Core Spatial Data Theme 'Cadastral Parcels' Recommendation for Content

Working Group A - Deliverable of Task 1.b

Version 1.1 - 2018-02-09

Version History

Version number	Date	Modified by	Comments
1.0	2017-02-14	WG A	Consolidated draft, for review by geographic and statistic community
1.1	2018-02-09	WG A	Comments from geographic and statistic community taken into account Definitive deliverable

Content

1   Executive Summary

As the United Nations (U.N) Millenium Development Goals (2000) era came to a conclusion with the end of the year, the U.N announced the 2030 Agenda for Sustainable Development in September 2015, an ambitious, integrated, indivisible and transformational global agenda with 17 Sustainable development Goals, 169 associated targets with 230 indicators promising to achieve sustainable development in its three dimensions – economic, social and environmental – in a balanced way. Geospatial data supports measuring, achieving and monitoring several if not all goals and targets set by the 2030 Agenda. The 2030 Agenda demands the need for new data acquisition and integration approaches to improve the availability, quality, timeliness and disaggregation of data. Goal 17 explicitly emphasizes the need for developing capacities and partnerships. In this context the success of Agenda 2030, depends on senior administrators owning and leading the geospatial efforts in their respective countries.

Building on INSPIRE Directive and pertinent documentation and redirecting the focus on a cohesive spatial data infrastructure without gaps in content and discrepancies in quality, stakeholders in Europe are working on geospatial standardization and increasing richness of data through Core Data Recommendation for Content that corresponds to the first phase of WGA work program. Core data is primarily meant for fulfilling the common user requirements related to SDGs in Member States and European institutions.

Millenium Development Goal and Target Indicators included access to land, adequate housing and property rights as a fundamental human right. Moreover, cadastral parcels, in both spatial and legal dimension, as a cornerstone of national spatial data infrastructure mapping and an engine for Land Administration Systems are indispensable to support a wide range if not all SDGs of the UN Agenda 2030.

Core Spatial Data Theme "Cadastral Parcels" Recommendation for Content includes a step wise approach for its adoption by the countries: **a) Core recommendations**, like Cadastral Parcels corresponding to scales larger than 1:5.000, with attributes of geometry and national cadastral reference, compatibility to the INSPIRE definition of cadastral parcel as single area of earth surface, completeness 100% over national territory, absolute accuracy better than 1 metre in urban areas and 2.5 metres in rural areas, topological consistency, temporal consistency between cadastral map and land registry, use of datum ETRS-89 with either geographic or projected coordinates; **b) good practices**, like full partition of land including both private and public domain, documentation of the estimated accuracy of parcel and zoning boundaries, versioning and life-cycle attributes, metadata according to INSPIRE regulations and delivery through INSPIRE services regulations, easy access for authorised users; and **c) Considerations for future,** like marine cadastre, 3-D cadastre and interoperability of land registries.

2   Foreword

2.1   Document purpose and structure

2.1.1   Purpose

This document provides the main characteristics of core data for theme Cadastral Parcels with focus on the recommendation for content. This document aims to help decision makers (from governments, data producers, national coordination bodies, etc.) to define their policy regarding the improvement of existing data and production of new geospatial data. It addresses digital data.

This document has annexes containing more detailed explanations targeting the technical people who will be in charge of implementing or adapting core data recommendations (e.g. for production purpose, as source of other standards, etc.).

2.1.2   Structure

The executive summary synthesizes the main conclusions of the Working Group A (WG A) process and results to develop the recommendation for content. It is meant mainly for high level decision makers.

The foreword reminds the general context of core data, the first step achieved by WG A (i.e. selecting core data themes), and it explains the general principles set by WG A to develop the recommendations for content of core data specifications for all selected themes.

The 'recommendation for content' document itself includes four chapters:
- Overview: it provides the general scope of the theme and describes the main use cases addressed;
- Data content: it provides the main characteristics of the recommended content, such as the list of core features and attributes (for vector data), as well as data capture and quality rules;
- Other recommendations: e.g. Coordinate Reference System, Metadata, Delivery;
- Considerations for future: this chapter addresses some key trends or significant user requirements that cannot be considered as core today but that might be considered in future.

The 'recommendation for content' document is meant for medium level decision makers. It is written in natural and not too technical language.

The technical explanations included in annexes describe the relationship between the recommendation for content and the corresponding INSPIRE specification, and contain any other appropriate information useful for this theme.

2.2 Core data context

2.2.1 Rationale for core data

The following background of harmonised pan-European data was identified.[1]

Authoritative geospatial data are used to support both the implementation of public policies and the development of downstream services. Moreover, geospatial data are required to be homogenous to enable the implementation of public policies in a coherent and coordinated way among countries and at regional or global level. Likewise, significant opportunities exist if services developed by industry can be exploited without requiring country specific adaptation.

The INSPIRE Directive has set up the legal and technical framework for harmonisation of the existing data related to the themes in annexes I, II and III. INSPIRE specifications provide common data models that ensure a first step towards interoperability, however ensuring homogeneous content is outside their scope, as they contain no indication about levels of detail, very few recommendations about quality, and as most features and attributes are "voidable", i.e. to be supplied if available or derivable at reasonable cost.

