cadastral references with different structure, which carries different meanings: sometimes a hierarchical cadastral division is stored in the cadastral reference, sometimes some lineage can be observed etc...

EXAMPLES

- Austria: 30133-123/45, behind the / is the result of dividing an (earlier) parcel
- Belgium: 92001A0999_02R999, cadastral division key (5d), section (1l), root (4d), bis ('_'+2d), alphanumeric (1l or ' '), numeric (3d)
- Denmark: 590151,157h, cadastral district (max 7d), parcel id (max 4d+3L)
- Finland: 09140300020017, municipality number (3d), cadastral division number (3d), group number (4d) and sequence number (4d)
- Norway: 1729 – 12/4/0/2. municipality number (4d), land number (max 4d), title number (max 4d), lease number (max 4d, only for leased area), unit number (max 4d, only for sectioned area, that is limited part of building) . “- “ is used as separator between municipality and land number. A “/“ is used as separator otherwise.
- Spain: two options:
 - urban: 9872023 VH5797S 0001 WX, estate/parcel (7d), sheet (7c), flat/unit (4d), control (2l)
 - rural: 13 077 A 018 00039 0000 FP, province (2d), municipality (3d), sector (1l), polygon (3d), parcel (5d), sub-parcel (4d), control (2l)
- The Netherlands: APD00 F 2345, municipality (3l+2d), section (2l), parcel (5d)
- Hungary: 0214-023 settlement statistic code (4 digits)-parcel_id (max. 6 digits)
- 0214-023/25: in the case of subdivided parcel: original_parcel_id + „/“ + subdivided_parcel_id (max. 3d). For parcels inside rural areas parcel_id started with „0“ (zero)

Recommendation 27 The structure of national cadastral reference should be documented as metadata, under lineage element.

Recommendation 28 The national cadastral reference being a key attribute, data producers should put in place the necessary checking processes to ensure that there are no errors about this attribute, e.g. that for each cadastral parcel, the national cadastral reference published for INSPIRE is the same as the one in national cadastral register or equivalent.

NOTE An error on attribute national cadastral reference may have big impact, especially in case of preparing expropriation for infrastructure projects or any other public land acquisition. It is why a specific care should be brought to this attribute.

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10.3 INSPIRE Identifier (*inspireId*)

As explained in clause 5.2.1.4, all spatial objects published for INSPIRE shall carry a unique identifier: the “*inspireId*”. This attribute must have the characteristics defined in the Generic Conceptual Model:

- be unique in the INSPIRE context
- be persistent (life-cycle rules being up to each Member State)
- give a way to find the download service where the spatial object is available
- be compliant with the lexical rules:
 - **composed of a namespace and a local identifier**
 - the namespace must begin by the 2 letter country code
 - the namespace and the local identifier can include only the limited set of characters allowed by the Generic Conceptual Model.

The following part of this clause gives some advices and examples to data providers about how they may supply such unique identifiers.

10.3.1 Namespace

The first point is to define a convenient **namespace**. To ensure both uniqueness within the INSPIRE context and possible link with download services, it may be useful to add to the mandatory country code, the data provider name or acronym.

For instance, namespace might be: NL.KADASTER (if download service at national level) or ES.Catastro.Barcelona (if download services available at province level in Spain).

More examples and details may be found in the Generic Conceptual Model.

10.3.2 Local identifier

The second point is to decide on the **local identifier** to be used. Of course, to ensure the required characteristics, this local identifier must be itself unique (in the local/national set of cadastral data), persistent and must include only the limited set of characters allowed by the Generic Conceptual Model.

Case 1: data provider has both external identifiers and thematic identifiers (the national cadastral reference)

For instance, Denmark has thematic structured identifiers and meaningless external identifiers (UUID). If both identifiers comply with the characteristics of the local identifier required by INSPIRE, it will be up to Danish cadastre to decide which should be used as the local identifier for INSPIRE.

Case 2: data provider has only thematic identifiers (the national cadastral reference) and this thematic identifier complies with the characteristics of the local identifier required by INSPIRE. It seems to be the case in many countries.

In this case, the thematic identifier may be used as local identifier.

Case 3: data provider has no external identifier, it has only thematic identifier (the national cadastral reference) but which does not comply with the characteristics of the local identifier required by INSPIRE.

- The thematic identifier may be not unique

It is the case, for instance, in Finland, where the thematic identifier is carried by the basic property units (which may be composed from 0 to many cadastral parcels). In this case, the national Cadastre must attribute unique identifiers to parcels, e.g. by adding a suffix to each parcel composing the same basic property unit, by using internal identifier, if any, by attributing automatic identifiers (UUID, coordinates of centroid points, ...). The method to form the local identifier is up to each data provider.

- The thematic identifier uses other characters than the ones allowed by the Generic Conceptual Model.

It is the case, for instance, in Austria where the thematic identifier may include the “/” separator to indicate parcel splitting whereas this separator is not allowed by the Generic Conceptual Model.

In this case, to form the local identifier, the national Cadastre must provide a method to make this thematic identifier compliant with the rules in the Generic Conceptual Model (e.g. by replacing the “/” by another allowed separator, such as “_”).

10.4 Estimated accuracy

For INSPIRE, cadastral data shall be published in the Coordinate Reference System mandated by the Implementing Rule on Reference Systems, i.e. in ETRS89 for areas on the Eurasian tectonic plate and in ITRS elsewhere.

Of course, INSPIRE users will be interested by having information about the accuracy of cadastral data, as they receive them, in the Coordinate Reference System mandated by INSPIRE. It is why the clauses about application schema and about quality and metadata require cadastral data providers to give estimated accuracy related to the coordinates in ETRS89 (or ITRS).

However, in most Member States, the estimated accuracy is generally known in the source Coordinate Reference System, the national or local one.

The estimated accuracy for INSPIRE will be the combination of estimated accuracy in original Coordinate Reference System and of the accuracy of the coordinate transformation between original Reference System to INSPIRE Reference System.

Coordinate transformation between two horizontal geodetic datum is generally done, using one of the three following methods:

- transformation with 3 parameters
- transformation with 7 parameters
- transformation with a grid.

Experience in some countries has shown that transformation with 3 or even 7 parameters might bring deviations up to 10 metres. So, the impact of such transformations may not be neglected on cadastral data whose original accuracy generally varies from some decimetres to some metres.

The ideal solution would be for each Member State to define good quality coordinate transformations (using grids and bringing no deviation bigger than some centimetres). However, if not possible before the deadlines of INSPIRE, the impact of coordinate transformation has to be taken into account when giving information about positional accuracy, both in the application schema and in metadata.

10.5 Level and levelName

These two attributes are related to cadastral zonings. They generally do not exist as such in national cadastral databases but should be created for INSPIRE.

EXAMPLE

In France, there are two feature types corresponding to INSPIRE cadastral zonings:

- municipalities ("commune")
- cadastral sheets ("division cadastrale")

Municipalities represent the upper level, so should be attributed level 1 (1stOrder).

Cadastral sheets represent a lower level and will be attributed level 2 (2ndOrder)

During the transformation of national data to INSPIRE specification,

- all instances of feature type "Commune" will be transformed into INSPIRE feature type "CadastralZoning" with attributes:
 - level = 1stOrder
 - levelName = "Commune" (and/or "municipalities")
- all instances of feature type "Division cadastrale" will be transformed into INSPIRE feature type "CadastralZoning" with attributes:
 - level = 2ndOrder
 - levelName = "Division cadastrale" (and/or "cadastral sheet")

10.6 Value of area

Both cadastral parcels and basic property units have the areaValue attribute.

Recommendation 29 The areaValue should be area of the whole cadastral parcel (or whole basic property unit).

NOTE When parcel is single area, the areaValue means that area. When parcel is multisurface, the areaValue mean total value of the several areas composing this cadastral parcel.

NOTE When areaValue is given for basic property unit, it means the total area of all parcels composing this basic property unit. When basic property unit has just one parcel, areaValue means area of that parcel.

11 Portrayal

This clause defines the rules for layers and styles to be used for portrayal of the spatial object types defined for this theme.

In section 11.1, the *types* of layers are defined that are to be used for the portrayal of the spatial object types defined in this specification. A view service may offer several layers of the same type, one for each dataset that it offers on a specific topic.

Section 0 specifies the default styles to be used for each of these layer types, while section 11.3 specifies other well-defined styles.

The XML fragments in these sections use the following namespace prefixes:

- sld="http://www.opengis.net/sld" (WMS/SLD 1.1)
- se="http://www.opengis.net/se" (SE 1.1)
- ogc="http://www.opengis.net/ogc" (FE 1.1)

11.1 Layer Types

Requirement 19 If an INSPIRE view services supports the portrayal of data related to the theme *Cadastral Parcels*, it shall provide layers of the types specified in this section.

Table 9: Layer types for the spatial data theme *Cadastral Parcels*

Layer Name	Layer Title	Spatial object type(s)	Keywords
CP.CadastralParcel	Cadastral Parcel	CadastralParcel	
CP.CadastralZoning	Cadastral Zoning	CadastralZoning	
CP.CadastralBoundary	Cadastral Boundary	CadastralBoundary	

11.2 Default Styles

Requirement 20 If an INSPIRE view network service supports the portrayal of spatial data sets corresponding to the spatial data theme *Cadastral parcels*, it shall support the default styles specified in the tables in this section.

If no user-defined style is specified in a portrayal request for a specific layer to an INSPIRE view service, the default style specified in this section for that layer shall be used.

Table 10: Default styles for the spatial data theme *Cadastral parcels*

Layer Name	CP.CadastralParcel
Style Name	CP.CadastralParcel.Default
Style Title	Cadastral parcel Default Style
Style Description	<p>Parcel outline as a black line carried by the attribute geometry + text with attribute label carried by the attribute geometry</p> <p>Parcel outlines: black (#000000) line 1 pixel</p> <p>Labels: in Arial 10 black (#000000)</p>
Symbology	<pre> <sld:NamedLayer> <se:Name>CP.CadastralParcel</se:Name> <sld:UserStyle> <se:Name>CP.CadastralParcel.Default</se:Name> <sld:IsDefault>1</sld:IsDefault> <se:FeatureTypeStyle version="1.1.0"> <se:Description> <se:Title>Cadastral Parcel Default Style</se:Title> <se:Abstract> Parcel outline as a black line carried by the attribute geometry + text with attribute label carried by the attribute geometry. Parcel outlines: black (#000000) line 1 pixel. Labels: in Arial 10 black (#000000). </se:Abstract> </se:Description> <se:FeatureTypeName>CadastralParcel</se:FeatureTypeName> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>20000</se:MaxScaleDenominator> <se:PolygonSymbolizer> <se:Geometry> <ogc:PropertyName>geometry</ogc:PropertyName> </se:Geometry> <se:Stroke> <se:SvgParameter name="stroke">#000000</se:SvgParameter> <se:SvgParameter name="stroke-width">1</se:SvgParameter> </se:Stroke> </se:PolygonSymbolizer> </se:Rule> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> </pre>

	<pre> <se:MaxScaleDenominator>20000</se:MaxScaleDenominator> <se:TextSymbolizer> <se:Label> <ogc:PropertyName>label</ogc:PropertyName> </se:Label> <se:Font> <se:SvgParameter name="font-family">Arial</se:SvgParameter> <se:SvgParameter name="font-size">10</se:SvgParameter> </se:Font> <se:Fill> <se:SvgParameter name="fill">#000000</se:SvgParameter> </se:Fill> </se:TextSymbolizer> </se:Rule> </se:FeatureTypeStyle> </sld:UserStyle> </sld:NamedLayer> </pre>
Minimum & maximum scales	from 1:1 to 1:20000
Layer Name	CP.CadastralZoning
Style Name	CP.CadastralZoning.Default
Style Title	Cadastral Zoning Default Style
Style Description	<p>Cadastral zoning outline carried by the attribute geometry+ text with attribute label carried by the attribute geometry</p> <p>Cadastral zoning outline : black (#000000) line 2 pixels</p> <p>Labels: in Arial 20 black (#000000)</p>
Symbology	<pre> <sld:NamedLayer> <se:Name>CP.CadastralZoning</se:Name> <sld:UserStyle> <se:Name>CP.CadastralZoning.Default</se:Name> <sld:IsDefault>1</sld:IsDefault> <se:FeatureTypeStyle version="1.1.0"> <se:Description> <se:Title>Cadastral Zoning Default Style</se:Title> <se:Abstract> Cadastral zoning outline carried by the attribute geometry+ text with attribute label carried by the attribute geometry. Cadastral zoning outline : black (#000000) line 2 pixels. Labels: in Arial 20 black (#000000). </se:Abstract> </se:Description> <se:FeatureTypeName>CadastralZoning</se:FeatureTypeName> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>20000</se:MaxScaleDenominator> <se:PolygonSymbolizer> <se:Geometry> <ogc:PropertyName>geometry</ogc:PropertyName> </se:Geometry> <se:Stroke> <se:SvgParameter name="stroke">#000000</se:SvgParameter> <se:SvgParameter name="stroke-width">2</se:SvgParameter> </se:Stroke> </se:PolygonSymbolizer> </pre>

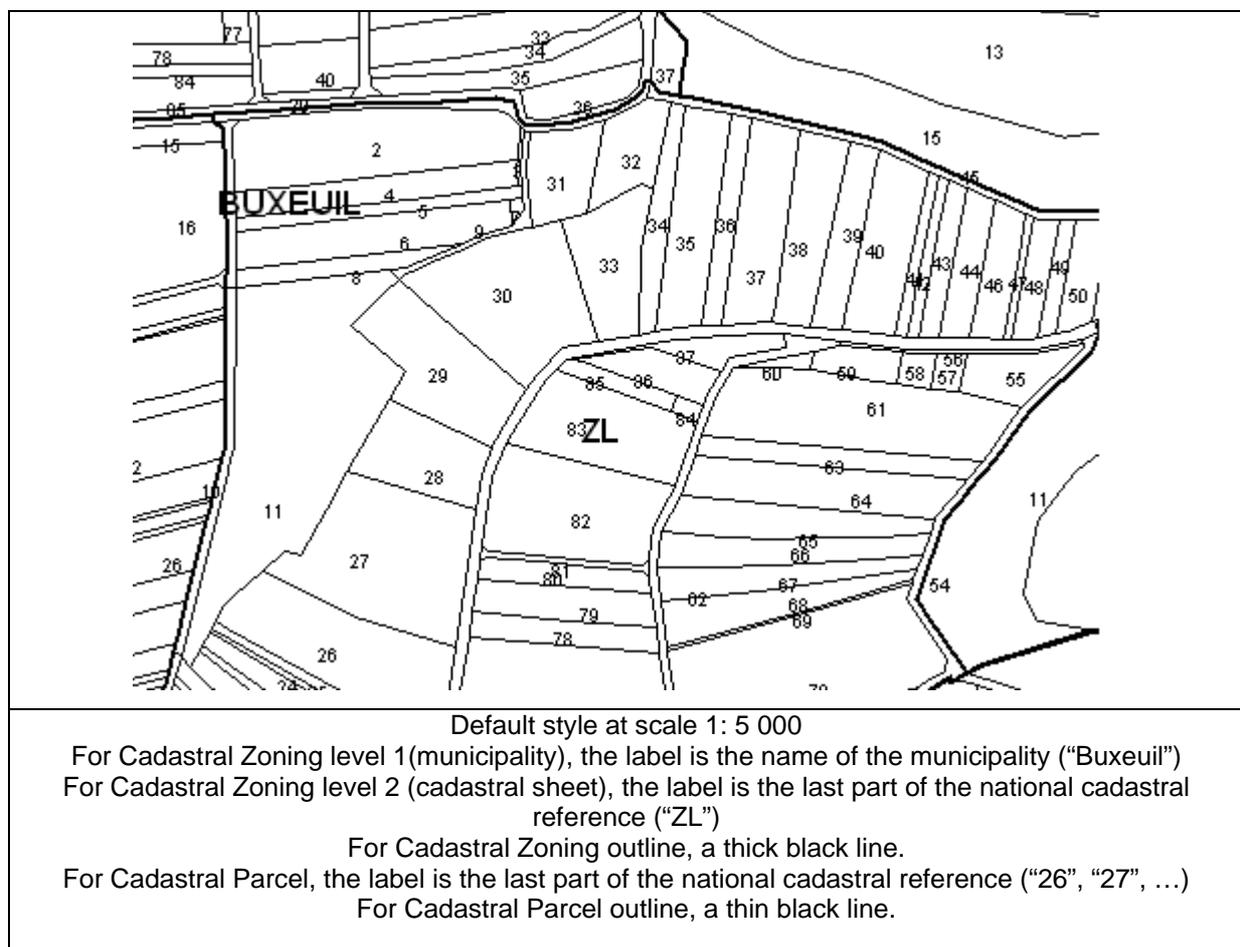
	<pre> </se:Rule> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>20000</se:MaxScaleDenominator> <se:TextSymbolizer> <se:Label> <ogc:PropertyName>label</ogc:PropertyName> </se:Label> <se:Font> <se:SvgParameter name="font-family">Arial</se:SvgParameter> <se:SvgParameter name="font-size">20</se:SvgParameter> </se:Font> <se:Fill> <se:SvgParameter name="fill">#000000</se:SvgParameter> </se:Fill> </se:TextSymbolizer> </se:Rule> </se:FeatureTypeStyle> </sld:UserStyle> </sld:NamedLayer> </pre>
Minimum & maximum scales	from 1:1 to 1:20000
Layer Name	CP.CadastralBoundary
Style Name	CP.CadastralBoundary.Default
Style Title	Cadastral Boundary Default Style
Style Description	Cadastral boundary: black (#000000) line 1 pixel
Symbology	<pre> <sld:NamedLayer> <se>Name>CP.CadastralBoundary</se>Name> <sld:UserStyle> <se>Name>CP.CadastralBoundary.Default</se>Name> <sld:IsDefault>1</sld:IsDefault> <se:FeatureTypeStyle version="1.1.0"> <se:Description> <se>Title>Cadastral Boundary Default Style</se>Title> <se:Abstract> Cadastral boundary: black (#000000) line 1 pixel. </se:Abstract> </se:Description> <se:FeatureTypeName>CadastralBoundary</se:FeatureTypeName> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>20000</se:MaxScaleDenominator> <se:LineSymbolizer> <se:Geometry> <ogc:PropertyName>geometry</ogc:PropertyName> </se:Geometry> <se:Stroke> <se:SvgParameter name="stroke">#000000</se:SvgParameter> <se:SvgParameter name="stroke-width">1</se:SvgParameter> </se:Stroke> </se:LineSymbolizer> </se:Rule> </se:FeatureTypeStyle> </pre>

	<pre></sld:UserStyle> </sld:NamedLayer></pre>
Minimum & maximum scales	from 1:1 to 1:20000

NOTE 1 The default styles described in 11.2 are considered as convenient for displaying current cadastral parcels and related information as background data.

NOTE 2 These default styles can always be overridden by a user-defined symbology, e.g. in order to use an existing national or thematic style or to avoid conflicts when visualising several themes together.

EXAMPLE 1:



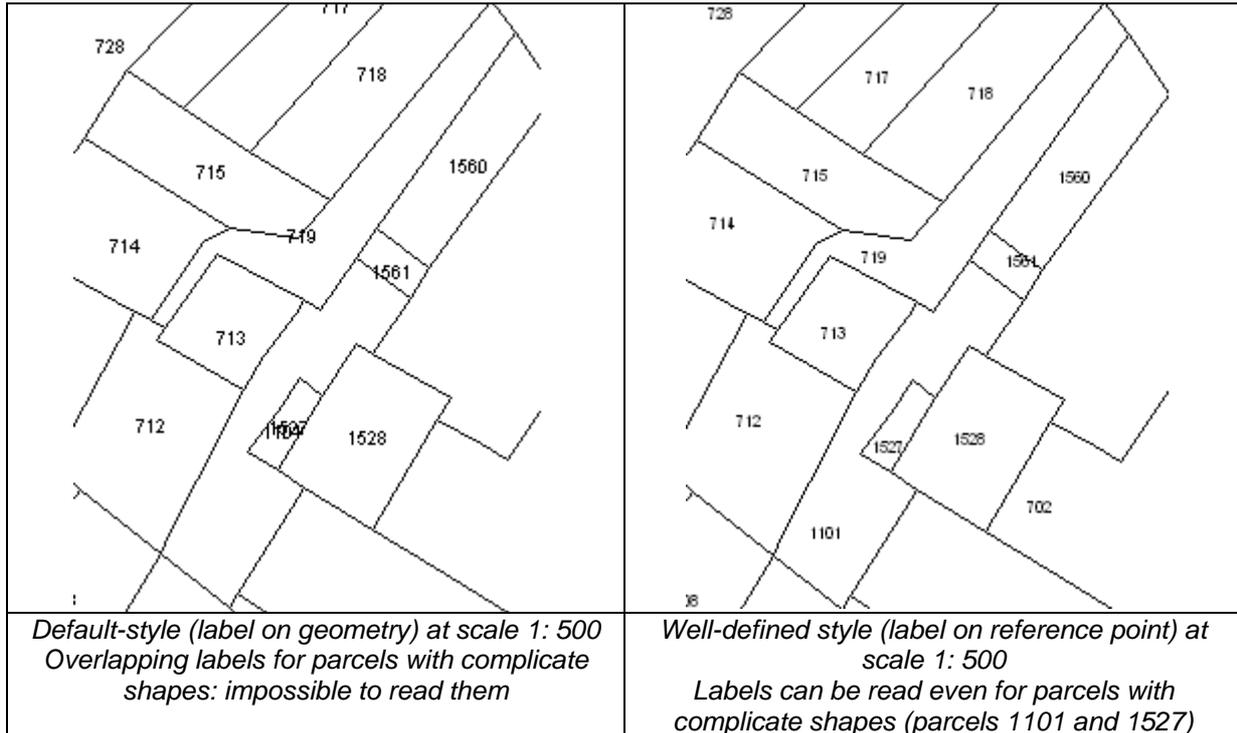
11.3 Other Well-defined Styles

Requirement 21 If an INSPIRE view service supports the portrayal of spatial data sets corresponding to the spatial data themes *Cadastral parcels*, apart from the default styles specified in Section 0, it shall also support the well-defined styles specified in this section (if the corresponding feature types are present in the database)..

Table 11: Other well-defined styles for the spatial data theme *Cadastral parcels*

Layer Name	CP.CadastralParcel
Style Name	CP.CadastralParcel.LabelOnReferencePoint
Style Title	Cadastral Parcel – with label on reference point
Style Description	Parcel outline carried by the attribute geometry + text with attribute label carried by the attribute referencePoint Parcel outlines: black (#000000) line 1 pixel Labels: in Arial 10 black (#000000)
Symbology	<pre> <sld:NamedLayer> <se:Name>CP.CadastralParcel</se:Name> <sld:UserStyle> <se:Name>CP.CadastralParcel.LabelOnReferencePoint</se:Name> <sld:IsDefault>0</sld:IsDefault> <se:FeatureTypeStyle version="1.1.0"> <se:Description> <se:Title>Cadastral Parcel - with label on reference point</se:Title> <se:Abstract> Parcel outline carried by the attribute geometry + text with attribute label carried by the attribute referencePoint. Parcel outlines: black (#000000) line 1 pixel. Labels: in Arial 10 black (#000000). </se:Abstract> </se:Description> <se:FeatureTypeName>CadastralParcel</se:FeatureTypeName> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>20000</se:MaxScaleDenominator> <se:PolygonSymbolizer> <se:Geometry> <ogc:PropertyName>geometry</ogc:PropertyName> </se:Geometry> <se:Stroke> <se:SvgParameter name="stroke">#000000</se:SvgParameter> <se:SvgParameter name="stroke-width">1</se:SvgParameter> </se:Stroke> </se:PolygonSymbolizer> </se:Rule> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>20000</se:MaxScaleDenominator> <se:TextSymbolizer> <se:Geometry> <ogc:PropertyName>referencePoint</ogc:PropertyName> </se:Geometry> <se:Label> <ogc:PropertyName>label</ogc:PropertyName> </se:Label> <se:Font> <se:SvgParameter name="font-family">Arial</se:SvgParameter> <se:SvgParameter name="font-size">10</se:SvgParameter> </se:Font> <se:Fill> <se:SvgParameter name="fill">#000000</se:SvgParameter> </se:Fill> </se:TextSymbolizer> </se:Rule> </se:FeatureTypeStyle> </sld:UserStyle> </sld:NamedLayer> </pre>
Minimum & maximum scales	from 1:1 to 1:20 000

EXAMPLE 2:



Layer Name	CP.CadastralParcel
Style Name	CP.CadastralParcel.BoundariesOnly
Style Title	Cadastral Parcel – Boundaries Only
Style Description	Parcel outline carried by the attribute geometry Parcel outlines: black (#000000) line 1 pixel
Symbology	<pre> <sld:NamedLayer> <se:Name>CP.CadastralParcel</se:Name> <sld:UserStyle> <se:Name>CP.CadastralParcel.OutlinesOnly</se:Name> <sld:IsDefault>0</sld:IsDefault> <se:FeatureTypeStyle version="1.1.0"> <se:Description> <se:Title>Cadastral Parcel - outlines only</se:Title> <se:Abstract> Parcel outline carried by the attribute geometry. Parcel outlines: black (#000000) line 1 pixel. </se:Abstract> </se:Description> <se:FeatureTypeName>CadastralParcel</se:FeatureTypeName> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>40000</se:MaxScaleDenominator> <se:PolygonSymbolizer> <se:Geometry> <ogc:PropertyName>geometry</ogc:PropertyName> </se:Geometry> <se:Stroke> <se:SvgParameter name="stroke">#000000</se:SvgParameter> <se:SvgParameter name="stroke-width">1</se:SvgParameter> </se:Stroke> </se:PolygonSymbolizer> </se:Rule> </se:FeatureTypeStyle> </sld:UserStyle> </sld:NamedLayer> </pre>

Minimum & maximum scales	from 1:1 to 1:40 000
-------------------------------------	----------------------

EXAMPLE 3:



*Well-defined style (boundaries only) for Cadastral Parcels
Default style (label on geometry) for Cadastral Zonings
Scale: 1: 20 000*

Layer Name	CP.CadastralParcel
Style Name	CP.CadastralParcel.ReferencePointOnly
Style Title	Cadastral Parcel – Reference Point Only
Style Description	Parcel representation carried by the attribute referencePoint Parcel point : diamond magenta (#FF00FF) 2 pixels
Symbology	<pre> <sld:NamedLayer> <se:Name>CP.CadastralParcel</se:Name> <sld:UserStyle> <se:Name>CP.CadastralParcel.ReferencePointOnly</se:Name> <sld:IsDefault>0</sld:IsDefault> <se:FeatureTypeStyle version="1.1.0"> <se:Description> <se:Title>Cadastral Parcel - reference point only</se:Title> <se:Abstract> Parcel representation carried by the attribute referencePoint. Parcel point : circle size 10 magenta (#FF00FF) 2 pixels. </se:Abstract> </se:Description> <se:FeatureTypeName>CadastralParcel</se:FeatureTypeName> <se:Rule> <se:MinScaleDenominator>1</se:MinScaleDenominator> <se:MaxScaleDenominator>60000</se:MaxScaleDenominator> <se:PointSymbolizer> <se:Geometry> <ogc:PropertyName>referencePoint</ogc:PropertyName> </se:Geometry> <se:Graphic> <se:Mark> <se:WellKnownName>circle</se:WellKnownName> <se:Stroke> <se:SvgParameter name="stroke">#FF00FF</se:SvgParameter> <se:SvgParameter name="stroke-width">2</se:SvgParameter> </se:Stroke> </se:Graphic> </se:PointSymbolizer> </se:Rule> </se:FeatureTypeStyle> </sld:UserStyle> </sld:NamedLayer> </pre>

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- [DS-D2.6] INSPIRE DS-D2.6, Methodology for the development of data specifications, v3.0, http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.6_v3.0.pdf
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- [DS-D2.8.1.4] INSPIRE DS-D2.8.1.4, INSPIRE data specification on Administrative units – Guidelines, v3.0
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- [ISO 19107] EN ISO 19107:2005, Geographic information – Spatial schema (ISO 19107:2003)
- [ISO 19108] EN ISO 19108:2005 Geographic information - Temporal schema (ISO 19108:2002)
- [ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)
- [ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)
- [ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)
- [ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)
- [ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation
- [OGC 06-103r3] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.0
- UNECE, 2004, Guidelines on Real Property Units and Identifiers, United Nations, New York and Geneva, 2004
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Annex A (normative)

Abstract Test Suite

Any dataset conforming to this INSPIRE data specification shall meet all requirements specified in this document.

NOTE A common abstract test suite including detailed instructions on how to test each requirement will be added at a later stage.

Annex B (informative) Correspondence between INSPIRE and national levels for CadastralZonings

Denmark

INSPIRE level	National level (levelName)	
	English term	National term
Level 1	Cadastral district	Ejerlav

Finland

No CadastralZoning in Finland

France:

INSPIRE level	National level (levelName)	
	English term	National term
Level 1	municipality	commune
Level 2	cadastral sheet	division cadastrale

The netherlands

No explicit CadastralZoning in the netherlands,

Norway

No CadastralZoning in Norway.

Spain

INSPIRE level	National level (levelName)	
	English term	National term
Level 1	municipality	municipio
Level 2 (urban areas)	block	manzana
Level 2 (rural areas)	polygon	poligono

United Kingdom

No CadastralZoning in United Kingdom

Switzerland

INSPIRE level	National level (levelName)	
	English term	National term
Level 1	Numbering range	Nummerierungsbereich

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Annex C (informative) Land Administration Domain Model (ISO19152)

In this annex, the current version of Land Administration Domain Model (LADM) is explained. In Section 1, the scope and purpose are described. Then Section 2 describes the current status of the LADM and finally Section 3 describes the relationship with INSPIRE.

What LADM is about?

The Land Administration Domain Model (LADM) aims to support 'an extensible basis for efficient and effective cadastral system development based on a Model Driven Architecture (MDA)' and to 'enable involved parties, both within one country and between different countries, to communicate based on the shared ontology implied by the model'. The LADM aims are equally valid for both developed and developing countries. The latter however explains the strong interest and support of UN Habitat and the development of a specialized model called the Social Tenure Domain Model, STDM (Lemmen et al., 2007). The scope of LADM includes the following:

- it defines a reference model, covering all basic information-related components of Land Administration,
- it provides a abstract, conceptual schema with five basic packages, related to (1) people and organizations (parties in LADM terminology), (2) parcels (spatial units in LADM terminology), (3) property rights (rights, responsibilities, and restrictions in LADM terminology), (4) surveying, and (5) geometry and topology,
- a terminology for Land Administration, based on various national and international systems, as simple as possible in order to be useful in practice. The terminology allows a shared description of different practices and procedures in various jurisdictions,
- a basis for national and regional profiles, and:
- it enables the combining of land administration information from different sources in a coherent manner.

LADM should be able to accommodate any legal framework. However, legal implications that interfere with (national) land administration laws are outside the scope of the LADM. It supports the reform of existing Land Administration systems at National or other jurisdictional level (e.g. Provincial, like in Canada) through provision of normative and informative annexes which include a number of spatial and legal profiles. These profiles represent specific information arrangements fitting within LADM, offering a variety of modes to organize the geometry and topology of Land Administration spatial units (e.g. text or point based, 2D unstructured, 2D partition, 3D full partition) or the Legal component (formal real rights, restrictions and responsibilities, including both the private and public originated laws and regulations). The profiles intermediate between the highly generic and widely applicable nature of LADM and the specification of an individual National Land Administration Model, having its own set of classes, obtained from the LADM generic and abstract classes through a mix of profiling and specialization. The ultimate goal of these annexes is thus the support for the implementation of specialized models in existing spatial databases, mainly built around the Object-Relational or the Object-Oriented paradigms. The provision of such a supporting framework is also fundamental in securing a level of interoperability and semantic translation, once different national specialized models are linked through the common ontology provided by LADM.

What is the status of LADM?

The work on the LADM started within FIG at the congress in Washington, 2002. The first mature version 1.0 was presented at the next FIG congress, in Munich 2006 and the last published changes were in version 1.1 as presented at the FIG Working Week 2009, in Eilat (Lemmen et al., 2009). In February 2008, FIG submitted the LADM to the International Organization for Standardization (ISO). The development of the Land Administration Domain Model (ISO 19152) is as follows:

- *New Working Item Proposal (NWIP): was in February 2008*
- *Working Draft (WD): discussions were in Copenhagen, Delft and Tsukuba*
- *Committee Draft (CD): discussion in Molde and text available since June 2009*
- *Draft International Standard (DIS): December 2009*
- *Final Draft International Standard (FDIS): December 2010*

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- *International Standard (IS): June 2011*

There is a close cooperation between ISO/TC211 and (European) CEN/TC287 Geographic Information. Via resolutions adopted by both organizations, it is now first explained how this cooperation is implemented. On 26 February 2009, in the Madrid meeting of CEN/TC287 after voting on the 'ISO19152 Draft Resolution 153 New Work Item Proposal Geographic Information - Land Administration Domain Model (LADM) - second vote' (CEN document number N 1304) it was decided to accept also the LADM within CEN TC287. Based on the above resolutions this means that from this moment onwards there will be parallel and simultaneous votings in the ISO and in the CEN on the different stages of the LADM towards an international standard. The implication of a CEN standard (statement of the CEN/TC 287 secretary Annet van der Horn-de Vries) is that this European standard is automatically also a national standard in all 30 CEN countries. The exact status and impact of this is depending on the legislation of the individual countries. By default a standard is voluntary, with private law regulating this. In some countries it is a matter of public law and then often government bodies are obliged to use the CEN standard on a case by case basis. In many countries the CEN standards are translated into the national language.

Link with INSPIRE

The INSPIRE Directive requires to take existing standards into account (article 7 of the directive). Once adopted, the ISO/CEN 19152 standard should be taken into account if there are requirements and consensus to extend Data Specification for Cadastral Parcels. In case of ISO/CEN LADM, there was an excellent opportunity as both INSPIRE CP and ISO/CEN LADM were under development at the same time. Through joint work between the INSPIRE TWG CP and the LADM Project Team this has been achieved. This ensured consistency between INSPIRE and LADM and resulted in a matching of concepts and compatible definitions of common concepts. Of course it must be remembered that there are differences in scope and targeted application areas; e.g. INSPIRE has strong focus on environmental users, while LADM has a multi-purpose character (also supporting legal security, taxation, valuation, planning, etc.) and LADM is supporting both data producers and data users in these various application areas. Also, LADM has harmonization solutions for rights and owners of 3D cadastral objects (such as building or network reserves), which are currently also outside the scope of INSPIRE CP. However, through the intensive cooperation, it is now made possible that a European country may be compliant both with INSPIRE and with LADM. Further, it is made possible through the use of LADM to extend INSPIRE specifications in future, if there are requirements and consensus to do so.

In order to 'proof' the compatibility, the ISO19152 document (in Annex G) includes a LADM-based version of INSPIRE cadastral parcels, showing that the INSPIRE development fits within the LADM and that there are not inconsistencies. Figure C.1 shows how the INSPIRE cadastral parcels model can be derived from the LADM. In INSPIRE context four classes are relevant:

- LA_Parcel as basis for CadastralParcel,
- LA_LAUnit as basis for BasicPropertyUnit,
- LA_FaceString as basis for CadastralBoundary,
- LA_SpatialUnitSet as basis for CadastralZoning.

The LADM attributes inherited by INSPIRE can have a more specific data type or cardinality in INSPIRE (compared to LADM). This has been included in the diagram. This implies that an optional LADM attribute [0..1], might not occur at all in INSPIRE as the cardinality can be set to 0; e.g. nationalVolume. This also implies that an optional LADM attribute [0..1], might be an obligatory attribute in INSPIRE; e.g. label. Further, INSPIRE specific attributes are added to the different classes. The Figure C.1 looks a bit more complicated as the normal INSPIRE CP UML class diagram, because it is showing the different LADM parent classes and the refinement of the different attribute types (but the resulting model is the same).

References (The content of this section is largely based on)

- ISO TC ISO/CD 19152 (2009). Geographic information — Land Administration Domain Model (LADM), 10 July 2009.
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- Lemmen, C., van Oosterom, P., Uitermark, H., Thompson, R. & Hespanha, J. (2009). Transforming the Land Administration Domain Model (LADM) into an ISO standard (ISO19152). In: Proceedings FIG Working Week 2009, Eilat, Israel, 3-8 May 2009.

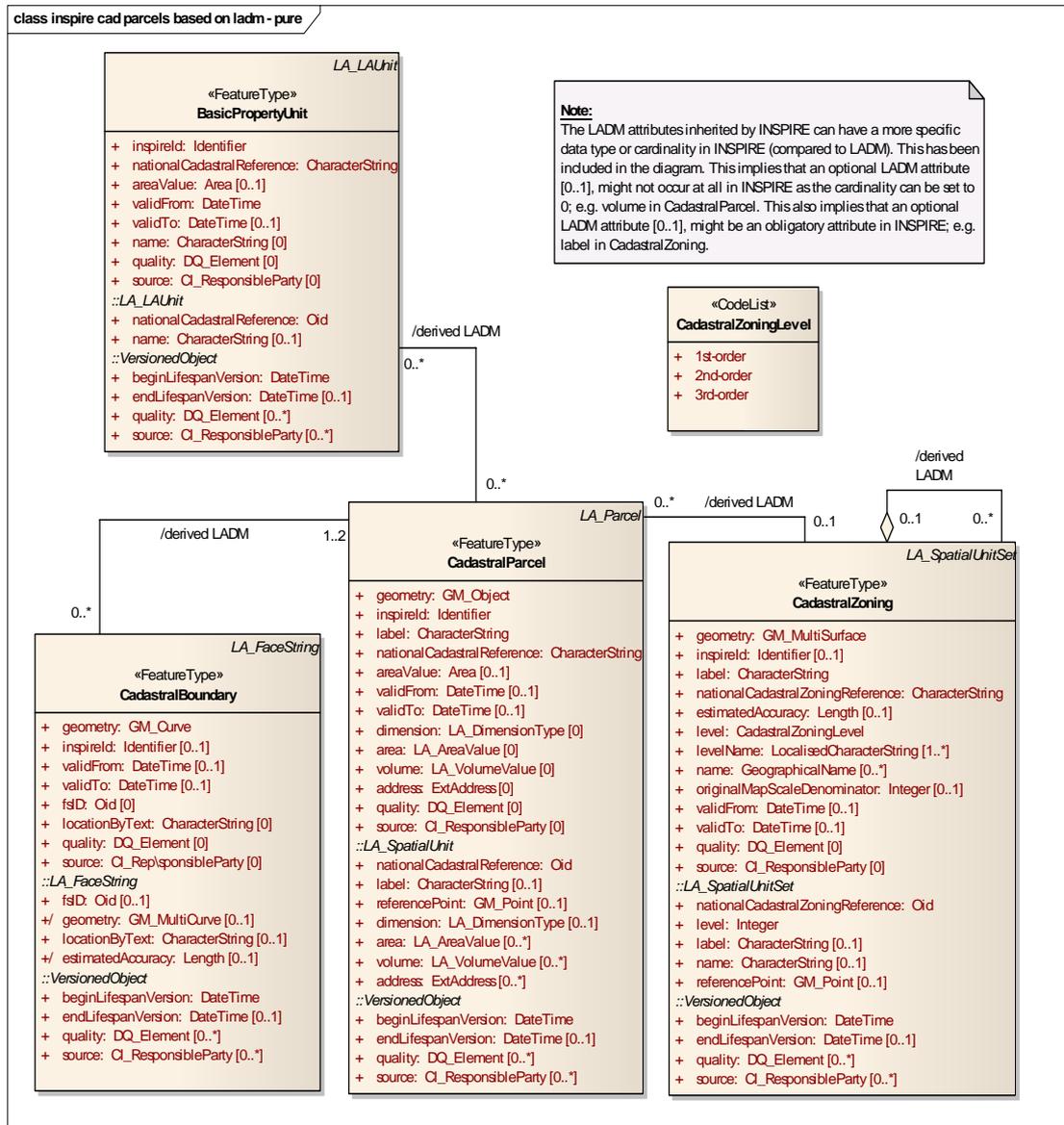


Figure C-1 The INSPIRE cadastral parcel model derived from ISO LADM via inheritance.

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Annex D (informative) **Lineage template and examples**

Annex D is composed of two parts:

- a template for lineage to be used by cadastral data providers
- examples supplied by some countries.

The lineage information should complement the INSPIRE data specification of Cadastral Parcels in the documentation of an INSPIRE compliant cadastral data set. The lineage information should, more especially, explain all the specificities of national cadastral data, even once data have been harmonised for INSPIRE.

This template for lineage is a tool provided to help data producers to supply the lineage information; it may be adapted, if necessary.

The lineage information supplied by some countries as examples is just an exercise done by these countries to illustrate how the template for lineage may/should be filled.

These examples are not binding. It is very likely that the information contained in these examples will evolve when the corresponding data producers will make their data INSPIRE compliant and supply them, through the INSPIRE services.

Note also that these examples may be not quite exhaustive as some information is impossible or at least very difficult to provide before the transformation into INSPIRE specifications has been carried out.

Lineage template for cadastral parcels

Country: Country name

Data provider: Data provider name or acronym

Date: date of filling

Population of spatial objects, attributes and associations

In the column "Obligation" indicate if the provision of the spatial object is mandatory (M) or it can be left void (V)

In the column "Populated", tick (X) the populated elements.

In the column "Comment", put any information you consider as useful or as specific to your data and related to the corresponding spatial object, attribute or association.

INSPIRE element	Obligation	Populated	Comment
CadastralParcel			
geometry	M		
inspireId	M		
nationalCadastralReference	M		
label	M		
referencePoint	V		
areaValue	V		
validFrom	V		
validTo	V		
beginLifespanVersion	V		
endLifespanVersion	V		
association to cadastral zoning	V		
association to basic property unit	V		
association to administrative unit	V		
CadastralZoning			
geometry	M		
inspireId	M		
nationalCadastralZoningReference	M		
label	M		
referencePoint	V		
level	V		
levelName	V		
beginLifespanVersion	V		
endLifespanVersion	V		
name	V		
estimatedAccuracy	V		
originalMapScaleDenominator	V		
validFrom	V		
validTo	V		
association to cadastral zoning upper level	V		
CadastralBoundary			
geometry	M		
inspireId	M		
estimatedAccuracy	V		
validFrom	V		
validTo	V		
beginLifespanVersion	V		
endLifespanVersion	V		
association to cadastral parcel	V		
BasicPropertyUnit			
inspireId	M		
nationalCadastralReference	M		
beginLifespanVersion	V		

endLifespanVersion	V		
areaValue	V		
validFrom	V		
validTo	V		
association to administrative unit	V		

M: mandatory

V: voidable

Selection criteria:

Cadastral parcels

Explain which parcels are published for INSPIRE (e.g. which rights are considered) and which are not.

Cadastral zoning (if any)

Explain which cadastral zonings are published for INSPIRE and which are not.

Cadastral boundaries (if any)

Explain which cadastral boundaries are published for INSPIRE and which are not.

Basic property units (if any)

Explain which basic property units are published for INSPIRE and which are not.

Geographic coverage

Cadastral gaps

Explain if there are cadastral gaps and, if yes, in which cases.

Cadastral overlaps

Explain if there are cadastral overlaps and, if yes, in which cases

Availability of data

Ideally a map (or a link to a map on Internet) showing where cadastral data, compliant with INSPIRE is available + explanations about the empty areas (not yet surveyed or not yet compliant with INSPIRE)

Structure of cadastral information

Explain the structure of cadastral information, e.g. the structure of the national cadastral reference and the different levels of cadastral zonings, if any.

Temporal aspects

Historic data

Explain if cadastral database published for INSPIRE contains only current version or also historic features. If it is the case, explain which (e.g. from when?)

If necessary, give more detailed explanations about temporal attributes.

Life-cycle rules (for parcels):

Give the life-cycle rules of cadastral parcels (i.e. in which cases the national cadastral reference changes, in which cases a new version of cadastral parcel is created and in which cases the national cadastral reference and the life-cycle remain the same).

This information may be provided, using the following table (table A for countries using only parcels and table B for countries using also basic property units).

This template provides the general structure for describing lineage information, please adapt where necessary for an appropriate representation of your situation

Please mark ('X') the consequence on the parcel identification after each specified maintenance activity

Table A

	New spatial object (new national cadastral reference)	New recorded version	No change in lifecycle attributes	Archive old parcel	Remove parcel record from registry	Comment
INDIVIDUAL PARCEL						
all parcel boundaries resurveyed						
part of the perimeter resurveyed (full length of a boundary)						
part of the perimeter resurveyed (only part of a boundary)						
non geometry attributes updated						
correction of registration errors						
SEVERAL PARCELS						
shared boundary resurveyed						
parcel subdivision						
parcel merging						
land consolidation/land distribution						
CADASTRAL ZONING						
upgrade, new survey in the cadastral zoning						
upgrade, data processing in the cadastral zoning (e.g. coordinate transformations)						
cadastral zoning modification (change in cadastral reference)						

If necessary, you may add other cases and/or give more detailed explanations or illustrations (see Spanish example)

Table B.

	New identifier		New recorded version	No change in lifecycle attributes		Archive old geometry	Remove record from registry	Comment
	national cadastral reference	inspireId for parcel		of basic property unit	of parcel			
BASIC PROPERTY UNIT								
all boundaries of parcel(s) resurveyed								
part of the perimeter of parcel(s) resurveyed								
non geometry attributes updated								
correction of registration errors								
parcelling out								
division								
merging								
land consolidation/land distribution								
CADASTRAL ZONING								
upgrade, new survey in the cadastral zoning								
upgrade, data processing in the cadastral zoning (e.g. coordinate transformations)								
cadastral zoning modification (change in cadastral reference)								

If necessary, you may add other cases and/or give more detailed explanations or illustrations (see Spanish example)

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Quality

Topological gaps

Explain if there are topological gaps and in which cases.

Topological overlaps

Explain if there are topological overlaps and in which cases.

Edge-matching

Explain if and how edge-matching with neighbour cadastral data sets has been done.

Positional accuracy

In case accuracy has not been provided neither as attribute (on cadastral zoning or on cadastral boundaries) nor as metadata element, you may provide information about the value of absolute positional accuracy for your cadastral data (e.g. in country X, positional accuracy varies from 1 m to 10 m).

If accuracy is provided as attribute or as metadata element, you may explain more in detail:

- at which level (data set, cadastral zoning, cadastral boundary)
- how it has been estimated or measured.

Any other useful information related to quality

Delivery

Explain shortly the technical conditions for delivery of data (e.g. which formats are available, what are the pre-defined data sets, if any, through which medium data can be made available).

Overview of production method

Explain (shortly) what is the data source (e.g. from which register or from which producer the data comes from), how cadastral data has been initially produced and how it has been transformed for INSPIRE.

Focus on the last step (transformation for INSPIRE), explain which transformations and which tests have been performed.

Any other useful information

Add in this paragraph any other information you consider helpful for users (and not already included in the INSPIRE specification or in previous paragraphs of this template).

Possible example: list of available projections for cadastral data, through transformation services.

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England-Wales

Lineage for cadastral parcels

Country: England-Wales
Data provider: Land registry
Date: June 2009

Population of spatial objects, attributes and associations

INSPIRE element	Obligation	Populated	Comment
CadastralParcel	M	X	
geometry	M	X	
inspireId	M	X	
nationalCadastralReference	M	X	
label	M	X	
referencePoint	V		
areaValue	V		Unable to provide an area value that has any meaning
validFrom	V		
validTo	V		
beginLifespanVersion	V	X	
endLifespanVersion	V		We hold no history at the cadastral parcel level and so have no end date for an object.
association with CadastralZoning	V		
association with BasicPropertyUnit	V		
association with AdministrativeUnit	V		
CadastralZoning	V		Not applicable to England and Wales
geometry	M		
inspireId	V		
nationalCadastralZoningReference	M		
label	M		
referencePoint	V		
level	V		
levelName	V		
beginLifespanVersion	V		
endLifespanVersion	V		
name	V		
estimatedAccuracy	V		
originalMapScaleDenominator	V		
validFrom	V		
validTo	V		
association with CadastralZoning upper level	V		
CadastralBoundary	V		Not applicable to England and Wales
geometry	M		
inspireId	V		
estimatedAccuracy	V		
validFrom	V		
validTo	V		
beginLifespanVersion	V		

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endLifespanVersion	V		
Association with cadastral parcels	V		
BasicPropertyUnit	V		Not applicable to England and Wales
inspireId	M		
nationalCadastralReference	M		
beginLifespanVersion	V		
endLifespanVersion	V		
areaValue	V		
validFrom	V		
validTo	V		
association with administrative units	V		

Selection criteria:

Cadastral parcels

England and Wales will supply Index Polygons (as cadastral parcels) relating to all Title Registrations under INSPIRE. That is, all registrations of interest in Land and Property whether they be freehold, leasehold or commonhold.

Registrations are classified as:

Legal Estates:

- Legal estates in land
- Rentcharge
- Franchise
- Profit a Prendre

Or Legal Interest:

- Caution (against first registrations)

The Cadastral Parcel dataset relates to all Legal Estates

Cadastral zoning (if any)

There are no cadastral zonings applicable for cadastral parcels in England and Wales

Cadastral boundaries (if any)

Cadastral boundaries do not exist for registrations in England and Wales

Basic Property units (if any)

Basic property units do not exist for England and Wales.

Geographic coverage

Cadastral gaps

In England and Wales certain types of land/property ownership need not be registered (e.g. rivers, however we are able to register all land and property above the mean low water (i.e. not in the sea e.g. sea based wind farms) with sufficient evidence of title.

Cadastral overlaps

Cadastral overlaps are a valid part of the data model for England and Wales, e.g. if different titles apply on same part of land.

Availability of data

To be done later.

Structure of cadastral information

To be done later.

Temporal aspects

Historic data

The cadastral data is the current view of registered titles with no historical registrations.

Life-cycle rules (for parcels):

Table A

	New spatial object (new national cadastral reference)	New recorded version	No change in lifecycle attributes	Archive old parcel	Remove parcel record from registry	Comment
INDIVIDUAL PARCEL						England and Wales have a slightly different approach as the parcel does not represent a part of the surface of the earth, it represents the indicative extent of a title registration.
Parcel created	x					New spatial object created at time of registration
Parcel updated (parcel boundary change but still represents same registration)			x			A change to the parcel boundary which does not represent a significant change to the registered extent.
Parcel retired					x	Where registered polygons are closed.
SEVERAL PARCELS						
Parcel merged			x			Where registered polygons within a title are combined to form one larger polygon.
Parcel split			x			Where registered polygons within a title are separated to form smaller polygons.

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Quality

Topological gaps

No topological gaps.

Topological overlaps

No topological overlaps (e.g. there should be no duplicated polygons within the dataset).

Edge-matching

Not applicable.

Positional accuracy

Cadastral Parcel extents are defined by the Title registration document and captured relative to Ordnance Survey large scale mapping (LandLine / MasterMap). The OS large scale mapping is scaled at 1:1,250 in urban areas, 1:2,500 in semi-rural and 1:10,000 in rural locations.

The polygon extent is captured to 'general boundaries', which means that the exact line of the legal boundary (legal extent of ownership) in relation to the physical boundary (mapped depiction of registered extent) has not been determined.

Delivery

To be defined later.

Overview of production method

To be defined later.

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Finland

Lineage for cadastral parcels

Country: Finland

Data provider: NLS

Date: 30.06.2009, draft 2

Population of spatial objects, attributes and associations.

INSPIRE element	Obligation	Populated	Comment
CadastralParcel	M	x	
geometry	M	x	Single area
inspireId	M	x	Not populated now. To be decided later.
nationalCadastralReference	M	x	e.g. "42940300120022"
label	M	x	e.g. "429-403-12-22"
referencePoint	V	x	
areaValue	V	-	Area is registered only for BPU
validFrom	V	-	Valid dates are registered only for BPU
validTo	V	-	
beginLifespanVersion	V	x	Date of insert or update to the database
endLifespanVersion	V	-	Retired parcels will be not delivered to INSPIRE as they have no area.
association to cadastral zoning	V	-	
association to basic property unit	V	x	
association to administrative unit	V	-	Association is registered only for BPU
CadastralZoning	V	-	
geometry	M		
inspireId	V		
nationalCadastralZoningReference	M		
label	M		
referencePoint	V		
level	V		
levelName	V		
beginLifespanVersion	V		
endLifespanVersion	V		
name	V		
estimatedAccuracy	V		
originalMapScaleDenominator	V		
validFrom	V		
validTo	V		
association to CadastralZoning upper level	V		
CadastralBoundary	V	-	
geometry	V		
inspireId	V		
estimatedAccuracy	V		
validFrom	V		
validTo	V		
beginLifespanVersion	V		
endLifespanVersion	V		
association with cadastral parcels	V		
BasicPropertyUnit	V	x	
inspireId	M	x	
nationalCadastralReference	M	x	e.g. "42940300120022"
beginLifespanVersion	V	-	Not in database, always unknown

INSPIRE	Reference: INSPIRE_DataSpecification_CP.doc1.pdf		
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endLifespanVersion	V	-	Not in database, always unknown
areaValue	V	x	Total area (land and water) of basic property unit
validFrom	V	x	Date of registration, may be missing exceptionally (old data)
validTo	V	x	Date of ceasing, may be missing exceptionally (old data), these BPU's will be not delivered to INSPIRE
association to administrative units	V	x	Municipality

Selection criteria:

Cadastral parcels

All parcels except those which should be renovated in the cadastral database will be published for INSPIRE.

Cadastral zoning (if any)

There are no such kind of cadastral zonings in Finland which are inside the scope of INSPIRE.

Cadastral boundaries (if any)

Cadastral boundaries do not have the information of estimated accuracy in Finland. Therefore cadastral boundaries are not published for INSPIRE.

Basic Property units (if any)

All valid and officially registered basic property units which are in the scope of INSPIRE will be published for INSPIRE.

Geographic coverage

Cadastral gaps

No. All land and water areas should be covered by parcels in register.

Cadastral overlaps

No.

Availability of data

All country except the topological gaps.

Structure of cadastral information

Cadastral data is structured by municipalities.

The national cadastral reference is structured as such:

municipality number (3d)

- cadastral division number (3d)
- group number (4d)
- sequence number (Ad)

Temporal aspects

Historic data

The data published for INSPIRE contains only valid data.

Ceased basic property units are officially in cadastral register and can be published (if queried) without associations for INSPIRE.

History of life-cycle of basic property units (both valid and ceased) is registered and available in the national cadastral register. History of spatial data does not exist but the view of register in certain date is available (boundaries, labels) from the national cadastral register.

Life-cycle rules (for parcels):

In Finland life-cycle rules are for basic property units.

Table B. How the national maintenance activities effects to information published for INSPIRE.

	New identifier		New recorded version	No change in lifecycle attributes		Archive old geometry	Remove record from registry	Comment
	national cadastral reference	inspireId for parcel		of basic property unit	of parcel			
BASIC PROPERTY UNIT								
all boundaries of parcel(s) resurveyed	No	Maybe	-	-	Maybe	No	No	
part of the perimeter of parcel(s) resurveyed	No	Maybe	-	-	Maybe	No	No	
non geometry attributes updated	No	Maybe not	-	-	Yes	No	No	
correction of registration errors	Maybe	Maybe	-	-	Maybe	No	Maybe	
parcelling out	New yes and old maybe	New parcel usually yes, old parcels maybe	-	-	Yes and no	No	No	New basic property units are given new id, changed basic property unit usually preserves old id.
division	Yes	Maybe	-	-	Maybe	No	No	
merging	Usually yes	Maybe	-	-	Maybe	No	No	
land consolidation/land distribution	Usually no	Maybe	-	-	Maybe	No	No	
consolidation of municipalities	Yes	Maybe	-	-	Maybe	No	No	National cadastral references include nowadays municipality code. If code is changed (new for all municipalities or one old for all) those national cadastral references are also changed.

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Quality

Topological gaps

Yes. There are some areas that should be renovated (valid parcels with valid associations to valid basic property units are missing now).

Topological overlaps

No. All cadastral data is maintained in one database and the maintenance application takes care of that there should be no topological overlaps exist.

Edge-matching

All cadastral data is maintained in one database and parcels are made of boundaries which are common to both neighbouring parcels.

Edge-matching with neighbour countries not yet considered.

Positional accuracy

To be done later.

Delivery

On-line connection with INSPIRE CP xml/gml -format. To be decided later.

Overview of production method

To be done later.

Any other useful information

All date information is recorded in date level and does not include timestamp.

Associations for ceased objects are not delivered.

France

Lineage for cadastral parcels

Country: France

Data provider: National Geographic Institute (IGN)

Date: June 2009

Population of spatial objects, attributes and associations

INSPIRE element	Obligation	Populated	Comment
CadastralParcel	M	X	
geometry	M	X	2D data
inspireId	M	X	
nationalCadastralReference	M	X	
label	M	X	
referencePoint	V	X	
areaValue	V		
validFrom	V		
validTo	V		
beginlifespanVersion	V		
endlifespanVersion	V		
association to CadastralZoning	V	X	
association to BasicPropertyUnit	V		
association to AdministrativeUnit	V	X	
CadastralZoning	V	X	
geometry	M	X	2D data
inspireId	V	X	
nationalCadastralZoningReference	M	X	
label	M	X	
referencePoint	V		
level	V	X	
levelName	V	X	
beginlifespanVersion	V	X	
endlifespanVersion	V		
name	V	X	
estimatedAccuracy	V	X	
originalMapScaleDenominator	V	X	
validFrom	V		
validTo	V		
association to CadastralZoning upper level	V	X	
CadastralBoundary	V		
geometry	M		
inspireId	V		
estimatedAccuracy	V		
validFrom	V		
validTo	V		
beginlifespanVersion	V		
endlifespanVersion	V		
Association to cadastral parcels	V		
BasicPropertyUnit	V		
inspireId	M		
nationalCadastralReference	M		
beginLifespanVersion	V		
endLifespanVersion	V		
areaValue	V		
validFrom	V		
validTo	V		
association with administrative units	V		

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Selection criteria:

Cadastral parcels

Cadastral parcels show the apparent ownership (ownership, usufruct, leasehold, etc). No conclusiveness of boundaries and extent.

Are published for INSPIRE all cadastral parcels available in vector format, except cadastral parcels with several national cadastral references. These cadastral parcels with several references are mistakes in the initial French cadastral database, they represent less than 1% of all parcels.

Cadastral zoning (if any)

Are published for INSPIRE all cadastral zonings containing vector cadastral parcels. Cadastral zonings containing only raster parcels or no parcels at all (public domain) are not published for INSPIRE.

Geographic coverage

Cadastral gaps

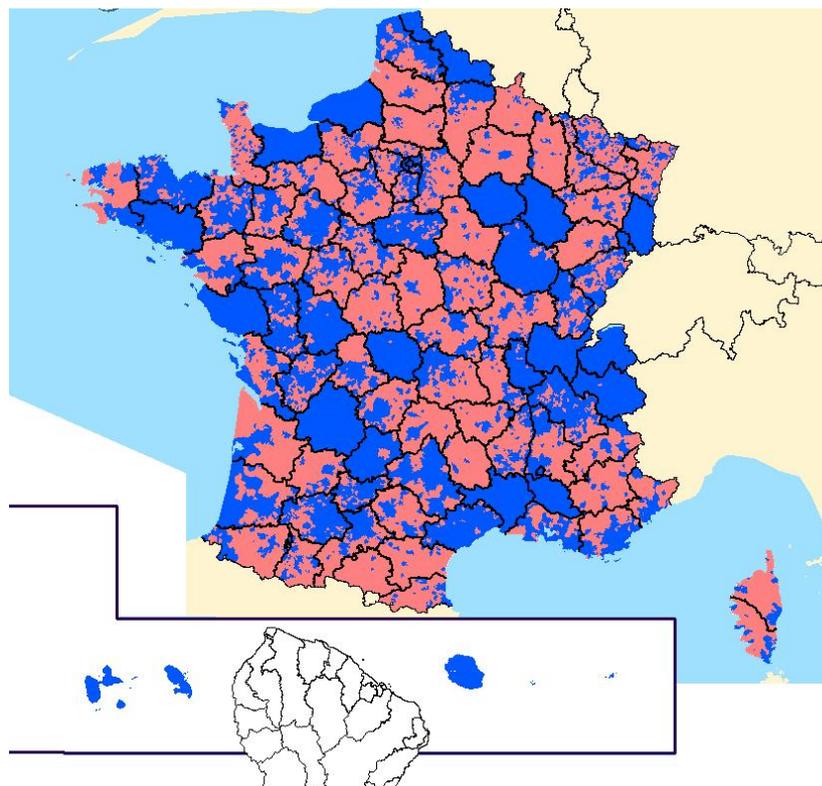
Public domain (roads, rivers, sea) is generally not considered as cadastral parcels.

Cadastral overlaps

No cadastral overlaps

Availability of data

Only half of the territory is covered by vector cadastral data. The remaining part of the territory is to be covered in several years. Municipalities covered with vector cadastral parcels in December 2009 are coloured in blue on the following map.



Structure of cadastral information

INSPIRE cadastral parcels come from cadastral maps, organised in the same way on the whole territory:

- cadastral zoning level one is the municipality
- cadastral zoning level two is the cadastral sheet (carrying the information about estimated accuracy and original map scale)

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The nationalCadastralReference is structured as such:

- code of the municipality : 5 characters
- code of the "arrondissement municipal" :3 characters
- or code of the "absorbed municipality" (3 characters) : code of previous municipality (for the case of merging municipalities) ; default value = 000
- code of "cadastral sheet" : 2 characters
- parcel number : 4 characters

Temporal aspects

Historic data

No historic data. Only current version.

Life-cycle rules (for parcels):

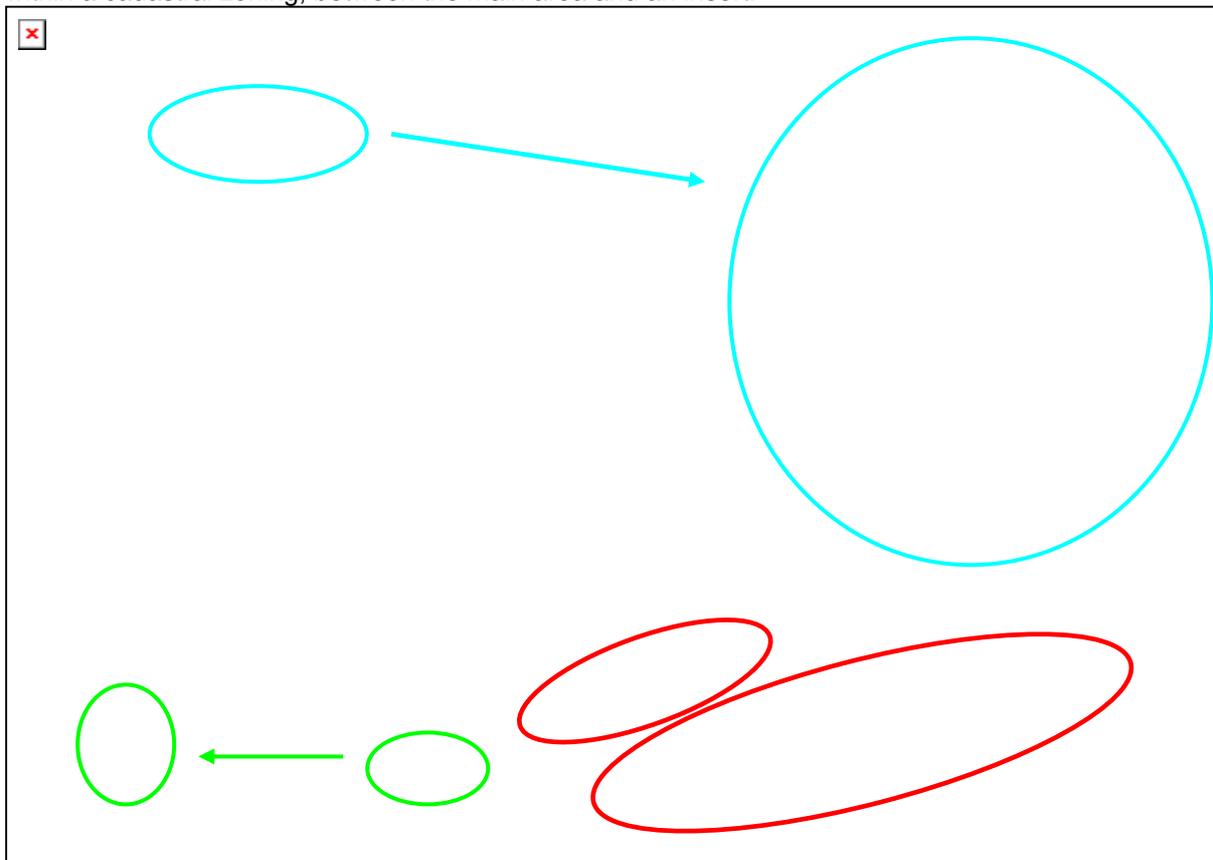
Table A

	New spatial object (new national cadastral reference)	New recorded version	No change in lifecycle attributes	Archive old parcel	Remove parcel record from registry	Comment
INDIVIDUAL PARCEL						
all parcel boundaries resurveyed			X			
part of the perimeter resurveyed (full length of a boundary)			X			
part of the perimeter resurveyed (only part of a boundary)			X			
non geometry attributes updated						We do not know what would happen in this case
correction of registration errors	X					
SEVERAL PARCELS						
shared boundary resurveyed			X			
parcel subdivision	X				X	new reference to all new parcels
parcel merging	X				X	new reference to the new parcel
land consolidation/land distribution	X				X	new reference to all new parcels
Expropriation					X	the parcel may disappear (if it becomes public domain)
CADASTRAL ZONING						
upgrade, new survey in the cadastral zoning	X				X	
upgrade, data processing in the cadastral zoning (e.g. coordinate transformations, update of edge matching)			X			
cadastral zoning modification (change in cadastral reference)	X				X	

Quality

Topological gaps

Topological gaps may occur between cadastral parcels at the boundaries of cadastral zonings or within a cadastral zoning, between the main area and an insert.



E.g. On this cadastral sheet, there are 3 inserts : when digitalised, topological gaps may occur at their border with the main area.

Topological overlaps

Topological overlaps may occur between cadastral parcels at the boundaries of cadastral zonings or within a cadastral zoning, between the main area and an insert.

Edge-matching

Cadastral data sets are processed at the departemental level. So topological gaps and overlaps between these data sets may remain. Currently no edge-matching is done with neighbour countries.

Positional accuracy

The attribute estimatedAccuracy on cadastral zonings has been filled in the following way:

Category of cadastral map	"plan mis à jour"	other
Estimated accuracy	5 m	1 m

Delivery

To be decided later.

Overview of production method

DGFIP (General Direction of Public Finances) is responsible for cadastral information. Cadastral parcels are captured both from stereo-plotting and from field survey.

Cadastral information has generally been captured in paper format, except the most recent plans (since 1998) which have been directly registered in digital formats. Some of these cadastral maps (around one half) are quite old, they have been captured during XIX century and are generally of poor quality.

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These cadastral maps have been then digitalised, either directly in vector format (generally by local governments) or in raster format (by DGFIP).

The data provider, IGN (National Geographic Institute) has then made a mosaic of these cadastral maps, using homologous points in topographic database (BD TOPO) to provide georeferencing. On some parts of the territory,, IGN is also transforming raster data into vector data by semi-automatic vectorisation.

The result of this process is called BD Parcellaire, whose specifications are available on http://professionnels.ign.fr/DISPLAY/000/506/446/5064462/BDPARCELLAIRE_specification.pdf

Finally, BD Parcellaire data will be transformed to be made compliant with INSPIRE:

- coordinate transformation from RGF93 – Lambert-93 to ETRS89 – geographic coordinates
- schema translation from BD Parcellaire application schema to INSPIRE one.

RGF93 being national realisation of ETRS89, there has been no lost of accuracy due to coordinate transformation.

Hungary

Lineage for cadastral parcels

Country: Hungary
 Data provider: FÖMI
 Date: June 2009

Population of spatial objects, attributes and associations

INSPIRE element	Obligation	Populated	Comment
CadastralParcel	M	X	
geometry	M	X	
inspireId	M	X	
nationalCadastralReference	M	X	
label	M	X	
referencePoint	V	X	
areaValue	V	X	
validFrom	V	?	
validTo	V	?	
beginLifespanVersion	V	X	
endLifespanVersion	V	X	
association with CadastralZoning	V	X	
association with BasicPropertyUnit	V		
association with AdministrativeUnit	V		
CadastralZoning	V	X	
geometry	M	X	
inspireId	V	X	
nationalCadastralZoningReference	M	X	
label	M	X	
referencePoint	V		
level	V	X	
levelName	V	X	
beginLifespanVersion	V	X	
endLifespanVersion	V	X	
name	V	X	
estimatedAccuracy	V	X	
originalMapScaleDenominator	V	X	
validFrom	V	?	
validTo	V	?	
association with CadastralZoning upper level	V	X	
CadastralBoundary	V		All information at Cadastral Parcel level
geometry	V		
inspireId	V		
estimatedAccuracy	V		
validFrom	V		
validTo	V		
beginLifespanVersion	V		
endLifespanVersion	V		
Association with cadastral parcels	V		
BasicPropertyUnit	V		
inspireId	M		
nationalCadastralReference	M		
beginLifespanVersion	V		
endLifespanVersion	V		

INSPIRE	Reference: INSPIRE_DataSpecification_CP_v3.0.1.pdf		
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areaValue	V		
validFrom	V		
validTo	V		
association with administrative units	V		

Selection criteria:

Cadastral parcels

The cadastral parcels which are single areas on Earth surface, not cut off by administrative or built-up area boundary, under unique or homogenous ownership or trusteeship rights are published for INSPIRE.

The parts of roads, squares, railroads and canals with branches and crossings, which are not cut off by administrative or built-up boundaries — except national roads, railroads and navigable canals — under unique ownership or trusteeship rights - are also published for INSPIRE, as cadastral parcels.

Cadastral zoning (if any)

All cadastral zonings are published for INSPIRE.

Cadastral boundaries (if any)

None

Basic Property units (if any)

None

Geographic coverage

Cadastral gaps

In Hungary there are no cadastral gaps (100% coverage)

Cadastral overlaps

In Hungary there are no cadastral overlaps

Availability of data

In Hungary, all the cadastral parcel data are available and public for everyone (approx. 7,3 million CP are existing in Hungary)

Structure of cadastral information

INSPIRE cadastral parcels come from digital cadastral databases (integrated with the legal part), organised in the same way on the whole territory:

cadastral index set level one is the settlement (each database unit is the settlement)

cadastral index set level two is the type of a single area within the settlement (built-up, garden or rural areas, corresponding to the information about estimated accuracy and original surveying)

The nationalCadastralReference is structured as such:

statistic code of the settlement : 4 digits (0 at first digit is allowed) (e.g. 0214)

parcel identifier : max. 6 digits (in the case of rural areas parcel the first digit is 0) (e.g. 256 or within rural areas : 056)

subdivided parcels : parcel_id "/" max 3 digits (e.g. 0214256/23 or 0214056/2)

Temporal aspects

Historic data

For INSPIRE, all historic data are available in digital form since 2007.

Life-cycle rules (for parcels):

1. new individual delimitation : same cadastral reference as before (if the parcel existed before)
2. new (general) survey : if possible the older cadastral reference is not changed, but the for new ones, new cadastral reference
3. merging or un-merging of municipalities : new cadastral references for new parcels, but if it is possible the older ones are not changed
4. Parcel subdivision : new cadastral references to all new parcels, the subdivided reference flagged as deleted
5. Parcel merging : no new cadastral reference to the new parcel, the smallest older reference would be the new one
6. Expropriation : same rules as at parcel subdivision and parcel merging

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Examples: 2 parcels with reference "256" and "512"

Subdivision of "256" to 2 new parcels. New references: 256/1 and 256/2

Subdivision of "512" to 3 new parcels: 512/1, 512/2 and 512/3

Merging the two parcels into one. The new parcel reference is "256", since 256 is less than 512.

Quality

Topological gaps

In Hungary no topological gaps are allowed in CP database (including cadastral index sets)

Topological overlaps

In Hungary no topological overlaps are allowed in CP database (including cadastral index sets)

Edge-matching

Edge-matching with neighbour countries to be considered later.

Positional accuracy

The attribute estimatedAccuracy on cadastral index sets has been filled in the following way:

Cadastral Index Set	built-up areas	garden areas	rural areas
Estimated accuracy	30 cm	60 cm	1 m

Delivery

Delivery for INSPIRE to be defined later.

Overview of production method

In Hungary the Land Office Network (20 County and 120 District Land Offices and Institute of Geodesy, Cartography and Remote Sensing (FÖMI)) are responsible for the daily updating of Unified Land Registry (including cadastral maps).

Cadastral information are stored in standardized databases integrated with legal data. Original cadastral information derived from field surveying and in some parts of the country, for rural areas, from stereophotogrammetric measurements. All the original paper form maps have been digitised during the last 6 years (for the 90% of the country) and databases developed from new field surveying for the 10% of the country.

All the digital maps have been uploaded into a standardized, integrated cadastral, land registry information system (DATR-TAKAROS) developed by FÖMI. The project will be finished by the end of 2009. Hungarian INSPIRE service will be available with the usage of DATR-TAKAROS for the whole territory of the country.

Netherlands

Lineage for cadastral parcels

Country: Netherlands
 Data provider: Kadaster
 Date: July 2009

Population of spatial objects, attributes and associations

INSPIRE element	Obligation	Populated	Comment
CadastralParcel	M	X	
geometry	M	X	
inspireId	M	X	
nationalCadastralReference	M	X	
label	M	X	
referencePoint	V	X	
areaValue	V	X	
validFrom	V	X	
validTo	V	X	
beginLifespanVersion	V	X	
endLifespanVersion	V	X	
association to CadastralZoning	V		
association to BasicPropertyUnit	V		
association to AdministrativeUnit	V		
CadastralZoning	V		Implicit based on hierarchical topological structure. Thus not in the cadastral theme of INSPIRE.
geometry	M		
inspireId	V		
nationalCadastralZoningReference	M		
label	M		
referencePoint	V		
level	V		
levelName	V		
beginLifespanVersion	V		
endLifespanVersion	V		
name	V		
estimatedAccuracy	V		
originalMapScaleDenominator	V		
validFrom	V		
validTo	V		
Association to CadastralZoning upper level	V		
CadastralBoundary	V	X	
geometry	M	X	
inspireId	V	X	
estimatedAccuracy	V	X	
validFrom	V	X	Creation date in database
validTo	V	X	Creation date in database
beginLifespanVersion	V	X	
endLifespanVersion	V	X	
Association to cadastral parcels	V	X	
BasicPropertyUnit	V		
inspireId	M		
nationalCadastralReference	M		
beginLifespanVersion	V		

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endLifespanVersion	V		
areaValue	V		
validFrom	V		
validTo	V		
association with administrative units	V		

Selection criteria:

Cadastral parcels

All cadastral parcels are published.

Cadastral zoning (if any)

No explicit cadastral zonings in NL.

Cadastral boundaries (if any)

All cadastral boundaries are published with reference to nationalCadastralReference of the cadastral parcels on either side.

Basic Property units (if any)

None.

Geographic coverage

Cadastral gaps

No gaps.

Cadastral overlaps

No overlaps.

Availability of data

Cadastral map has a full 100% coverage of the Netherlands.

Structure of cadastral information

A cadastral parcel is identified by a unique cadastral reference:

- code for cadastral municipality (3l + 2d)
- section code (2l)
- parcel number (5d)

Example: APD00 F 2345

Temporal aspects

Historic data

Database stores history since 1999.

History can be retrieved by backtracing deeds and field sheets in public registers (also prior to 1999).

This is outside the INSPIRE data.

Creation of a new parcel is trigger for a new identifier.

Life-cycle rules (for parcels):

Daily updates based on measurements initiated by deeds where whole parcels are divided or merged by requests from parcel owners and merging of parcels. Alternatively land consolidation (also triggered by a 'large' deed) will result in a reparcelation of larger area's, i.e. many new parcels and boundaries (and also many old/historic parcels and boundaries).

As a general rule when the geometry of a parcel changes not due to quality improvement of map), the new id's will be assigned (in map and registry, which are in synchronisation).

Table A

	New spatial object (new national cadastral reference)	New recorded version	No change in lifecycle attributes	Archive old parcel	Remove parcel record from registry	Comment
INDIVIDUAL PARCEL						
all parcel boundaries resurveyed	Not applicable see comment	Not applicable see comment	Not applicable see comment	Not applicable see comment	Not applicable see comment	All parcel boundaries relate to two cadastral parcels. Changing one parcel boundaries changes the perimeter of those two parcels.
part of the perimeter resurveyed (full length of a boundary)	Not applicable see comment	Not applicable see comment	Not applicable see comment	Not applicable see comment	Not applicable see comment	All parcel boundaries relate to two cadastral parcels. Changing one parcel boundaries changes the perimeter of those two parcels.
part of the perimeter resurveyed (only part of a boundary)	Not applicable see comment	Not applicable see comment	Not applicable see comment	Not applicable see comment	Not applicable see comment	All parcel boundaries relate to two cadastral parcels. Changing one parcel boundaries changes the perimeter of those two parcels.
non geometry attributes updated		X		X		
correction of registration errors		X		X		
SEVERAL PARCELS						
shared boundary resurveyed		X		X		
parcel subdivision	X	X		X		
parcel merging	X	X		X		
land consolidation/land distribution	X	X		X		Not all spatial objects are renewed.

INSPIRE	Reference: INSPIRE_DataSpecification_CP_v3.0.1.pdf		
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Quality

Topological gaps

No gaps.

Topological overlaps

No overlaps.

Edge-matching

Because of historic reasons (local coordinate system and local map production), different parts (cadastral municipalities) did not fit well. These issues were first resolved within the cadastral offices level while digitising all separate paper cadastral maps (map boundaries) (more or less Dutch provinces) and later the edge matching between provinces was corrected in a specific campaign in the early 2000's (project 'kaartverbetering' using different sources, including large scale topographic maps of recent date as reference for 'the reality').

Edge-matching with neighbour countries: map-differences are the result of coordinate transformations. The national border boundary coordinates are in ETRS89. In turn the countries take care of the necessary measurements for reconstructing the existing boundaries in the field and send the results to their neighbour countries. National boundaries with Germany and Belgium are described in ETRS and transformed to co-ordinates in the national reference systems (causing small shifts, e.g. 1 cm or 2 cm). The national boundaries are also provincial, municipal and parcel boundaries. The parcel boundaries which are equal to national boundaries are represented in the cadastral map database with the transformed co-ordinates as agreed in ETRS between the involved boundary commissions. It is unknown if the same is valid for the cadastral map database in Belgium and Germany. If this would be valid a seamless map would be constructable without too many complications; e.g. in ETRS.

Note 1: the Belgium Cadastre is a taxation cadastre which does not cover state lands.

Note 2: the Belgium territory has a set of exclaves in the Netherlands. Within those exclaves there can be Dutch exclaves again.

Positional accuracy

- 20 – 40 cm (urban - rural areas) relative accuracy in the cadastral map in metadata (history can be retrieved by backtracing deeds and field sheets in public registers)
- Scale 1:1.000 (20 cm accuracy – urban area) to scale 1:2.000 (40cm accuracy – rural area)

Delivery

Direct access to cadastral data via Web services

More detailed delivery conditions to be defined later.

Overview of production method

Unambiguous and homogeneous geodetic reference frames are essential to the proper determination of locations and heights. The reference frames used in the Netherlands are the Rijksdriehoekmeting (RD) for locations and the Normaal Amsterdamse Peil (NAP) for heights. The RD has traditionally been managed by the Kadaster; the NAP by Rijkswaterstaat

The national geodetic reference frames (RD) has 1 :1 conversion to ETRS89

RDNAPTRANS™ is the official and accurate transformation between the Dutch reference systems for location (RD : Rijksdriehoeksmeting) and height (NAP : Normaal Amsterdams Peil) and the European Terrestrial Reference System 1989 (ETRS89). De parameters for this transformation are freely available for software producers and other interested parties.

For transformations better than 25 centimetres, the transformation RDNAPTRANS™ is a must.

Any other useful information

In the Netherlands the cadastral map is mainly used as an index map, giving information on the relations between parcels. The legal information on individual boundaries is documented in field sheets.

The cadastral map is a graphical depiction and has been brought in accordance with national base map (GBKN)

Norway

Lineage for cadastral parcels

Country: Norway

Data provider: Norwegian Mapping and Cadastre Authority (NorMCA)

Date: 2009-06-26

Population of spatial objects, attributes and associations

INSPIRE element	Obligation	Populated	Comment
CadastralParcel	M	X	
Geometry	M	X	2D data
inspireId	M	X	Not populated now. To be decided how it is determined.
nationalCadastralReference	M	X	Not unique
Label	M	X	
referencePoint	V	X	
areaValue	V	X	
validFrom	V		
validTo	V		
beginLifespanVersion	V		
endLifespanVersion	V		
association to CadastralZoning	V		
association to BasicPropertyUnit	V	X	
association to AdministrativeUnit	V	X	
CadastralZoning	V		Not used in Norway.
Geometry	M		
inspireId	V		
nationalCadastralZoningReference	M		
Label	M		
referencePoint	V		
Level	V		
levelName	V		
beginLifespanVersion	V		
endLifespanVersion	V		
name	V		
estimatedAccuracy	V		
originalMapScaleDenominator	V		
validFrom	V		
validTo	V		
association to CadastralZoning upper level	V		
CadastralBoundary	V	X	
geometry	M	X	
inspireId	V	X	Not populated now. To be decided how it is determined.
estimatedAccuracy	V	X	Not in database, but may be derived.
validFrom	V		
validTo	V		
beginLifespanVersion	V		
endLifespanVersion	V		
Association to cadastral parcels	V	X	
BasicPropertyUnit	V	X	
inspireId	M	X	
nationalCadastralReference	M	X	
beginLifespanVersion	V		
endLifespanVersion	V		

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areaValue	V		
validFrom	V		
validTo	V		
Association to administrative units	V	X	

Selection criteria:

Basic Property units

All basic property unit types except "anleggseiendom" (construction unit) are published for INSPIRE. Construction units are for instance Buildings on poles above earth surface, and tunnels or parking areas below earth surface.

Cadastral parcels

All parcels will be published for INSPIRE except for parcels belonging to basic property unit type "anleggseiendom" (construction unit). This is volume parcels below or above earth surface. Some parcels may miss important information from national cadastre. For instance may parcels associated to more than one basic property unit be of two kinds. One is parcels under joint ownership (legal), the other due to missing registration of boundaries (to be improved/corrected).

Cadastral boundaries (if any)

All ordinary boundaries associated with parcels mentioned above are published for INSPIRE.

Geographic coverage

Cadastral gaps

Some roads, rivers, lakes, and sea are generally not considered as cadastral parcels. Some of them are registered in national cadastre, but are given fictitious basic property unit identification. Some areas (most in mountainous area) are not registered in cadastre yet.

Cadastral overlaps

There are no cadastral overlaps as construction units are omitted.

Availability of data

Whole Norway is covered with cadastral parcels. Some mountainous areas are not covered. All parcels are available through the national cadastral system called "Matrikkelen".

Structure of cadastral information

INSPIRE cadastral parcels come from the national cadastral system administrated by the Norwegian Mapping and Cadastre Authority. The input may come from different sources. In rural areas most information is digitized from old maps, in urban areas most information come from original measurements. From 1980 all information even in rural areas is based on original measurements. Accuracy information is mainly stored on boundary points, but may be estimated on boundaries. Cadastral index sets are not used in Norway. The cadastre also includes information on addresses and buildings.

The nationalCadastralReference is structured as such:

- code of the municipality : 5 digits
- code of land number: 5 digits
- code of title number: four digits
- code of lease number: four digits (used for leased area only)
- code of unit number: four digits (used for what in Norway is called "section". This is a right of use to a part of a building. The BPU (or parcels) are owned in joint ownership, but each unit may have right to use a part of the BPU. One or more units may therefore have one or more parcels, even if the ownership is shared. Units without parcels (most properties of this kind) will be omitted and all the sectioned area (BPU) will be shown as one (or sometimes several) parcel(s).

Temporal aspects

Historic data

No historic data on geometry yet, only current version. Future versions will include historic data.

Life-cycle rules (for parcels):

INSPIRE	Reference: INSPIRE_DataSpecification_CP_v3.0.1.pdf		
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All official ID's refer to basic property unit (BPU). Internal ID's on parcel level exists, but are not persistent. There is no lifecycle info on geometry in current version of the cadastral system. A kind of lifecycle information is stored on all feature types, but not the geometry itself.

1. New individual delimitation : same cadastral reference (to BPU)
2. New (general) survey : same cadastral reference (to BPU)
3. Merging or un-merging of municipalities: new cadastral references for all parcels (reference to BPU). Internal ID's on parcels may be preserved.
4. Parcel splitting (new BPU): new cadastral references to all new parcels(reference to BPU).
5. Parcel merging (One BPU remains): reference to BPU (remaining) is preserved. Internal ID's on parcel level
6. Expropriation: the parcel may be merged with another BPU, or a new BPU is established with its cadastral reference.
7. Partitioning: In INSPIRE context the reference to BPU remains the same. Partitioning according to Norwegian legislation is not covered by INSPIRE.

Table A

	New spatial object (new national cadastral reference)	New recorded version	No change in lifecycle attributes	Archive old parcel	Remove parcel record from registry	Comment
INDIVIDUAL PARCEL						
all parcel boundaries resurveyed			X			
part of the perimeter resurveyed (full length of a boundary)			X			
part of the perimeter resurveyed (only part of a boundary)			X			
non geometry attributes updated			X			
correction of registration errors			X			
SEVERAL PARCELS						
shared boundary resurveyed			X			
parcel subdivision			X			The original parcel will keep its CR.
parcel merging			X			CR from one of the parcels is preserved.
land consolidation/land distribution			X			
CADASTRAL ZONING						
upgrade, new survey in the cadastral zoning						
upgrade, data processing in the cadastral zoning (e.g. coordinate transformations)						
cadastral zoning modification (change in cadastral reference)						

Quality

Topological gaps

Topological gaps may occur in rural areas, and where data capture is not finished.

Topological overlaps

Topological overlap is not allowed.

Edge-matching

The national cadastre is seamless nationwide. Edge-matching will then not be necessary. Edge-matching with neighbour countries not yet considered.

Positional accuracy

The attribute estimated Accuracy on cadastral boundaries has been filled in the following way:

Category of cadastral map	Topological map	Economical map	Technical map	Other (measurements)
Estimated accuracy	50 m	2 m	0.36 m	SDEV

Delivery

To be decided later, but data will probably be provided as Web Feature Services (WFS).

Overview of production method

The municipalities are responsible for cadastral information. This includes the legal part of property management, data capture and database registration. The Norwegian Mapping and Cadastre Authority (NorMCA) is responsible for developing and managing the cadastral system. Since April 2009 all municipalities use the same cadastral system. Maintenance is done by use of clients developed by different software companies. NorMCA has developed a client available for users without any costs.

Cadastral information has generally been captured in paper format, except BPU's established since 1980 which are based on original measurements..

These cadastral maps (economical or technical maps) have then been digitalised in vector format by the municipalities or NorMCA.

Since late 2007 cadastral maps (covering one municipality) and the register are transformed into the new cadastral system. Data is available as WEB-services, WFS and WMS. Coordinates are stored in ETRS89 UTM zone 32, 33 and 35.

Spain

Lineage for cadastral parcels

Country: Spain

Data provider: Spanish General Directorate for Cadastre

Date: June 2009

Population of spatial objects, attributes and associations

INSPIRE element	Obligation	Populated	Comment
CadastralParcel	M		
Geometry	M	x	
inspireId	M		
nationalCadastralReference	M	x	
Label	M	x	
referencePoint	V	x	
areaValue	V	x	
validFrom	V	x	Derecho.Desde Date of the business or act
validTo	V		
beginlifespanVersion	V	x	
endlifespanVersion	V	x	
Association to CadastralZoning	V	x	
Association to BasicPropertyUnit	V		
Association to AdministrativeUnit	V	x	
CadastralZoning	V		
Geometry	M	x	This entity are blocks in urban and polygons in rural areas
inspireId	V		
nationalCadastralZoningReference	M	x	
Label	M	x	
referencePoint	V	x	
Level	V	X	
levelName	V	x	
beginlifespanVersion	V	x	
endlifespanVersion	V	x	
Name	V		
estimatedAccuracy	V	X	
originalMapScaleDenominator	V	x	
validFrom	V	X	
validTo	V	x	
Association to CadastralZoning upper level	V	x	
CadastralBoundary	V		
Geometry	M		
inspireId	V		
estimatedAccuracy	V		
ValidFrom	V		
validTo	V		
beginlifespanVersion	V		
endlifespanVersion	V		
Association to cadastral boundaries	V		
BasicPropertyUnit	V		
inspireId	M		

nationalCadastralReference	M		
beginLifespanVersion	V		
endLifespanVersion	V		
areaValue	V		
validFrom	V		
validTo	V		
Association to administrative units	V		

Selection criteria:

Cadastral parcels

The Cadastral Parcel is defined as the portion of land delimited by a closed line, owned by a single individual or by several.

The Spanish Cadastre distinguishes between two basic types of properties, based on the type of land on which they are located and the applicable assessment model: these are urban real estate and rural real estate. A third residual category exists for special real estates, whose characteristics require different treatment, especially with regard to assessment (motorways, airports, nuclear plants, etc.).

The Spanish cadastre has information for 12 million urban parcels and 42 million rural parcels

Cadastral zoning (if any)

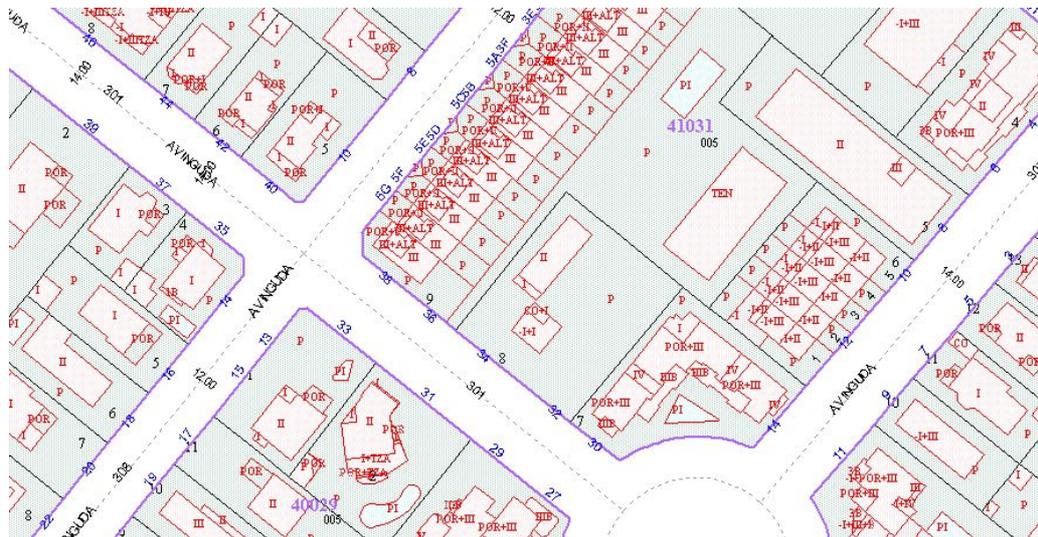
The Spanish Directorate General for Cadastre will provide for every municipality two data sets: one for urban area and other for rural area.

Each of these two

- have different metadata, different scale and different lineage....
- the Spanish cadastre can provide several CadastralZoning.
- have nationalCadastralZoningReference, label and geometry

For Urban data set the CadastralZoning will be THE BLOCK (la manzana) (in purple color in the map)

For Rural data set, the CadastralZoning will be THE POLYGON (purple line)





Geographic coverage

Cadastral gaps

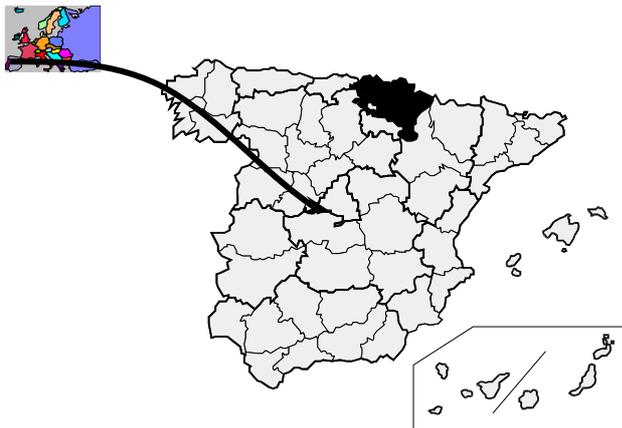
All territory is covered with cadastral parcels, but in urban cadastre, there are not information about the streets and roads (public domain).

Cadastral overlaps

No overlaps.

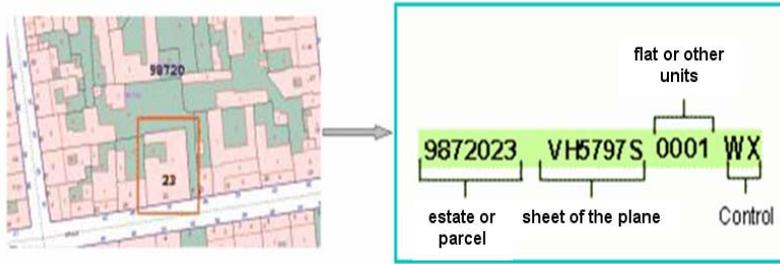
Availability of data

The Spanish General Directorate General for Cadastre is responsible for the cadastral administration of 95% of the Spanish territory, and the remaining 5% (on black colour in the next map) is administered by the regional governments of Navarre and the Basque Country.

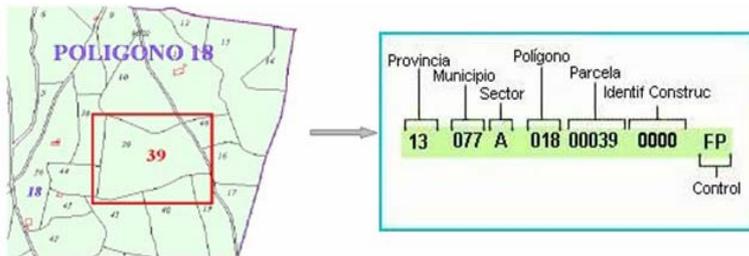


Structure of cadastral information

In the case of urban land, the parcels are grouped in blocks. The parcels contain buildings and urban units (flats, individualised parking, other units inside the real estate...). Each unit inside the parcel has his own cadastral reference, but all the urban units of a parcel have the same first part of the cadastral reference and all the parcels of a block have in common the first 7 digits of the reference.

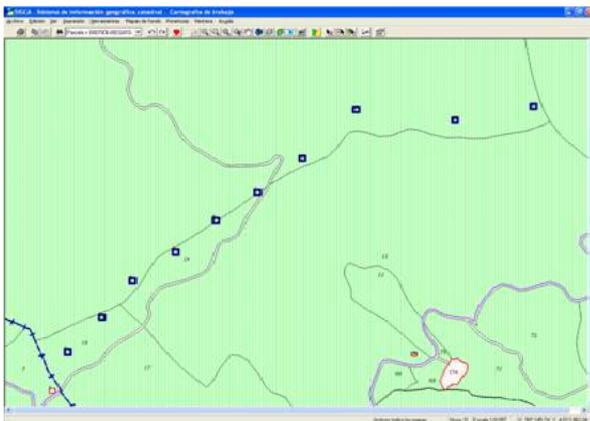


In the case of rural real estate, the municipality is divided in polygons (zones) depending on the homogeneity of the cultures, existence of geographical accidents, etc, inside each polygon there are several parcels. The unit of property is the parcel. Each parcel has its cadastral reference. The rural parcel contains one or more sub-parcels depending on use or crops and intensity and quality of these crops. A rustic parcel can contain constructions too.

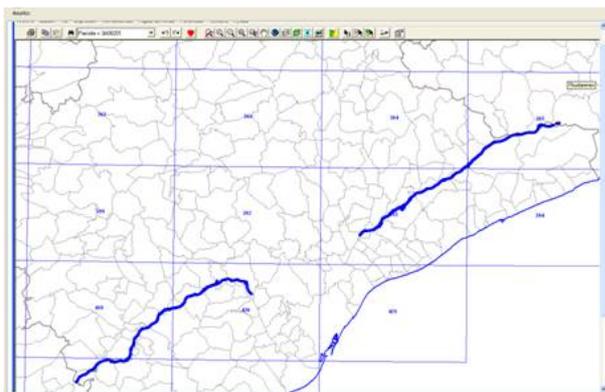


In the third residual category, “the special real estates”, (motorways, airports, nuclear plants, etc.), there are only one cadastral reference for each “special real estate” and it can be composed by several parcels even in different municipalities.

For example a wind generators plant,



motorway case , the same cadastral reference can be in many municipalities



Temporal aspects

Temporal Information

The SDGC has stored all the map modifications in digital form from 2002, so it is possible to query the evolution of a map. In the literal form the SDGC has the information computerized since 1990 and in papers from the origin.

The Spanish cadastral GIS not only keep the last change but all of them.

Update frequency

The cadastral information is daily updated.

Parallel to the daily update (on line and off line), there are massive processes of update that are done generally joined with processes of revaluation. The new information obtained is in general of major quality, more current and complete

Life-cycle rules

A real estate never changes its reference.

This is the way SDGC precede when there are changes in the real estate configuration:

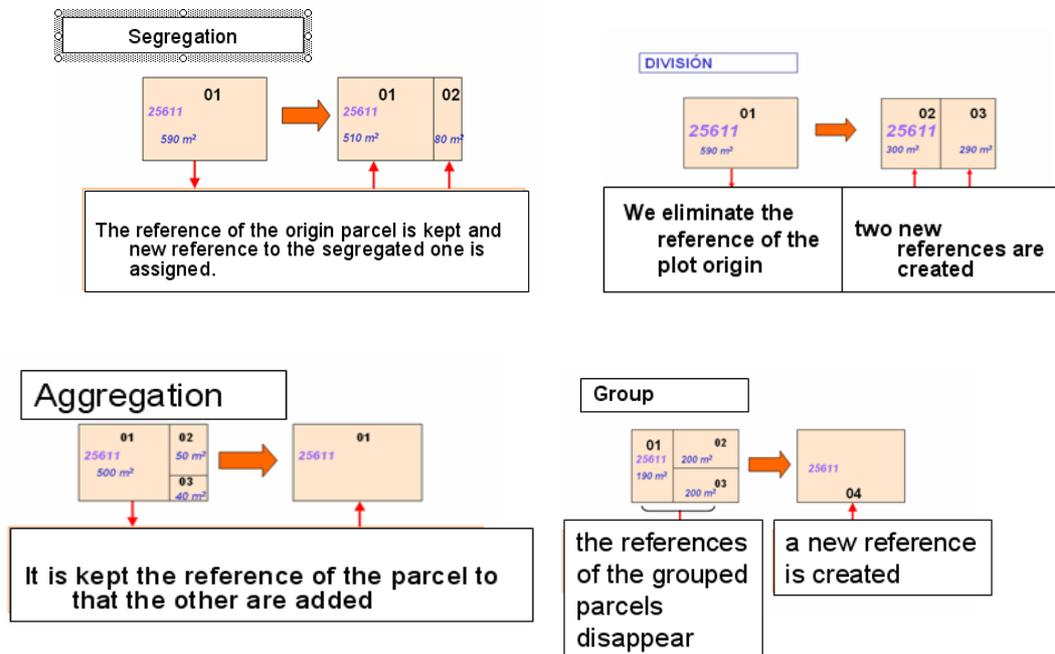


Table A

	New spatial object (new national cadastral reference)	New recorded version	No change in lifecycle attributes	Archive old parcel	Remove parcel record from registry	Comment
INDIVIDUAL PARCEL						
all parcel boundaries resurveyed		X		X		
part of the perimeter resurveyed (full length of a boundary)		X		X		
part of the perimeter resurveyed (only part of a boundary)		X		X		
non geometry attributes updated						In this case we modify only the attribute
correction of registration errors						
SEVERAL PARCELS						
shared boundary resurveyed		X		X		
parcel subdivision		X		X		
parcel merging		X		X		
land consolidation/land distribution		x		x		
CADASTRAL ZONING						
upgrade, new survey in the cadastral zoning		X		X		
upgrade, data processing in the cadastral zoning (e.g. coordinate transformations)						
cadastral zoning modification (change in cadastral reference)		x		x		The same as individual parcel

Quality

Topological Gaps and Overlaps

Now the Spanish Cadastre has a continuous map for all towns, between neighbouring municipalities, and between rural and urban land; but because all this information was separately took, there are still some problems with gaps and overlaps, but we are working to eliminate them. We are studying and proceeding to eliminate one by one.

Edge-matching

There are still some problems of edge-matching between neighbouring municipalities, and between rural and urban land. We are studying and proceeding to eliminate one by one. Edge-matching with neighbour countries not yet considered.

Positional accuracy

Urban areas

Absolute accuracy

The maximum deviations are lower than a certain absolute linear magnitude: P1.

A percentage of 85 % of the points and elements present deviation lower than another linear parameter: P2.

Categoría	Escala plano	P1(cm.)	P2(cm.)
I	1/500	25	20
II	1/1000	40	30
III	1/2000	75	60

Relative accuracy

Contractual Technical specification define: Linear magnitudes of a cartographic object and the distances between points of different entities in a proximity radio of 100m, will be obtained with a maximum tolerance of:

$$T(\text{cm}) = 20 + \frac{L^2(\text{m})}{1000} \text{ for scales } 1/500$$

$$T(\text{cm}) = 30 + \frac{L^2(\text{m})}{1000} \text{ for scales } 1/1000.$$

$$T(\text{cm}) = 60 + \frac{L^2(\text{m})}{1000} \text{ for scales } 1/2000.$$

Being L the considered linear magnitude, express in meters

In rural areas

Digital cartography of rural land was generated municipality by municipality in the process of cadastral renovation, from orthophotography (1/5.000- expanded 1/ 2.500),

Followed by fieldwork, to identify the property, and digitalization.

So, the accuracy is related to the accuracy of the orthophotography

Now we work with ortophotos of the "Plan nacional de ortofotografía aérea" PNOA with flights on 1:30000 scale and digital ortophotos in colour with size of the pixel of 0,50 meter and planimetric precisions of 1 meter

Delivery

Spanish General Directorate for Cadastre makes available all its information on Internet to citizens and public administrations in the form of the Cadastral Virtual Office (CVO) (<http://ovc.catastro.meh.es>)

The CVO provides updated Cadastral Information and services in Internet, 24 h. 7 days and Cost-free. The cartography is provided via web services like WMS, WFS or SOAP protocol for other services. The system permits the TIME parameter to have historic information. And offers too the Getfeatureinfo service

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And in digital format in: DXF (Autodesk), Shapefiles (Esri), SVG (Standard Vectorial Graphics) and the FICC [(Own format: Cadastral Cartography Interchange Format), an ASCII format over which reflects the geometry and features of the entities of cadastral cartography in vectorial format]

Overview of production method

The cadastral cartography is generated at the municipal level.

Now the SGDC has a continuous map with urban and rustic cartography, and with all the municipalities aggregated in a unique database but in origin:

Digital urban cartography 1:500 or 1:1000 was generated at the municipal level from the digitalisation of existing cadastral cartography following verification of its quality, or using new cartography generated by a process of analytical restitution of apparent parcellary entities obtained in stereographical flights upon which the cadastral parcellary data is placed, identified and updated.

Process:

1. Photogrammetrical numerical restitution to obtain an apparent parcellary
2. "Fieldwork and later edition in office to incorporate the property parcellary"
3. "Semantic Treatment: codification, alteration and assignment of cadastral References and labels"

Digital cartography of rural land was generated municipally by municipally in the process of cadastral renovation, from orthophotography (1/5.000- expanded 1/ 2.500), upon which rural parcel and sub-parcel boundaries was projected.

Orthophotographs were at the beginning on paper and since last ninety's also available in digital format.

Process:

1. Generation of orthophotos,
2. Fieldwork, to identify the property, re-dyed on the orthophoto and later on digitalization and edition in office to incorporate the cadastral parcelary,
3. Semantic Treatment: codification, alteration and assignment of cadastral References and labels

In that way the Spanish Cadastre had got the first digital cartography for every municipality in the years 90's but since then, SDGC maintains this information every time with better methodology, more precise technologies and more accuracy

In cases where the cartography were not good enough the Spanish Cadastre have produced new cartography with review of fieldwork.

Annex E (informative) Rationale for Cadastral Parcel Data Specification

Abbreviations

CRS	Coordinate Reference System
DPS	Data Product Specification
DT DS	Drafting Team Data Specification
DTM	Digital terrain Model
EULIS	European Land Information System
GCM	Generic Conceptual Model
GIS	Geographic Information System
GML	Geographic Markup Language
JRC	Joint Research Centre
LADM	Land Administration Domain Model
LMO	Legally Mandated Organisation
SDIC	Spatial Data Interest Community
TWG	Thematic Working Group
TWG CP	Thematic Working Group
WG CPI	Working Group on Cadastral Parcel in INSPIRE

Methodology

TWG CP has followed the methodology defined in the document D2.6 elaborated by the Drafting Team Data Specification.

User requirements

The first step has been to find relevant use cases for cadastral parcels in INSPIRE. Use cases have been considered as relevant for INSPIRE if they are linked with environment and if they are (at least potentially) European or cross-border use cases.

Two main sources have been used to identify relevant use cases:

- the user requirement survey launched by JRC in February 2008
- use cases proposed by TWG CP members.

The check-list provided in the document "Methodology for the development of data specifications" from DT DS has been adapted for the cadastral parcels context (e.g. the lines concerning multiple representation have been deleted because not relevant for cadastral parcels).

Then, TWG CP has tried to have this check-list filled for each use case, contacting the user(s) and/or using existing documentation, if any.

Use cases have been based on the ones used during the survey conducted by WG-CPI (of Eurogeographic and PCC) in 2005:

- real estate market
- agriculture (subsidies on land use)
- environmental monitoring
- spatial planning (urban/rural/regional planning + restrictions on land use)
- infrastructure management
- public administration
- public safety
- socio-economic analysis

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Land market is not considered as a use case for INSPIRE but two examples have nevertheless been considered, one about EULIS as it is an harmonisation initiative about cadastre and one coming from Nature GIS project because including also protected sites and other INSPIRE themes.

Main conclusions of the TWG CP investigation of use cases were the following:

- There are few Use cases based on European Directives or policies
- However nowadays there are not yet pan-European level or cross-border level use cases, except these European Directives.
- As cadastral data is generally used as background information for other themes, harmonisation of cadastral data may be considered as a pre-condition to harmonise other INSPIRE themes
- Most of the use cases are just national or regional ones but TWG CP understanding is when harmonised cadastral data exists be cross-border applications will appear and the cadastral parcel will be widely used.

All the valid use cases submitted during the user requirements survey launched by JRC in February 2008 have been considered.

NOTE: The examples (collected during this survey) involving only publishing of existing data have not been considered as valid use cases

TWG CP has collected more than 20 check-lists during this user requirement phase, covering a wide range of applications.

The main weaknesses in this user requirements phase are the following:

- the information collected in the check-list has given various and sometimes disappointing results (e.g. answers not detailed enough or not focusing on cadastral parcels)
- the geographic extent of national use cases is mainly limited to 7 countries (Belgium, France, Hungary, Netherlands, Spain, Sweden, Germany)
- the use cases (except Land Parcel Identification System) giving good reasons to harmonise data in Europe because at European level have provided only very generic requirements
- the detailed (and really useful) requirements mainly come from national examples (even if potentially cross-border in future)

As-is analysis

TWG CP has investigated the Reference Material provided by SDIC/LMO:

- the survey conducted by WG-CPI in 2005 about the cadastral parcel in INSPIRE
- some national cadastral specifications (some countries already having experts involved in the TWG CP + Italy).

TWG CP has begun to investigate more in detail the existing data in countries represented in TWG CP, with focus on the five key elements identified by the survey conducted by WG-CPI: identifier, boundaries, surface, georeferencement, origin-history.

TWG CP has tried to enlarge the geographic extent of the as-is analysis by inviting other countries to provide more detailed information about their existing cadastral data.

To summarise, TWG CP has generic information about cadastral parcels in most of European countries, due to the survey conducted by WG-CPI and more detailed information for the following countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Netherlands, Latvia, Norway, Spain, Switzerland and United Kingdom.

Moreover, as TWG CP has considered, since the beginning of its work, that the existence of cadastral parcels only as raster data was a key issue, a questionnaire about existence and characteristics of cadastral raster data has been sent to countries:

- which answered to the questionnaire sent by WG-CPI saying they had only raster data on parts of their territory
- which did not answer the questionnaire sent by WG-CPI.

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Gap analysis

The gap analysis has been done during the whole process through oral discussions during telecons and meetings and through written discussion papers about main components of cadastral parcels. The results are summarised in the following chapter (recapitulative check-list).

Harmonisation approach:

TWG CP has been helped by some Reference Material, mainly:

- the work done by WG-CPI in 2005 about the cadastral parcel in INSPIRE
- the Land Administration Domain Model, a proposal for a new ISO standard

Documents issued by UNECE and the EULIS glossary have also been used in order to clarify some cadastral concepts.

TWG CP has had to cope with the many national specificities which exist in cadastral data in European countries.

The results are summarised in the following chapter (recapitulative check-list).

Moreover, these steps have been complemented by:

- the internal review (by the European Commission, by the European Environmental Agency and by the INSPIRE Thematic Working Groups and Drafting Teams)
- the review by SDIC/LMO
- the testing by SDIC/LMO

The comments received during these steps have been considered and taken into account, when considered as relevant.

Recapitulative check-list

Data harmonisation component	Requirements	As-is analysis	Harmonisation approach	Gap analysis
(B) Terminology in general	<p>Current use of cadastral concepts as defined by national data providers.</p> <p>The INSPIRE context requires harmonised terminology.</p>	<p>Definition of cadastral parcels given by the Directive but very vague "areas defined in cadastral registers or equivalent"</p> <p>Some Reference Material providing already some cadastral terms with more or less agreed definition (WPLA, UN/ECE).</p>		
(B) Terminology definition/description of cadastral parcels	<p>TWG CP understanding is that users require parcels as "single areas on the Earth surface under unique ownership and homogeneous property rights".</p> <p>Parcels as single areas are better:</p> <ul style="list-style-type: none"> - for queries (e.g. parcels included in an area of interest) - to attach user-defined attributes - for portrayal 	<p>Definition given by the Directive is too vague because some MS have several levels of "areas defined in cadastral registers or equivalent":</p> <ul style="list-style-type: none"> - sub-parcels - parcels - multi-parcels 	<p>TWG CP decided: to keep the definition coming from the INSPIRE directive to add as description "single areas on the Earth surface under unique ownership and homogeneous property rights, ownership and real property rights being defined by national law, forming partition of territory" as description of cadastral parcels</p>	<p>Definition from the Directive will have precedence.</p> <p>Description given, by TWG CP to be used as guidelines by MS to decide which parcels are in the INSPIRE scope.</p> <p>May be not obvious in some countries (e.g. UK, Ireland)</p>
(D) Application schemas Cadastral parcels	<p>Of course, the spatial object type required by all use case</p>	<p>Cadastral parcels widely available in most countries in Europe.</p>	<p>Cadastral parcels as mandatory spatial object type.</p>	

areaValue	<p>Official area required by some use cases.</p> <p>Area required by JRC as mandatory attribute.</p> <p>Need for horizontal area</p>	<p>Areas are generally available in cadastral registers or equivalent. They may be official (legal, fiscal) or not.</p> <p>Some countries do not register area.</p>	<p>areaValue as voidable attribute, with definition including “projected on the horizontal plan”</p>	
referencePoint	<p>Centroid point required by some use cases with its coordinates.</p> <p>Moreover, TWG CP consider that reference point may be useful for portrayal (e.g. case of concave parcels) or to speed some spatial queries.</p>	<p>Reference point available in many countries but not all.</p>	<p>TWG CP has included reference point as voidable attribute with definition “point within cadastral parcel”.</p> <p>TWG CP has not included as semantic attributes the coordinates of this reference point, coordinated may be derived from geometry by users.</p>	<p>Some countries (Germany) have some reference points located outside the parcel, so not corresponding to the INSPIRE definition.</p>

CadastralZoning	<p>Cadastral zonings are required by some use cases They are generally required as defined in the national model, i.e. not as cadastral zonings but as municipalities, sections, ... In the quoted use cases, they are required with the following attributes: name and code</p> <p>TWG CP understanding is that cadastral zonings are required:</p> <ul style="list-style-type: none"> - for querying/searching data - for carrying metadata information - for displaying data 	<p>Cadastral zonings are often available in existing data, they are ordered generally in a pyramidal classification but in a very heterogeneous way:</p> <ul style="list-style-type: none"> - there may be different number of levels - they have different names and meanings (e.g. municipalities, parishes, settlements, sections, blocks). - pyramidal classification may be different in rural and urban areas 	<p>The LADM offers a model allowing the harmonisation of cadastral zonings.</p> <p>Examples of correspondence between national and INSPIRE levels are provided in annex B of this DPS. Attribute level name has also been added to explain this correspondence.</p> <p>Cadastral zonings have same attributes as cadastral parcels plus: level (as in LADM) name (in case cadastral zoning is also an administrative unit)</p>	<p>No cadastral zonings in some countries (e.g. United Kingdom).</p>
ParcelBoundary	<p>Generally not required by use cases.</p>	<p>For some countries (e.g. Netherlands, Norway), the most convenient way to provide information about positional accuracy (required by users) is at the parcel boundary level.</p>	<p>TWG CP has added optional spatial object type Parcel Boundary ; to be provided by MS only if carrying accuracy information</p>	
BasicPropertyUnit	<p>Not required by the investigated use cases.</p>	<p>Widely used in Nordic countries.</p>	<p>TWG CP has added optional basic property units (though out of the INSPIRE scope) to provide a practical and meaningful way for Nordic countries to give information about area and about temporal validity.</p>	

Association	<p>Not required by the investigated use cases.</p> <p>Useful at conceptual level to understand links between features.</p>	<p>Some countries very willing to provide these associations; some countries very reluctant to provide them.</p>	<p>TWG CP has included associations as avoidable elements. Associations are only uni-directional to simplify the implementation.</p> <p>Recommendation to provide them only for last versions of spatial objects (to avoid temporal inconsistencies).</p>	<p>To be provided by countries already having the semantic associations. No need to derive them from geometry.</p>
(E) Spatial and temporal aspects (Vector geometry)	<p>Users require cadastral parcels as closed surfaces and generally as 2D data.</p> <p>Some use cases interested at least in future by 2,5D cadastral parcels.</p> <p>Possible requirements in future for 3D parcels.</p> <p>Possible requirements for Simple Feature profile (recommendation of GCM)</p>	<p>Most countries have parcels as closed polygons and as 2D data.</p> <p>Some countries also use circular arcs. However, from experts experience, circular arcs are generally sources of problems.</p> <p>Currently, few countries have 3D parcels (Norway, ...) but it may be growing in future.</p> <p>Norway has some 2,5D parcels used as a way to represent 3D parcels.</p> <p>Some countries (e.g. Germany, Norway) use circular arcs or circular interpolations, sometimes for very long arcs.</p>	<p>TWG CP has required geometry as GM_Surface with only linear interpolation.</p> <p>TWG CP has restricted cadastral parcels as 2D (or 2,5D) parcels: the INSPIRE directive defines parcels as "areas" no current environmental use case requiring them.</p> <p>TWG CP has given priority to feasibility and accepted circular arcs or interpolations. Simple Feature is just a recommendation.</p>	<p>Countries with circular arcs will have to convert them into lines.</p> <p>3D parcels may be useful now for non-environmental use cases or in future for environmental use cases.</p> <p>To be monitored in future.</p>

<p>(E) spatial and temporal aspects (Topology)</p>	<p>Users generally require topologically correct cadastral data (i.e. without topological gaps and overlaps).</p>	<p>Some countries still have topological gaps and overlaps (e.g. when assembling parcels from 2 cadastral sheets).</p>	<p>TWG CP has adopted the common cross-TWG solution: no topologic attributes such as TP_Face and TP_Edge topology expressed as constraint (boundaries of a parcel must form a closed ring) recommendation about no topological gaps nor overlaps.</p>	<p>In some countries, topological gaps and overlaps between cadastral parcels will remain in INSPIRE.</p>
<p>(E) Spatial and temporal aspects (Coverages)</p>	<p>Use of raster data is generally considered as a “minimum solution”, e.g. because only raster data is available or because the application is only for viewing.</p> <p>Use of raster data is generally considered as not practical (big data volume, not possible to change symbology, bad results when zooming, bad quality when printing, not possible to make requests or modifications / simulations)</p>	<p>Most countries have cadastral parcels as vector data. Some countries have raster data on part of their territory but have vectorisation projects which will be achieved before 2016 (Croatia, Czech Republic, Poland). Some countries have raster data on part of their territory but have vectorisation projects whose date of achievement is unknown (Bulgaria, France, Slovakia).</p>	<p>At the beginning, TWG CP envisaged 2 possible options for cadastral parcels: raster and vector. Taking into account that: the Commission considers vectorisation as new data capture (so no feasibility issue) -only few countries will/may still have only raster cadastral data on part of their territory in 2016 TWG CP has decided to keep only the vector option.</p>	<p>Even after 2016, some parts of Europe will/might not be covered by cadastral parcels because only raster data will be available.</p> <p>These parts should be limited to a small number of countries.</p>
<p>(E) Spatial and temporal aspects (Temporal profile)</p>	<p>Some use cases require historic cadastral data. Temporal information at spatial object level required by many use cases but it is not very clear which dates are most relevant.</p>	<p>Historic data not available in all MS. WG-CPI considered date of last update as the most relevant temporal information.</p>	<p>TWG CP has given priority to harmonisation of temporal information between TWG and has adopted the common cross-TWG solution: begin/endLifespanVersion (provided by GCM). validFrom/validTo (adopted by other TWGs)</p>	<p>Temporal attributes not available in each MS. More detailed information about history/traceability of parcels to be found in national cadastral registers.</p>

(F) Multi-lingual text and cultural adaptability (content)	In multi-lingual countries, some use cases require all languages spoken in the country, including regional ones.	As cadastral data include very few geographical names, these names are generally available only in one language.	Name (for cadastral zoning) will be multi-lingual (reference to GN). Level name (for cadastral zonings) is required in at least one of the official languages of the EC.	
(G) Coordinate referencing and units model	<p>Currently, users work with national CRS.</p> <p>Users need to measure distances and surfaces, so they require working with projections offering few linear alteration.</p> <p>The INSPIRE context requires harmonised CRS.</p>	<p>Currently, cadastral data mainly available in national CRS.</p> <p>But many MS have already prepared accurate coordinate transformations between national CRS and ETRS89.</p>	<p>TWG CP has required official CRS defined by TWG RS.</p> <p>Moreover, TWG CP has recommended MS to define relevant projection (or set of projection) to work with cadastral parcels.</p>	
(H) Object referencing model	<p>Users widely use cadastral parcels to reference (in a wide meaning) other data or administrative dossiers.</p> <p>They generally do it using the parcel identifier and/or the address. Some also use the coordinates of centroid point.</p>	<p>Parcel identifier available in all European countries (except may be Iceland).</p>	<p>TWG CP has included in its application schema for cadastral parcels both an external identifier and a thematic one.</p> <p>TWG CP has not included as semantic attributes the coordinates of this reference point, coordinates may be derived from geometry by users.</p>	<p>TWG CP has identified the following risk: if cadastral parcels are used as reference data (in D2.5 meaning) for other themes, it may lead to inconsistencies due to different update cycles.</p>

<p>(I) Data transformation guidelines</p>	<p>The INSPIRE context requires harmonised specifications.</p>	<p>Cadastral data is subject to lots of national specificities.</p> <p>Some specificities are due to national regulations and it won't be possible to make them change.</p>	<p>TWG CP has tried, through standardised options, to propose a UML schema enabling each country (from TWG CP current knowledge) to match its existing cadastral data to common INSPIRE schema,</p> <p>Moreover, in data capture comment, TWG CP has given some examples about possible matching rules.</p>	<p>Information lacking about at least half MS.</p> <p>Probably, some unknown national specificities and difficulties to match with INSPIRE specifications.</p>
<p>(J) Portrayal</p>	<p>Main current use of cadastral parcels:</p> <ul style="list-style-type: none"> - as background data with a discrete style (grey or black) - with orthophoto as background or on a coloured screen with a brighter style. <p>The INSPIRE context requires a harmonised default style for view services.</p>	<p>Generally, the full identifier is not displayed but only its last part (e.g. parcel number)</p> <p>No detailed information about style. It seems that many countries use to represent cadastral parcels in black but some others use red or other colours.</p>	<p>TWG CP has decided:</p> <ul style="list-style-type: none"> - to add in the application schema the attribute label for cadastral parcels and cadastral zonings - to define some basic styles: <ul style="list-style-type: none"> outline of parcels with label on geometry outline of parcel with label on reference point just the outline of parcels just the reference point 2 last styles in order to cover a wider scale range. <p>Moreover, TWG CP has recommended (without defining them) other styles (with background, if historic data)</p>	<p>May probably be improved after testing phase.</p>

<p>(K) Identifier Management</p>	<p>Users need thematic identifier to make links with rights, owners and other information related to cadastral parcels. They also need a unique identifier to use cadastral parcels as reference data.</p> <p>INSPIRE Directive requires unique external identifier; characteristics defined in the GCM.</p>	<p>Most MS have only thematic identifier for cadastral parcels.</p>	<p>TWG CP has included in its application schema 2 identifiers with 2 different roles: -INSPIRE Id: identifying the cadastral parcel (be unique) - national cadastral reference: making link with rights and owners in national cadastral registers.</p>	<p>As most countries may have difficulties to match with the INSPIRE identifier, some examples are given in the data capture component.</p> <p>The national cadastral reference is not really an identifier as in some cases, it won't be unique for cadastral parcels.</p>
<p>(M) Metadata</p>	<p>Main user requirements are about:</p> <ul style="list-style-type: none"> - lineage - quality (see component (O)) - temporal info (see components (E) and (N)) 	<p>In some countries, lineage information is heterogeneous in whole country and is available at cadastral zoning level or even at parcel boundary level.</p>	<p>TWG CP has decided: not to include an attribute about lineage at spatial object level (because of multi-lingual issues and because information not really interesting) ask MS to report in detail about characteristics of their initial cadastral data (e.g. about cadastral gaps or overlaps) and has provided a template for lineage (annex D).</p>	
<p>(N) Maintenance</p>	<p>Users generally want to work with the most updated available cadastral data. However, actuality less than one year is considered enough for most use cases.</p>	<p>Update frequency varies according to countries, from daily update to yearly updates or less. Generally, there is some delay between the change in cadastral register and the update of cadastral map.</p>	<p>TWG CP has required MS to report about the update frequency of their cadastral data and has recommended an update frequency better than one year.</p>	<p>Even with yearly updates, there may be data with an actuality worse than one year.</p>

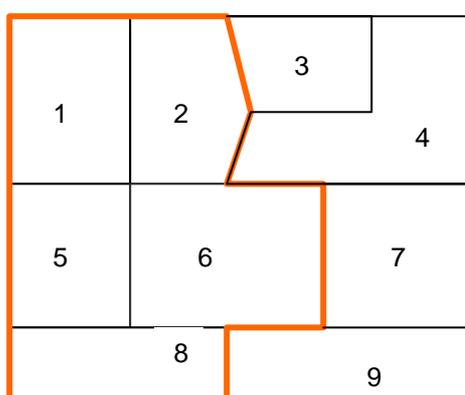
<p>(O) Data quality</p>	<p>Main user requirements are about:</p> <ul style="list-style-type: none"> - positional accuracy (1m more frequently quoted) - semantic accuracy (for national cadastral reference) - topological consistency (see component (E)) - completeness 	<p>MS may have information about absolute accuracy:</p> <ul style="list-style-type: none"> - at data set level - at cadastral zoning level - at cadastral point level - at parcel boundary level - not at all. <p>Moreover, many MS have attribute original map scale available at cadastral zoning level. This attribute may give an idea about relative accuracy.</p> <p>Generally, no issue about completeness</p>	<p>TWG CP requires MS to report about positional accuracy at data set level.</p> <p>TWG CP has included the attributes estimated accuracy (for cadastral zoning and cadastral boundary) and original Map Scale Denominator (for cadastral zoning) in order to enable MS to report about this information at the most relevant level for them. Accuracy on cadastral points has been considered as not meaningful for INSPIRE use cases.</p> <p>TWG CP has recommended 1 m in urban areas and 2,5 m in rural area (based on Agriculture use case) for positional accuracy</p> <p>TWG CP also ask MS to report about completeness (0% omission recommended)</p>	<p>Some efforts to be done by MS:</p> <ul style="list-style-type: none"> - for those which do not have any metadata, to produce and supply them - estimated accuracy generally known in national CRS but will have to be provided in ETRS89
<p>(P) Data transfer</p>	<p>Current use of industry standards (shape, MIF/MID, dxf, dgn) or national standards. Cadastral data already available on-line in some countries. D2.7 requires GML but allows alternative/additional formats, if specific requirements.</p>	<p>Current use of industry standards (shape, MIF/MID, dxf, dgn) or national standards. Cadastral data already available on-line in some countries.</p>	<p>TWG CP has decided to require only GML: common cross-TWG decision the general guess is that INSPIRE will give great incitation to GIS providers for including GML</p>	

(Q) Consistency between data (between themes)	Cadastral data often used with administrative units, orthoimage, addresses, roads, buildings, In future, combination with DTM. No clear consistency rule widely required by users.	Few information on this topic.	In the application schema, association between cadastral parcels and administrative units (and between addresses and cadastral parcels from TWG AD). Possible recommendation for annex II and III for data compatible with cadastral parcels (orthophoto, DTM) or for associations (buildings)	
(Q) Consistency between data (across boundaries)	Current use of cadastral data at national level. Only one example quoted of a cross-boundary infrastructure project requiring consistency across boundaries.	Geometric consistency across international boundaries seems difficult to achieve (legal issues). Even, within a country, it does not seem so obvious to have good continuity of cadastral data.	TWG CP just recommends MS to do and to report about edge-matching with neighbour data sets.	
(S) Data capturing	Users generally want all cadastral parcels on the area of interest for their application (e.g. rural for Agriculture, settlements for urban planning) As only one level of detail, no selection rules required (all parcels to be published)	Due to national regulations, MS do not survey and register same parts of their territory, e.g. generally no cadastral parcels on sea (except for instance Finland) and in some countries, no cadastral parcels on public domain. As only one level of detail, no selection rules (all parcels are published)	TWG CP requires MS to publish for INSPIRE all registered parcels. Moreover, TWG CP requires MS to report about their "cadastral gaps"	Cadastral parcels will also miss in countries building their cadastre (e.g. Greece)
(T) Conformance	For input data, users quote sometimes conformance to national specifications and once to ISO standards.	Few information on this topic.	TWG CP has applied the common solution for all TWG : Conformance is required in clause 2.8	

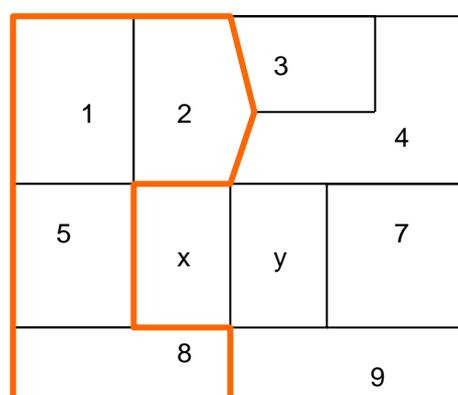
Possible evolutions

Links with themes in Annex II and III

- Many users work both with cadastral parcels and orthophoto. When cadastral parcels are displayed on an orthophoto background, it is better if the result look consistent. This may be more or less solved by orthophotos of similar resolution and accuracy as cadastral parcels.
- Some users have expressed the requirement (in future) to combine cadastral parcels with 3D data (DTM, buildings).
- Other TWGs should not recommend using parcels as reference data (in D2.5 meaning) because it may put strong requirements on temporal aspects for cadastral parcels.



at date t1
Land use area defined as set of parcels 1, 2, 5, 6, 8



At date t2
Parcel 6 has been split
The user can not completely build Land use area because parcel 6 missing



If a TWG recommends using cadastral parcels as reference data (in D2.5 meaning), it would oblige to keep in INSPIRE historical data. It would be a big requirement, specially for countries (such as France) which only use dataset versioning, publishing cadastral data at regular dates.

- Many cadastral data sets include information about official land use; this source of existing data may be worth to be investigated by future TWG Land use.
- This Data Specification does not include 3D cadastral data (because cadastral parcels are defined as “areas” by the Directive so volumes are excluded) but some 3D cadastral data are related to building or to utilities network.

Ideally, Data Specification for cadastral Parcels should be reviewed and, if required, updated, once data specification for themes in annexes II and III have been developed.

Points to be monitored and/or improved

This paragraph lists a few points to be carefully monitored for potential new version(s) of the Data Specification of theme Cadastral Parcels.

Associations between objects

INSPIRE	Reference: INSPIRE_DataSpecification_CP_v3.0.1.pdf		
TWG-CP	INSPIRE Data Specification on <i>Cadastral parcels</i>	2010-04-26	Page 111

TWG CP has now modelled all associations as uni-directional. Implementation may raise new needs which are not covered by this model. It is possible that some associations need to be bi-directional to be able to fulfil some use cases.

TWG CP also recommends checking the multiplicities between associations to find if the model corresponds to the situation of real world, e.g. about the usage of void.

Single area – Multi-surface

TWG CP understanding is that, to be good locators of geo-information, cadastral parcels shall be single areas (GM_Surface). It is generally the case but unfortunately with few exceptions: some countries have a small percentage of multi-surface parcels. It is why TWG CP has recommended the use of GM_Surface but has allowed the use of GM_MultiSurface.

These countries with multi-surface parcels are often in a (slow) process of transforming these multi-surface parcels into single areas. The feasibility issue about the use of only GM_Surface may disappear in future.

If it is the case, INSPIRE specifications should be modified and geometry of all cadastral parcels should be GM_Surface.

Circular arcs – Simple Feature

The Generic Conceptual Model recommends the use of Simple Feature profile, this profile using only linear interpolations. But, some countries use circular arcs or circular interpolations and are very reluctant to move to linear interpolations.

The drawback of imposing Simple Feature was obvious (extra-cost for producers), the drawback of allowing circular arcs or interpolations was not so obvious, as different TWG CP members had different experiences and points of view on this topic. It is why TWG CP has only recommended (and not required) the Simple Feature profile.

However, experience is lacking about how users will receive and manage these circular arcs or interpolations in the INSPIRE context (e.g. with changes of CRS). This point should be monitored and if big issues on this topic, decision about Simple Feature might have to be reconsidered.

Temporal aspects

Some use cases (e.g. Soil Directive) require historic data and traceability of cadastral parcels. TWG CP has adopted the cross-theme solution: 2 attributes for lifespan in the dataset and 2 attributes for lifespan in the real world.

It has to be monitored if this set of attributes is widely used or not and if it is enough for user requirements.

Template for lineage

The template from lineage aims to complement the INSPIRE specifications in the documentation of an INSPIRE compliant cadastral data set. But currently, practical experience is still missing about what data producers want to explain about their (INSPIRE) cadastral data and even more about what users want to know, what they need as documentation of these (INSPIRE) cadastral data.

Portrayal

TWG CP has proposed some basic styles to portray cadastral data, in view services. These styles may be improved and other styles may be required, for more specific uses.

New feature type: sub-parcel (or plot)

This feature type has been required only by one use case (1 check-list among the 20) and so, not included in the INSPIRE specifications. However, this potential feature type is in the INSPIRE scope and user requirements may come later (especially during the development of specification for theme land use). If it is the case, this feature type should be added to the theme Cadastral Parcel.

New standard

The new ISO 19152 standard LADM is currently being developed. It deals with land administration in general and includes cadastral parcels. Its scope is wider than the scope of cadastral parcels in INSPIRE (see annex C). If there are requirement and consensus to extend Data Specification for Cadastral Parcels LADM may for instance propose harmonisation solutions.