This background led the UN-GGIM: Europe Regional Committee to setup in 2014 the Working Group A on Core Data to deal with core data content and quality, production issues, funding and data availability.

Recommendations for content of core data will complement INSPIRE data specifications by defining the priorities on the core content that is encouraged to be made available in Europe in order to fulfil the main user requirements that are common to many countries, with focus on the SDG related ones.

Core data availability may be ensured either through upgrading of existing data when feasible or through production of new data when necessary.

2.2.2 Core data scope

In its first phase, WG A selected core data themes according to the following criteria: core data is the geospatial data that is the most useful, either directly or indirectly, to analyse, to achieve and to monitor the Sustainable Development Goals.

Among the 34 INSPIRE data themes, 14 have been considered as core including theme Cadastral Parcels.

More information about the selection process and results may be found in document 'Core Data Scope - Working Group A - First Deliverable of Task 1.a - Version 1.2' on http://un-ggim-europe.org/content/wg-a-core-data

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[1] Extract from the Report by the Preparatory Committee on the establishment of the UN-GGIM: Europe Regional Committee, European Commission Ref. Ares(2014)1491140 - 09/05/2014.

2.3 Document objectives and principles

2.3.1 Encouraging content availability

This deliverable provides recommendations for national governments and data producers, aiming to help them to define their priorities for enriching existing data or producing new data. This deliverable is meant mainly for data producers, however it defines the recommended result and target but not the production process.

2.3.2 Complementing INSPIRE

Core data specifications are built upon INSPIRE data specifications. On one hand, they often simplify INSPIRE by selecting core feature types and attributes and by restricting or clarifying the scope; On the other hand, they enrich INSPIRE by recommending specific levels of detail, quality rules and sometimes data model extensions. Besides, the INSPIRE common terminology is thoroughly used for naming core features and attributes.

Regarding the levels of detail, the ELF (European Location Framework) project terminology has been used. The ELF levels of detail are the following: Global, Regional, Master level 2, Master level 1, Master level 0. These terms are defined in the glossary.

Regarding delivery, core data may be supplied according to several ways. It is expected that, very often, the core data recommendations will be used to enrich and upgrade existing products. In this case, core data will be available through these improved products. Core data may also be delivered through INSPIRE conditions (specifications and services).

2.3.3 Status of core data recommendations

This document contains recommendations that are not legally binding. However, some recommendations are more important than others. This order is indicated as follow:

Core Recommendation X

It is first priority recommendation, considered as both necessary and achievable in principle. Ideally, it should encourage involved stakeholders to launch short-term actions (typically within a couple of years).

Core recommendations are usually addressing only technical aspects and are meant for the organisations in charge of producing this theme. The set of core recommendations defines the basic expectations on core data.

Good Practice X
It is second priority recommendation; if adopted, it will provide significant added value to core data; it indicates a relevant trend to be adopted as much as possible. It encourages involved stakeholders to take these recommendations into account in long term, if not possible in short term.

NOTE: some of these good practices may be quite easy to achieve and are already effective in some countries whereas some others may be more difficult to achieve. This is typically the case when these good practice recommendations involve other stakeholders in addition to the organisations in charge of producing this theme, and when they address not only technical aspects but also legal or organisational ones.

A "core data set" should contain the minimum data defined by the core recommendations (and ideally also by the good practices) of this deliverable but may of course contain more and/or better information.

2.4   Abbreviations

CRS	Coordinate Reference System
ELF	European Location Framework
INSPIRE	Infrastructure for Spatial Information in the European Community
SDG	Sustainable Development Goal
UN-GGIM	United Nations initiative on Global Geospatial Information Management
WG A	(UN-GGIM: Europe) Working Group on Core data

2.5   Glossary

Global	Level of detail defined by ELF: data to be used generally at scales between 1: 500 000 and 1: 1 000 000, i.e. mainly at international level
Master level 0	Level of detail defined by ELF: data to be used generally at scales larger than 1: 5 000; typically, data at cadastral map level, for local level actions.
Master level 1	Level of detail defined by ELF: data to be used generally at scales between 1: 5 000 and 1: 25 000; data for local level actions.
Master level 2	Level of detail defined by ELF: data to be used generally at scales between 1: 25 000 and 1: 100 000); data for regional (sub-national) actions.
Regional	Level of detail defined by ELF: data to be used generally at scales between 1: 100 000 and 1: 500 000; data for national or regional (European or cross-border) actions.

2.6   Reference documents

INSPIRE Data Specification on Cadastral Parcels– Technical Guidelines 3.1:
http://inspire.ec.europa.eu/id/document/tg/cp

3 Overview

3.1 General scope

Definition: Areas defined by cadastral registers or equivalent. [INSPIRE Directive 2007/2/EC]

Description: As much as possible, 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 [INSPIRE description itself 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.

The general scope of core theme Cadastral Parcels is the same as the scope of the INSPIRE theme Cadastral Parcels but core data aims to enrich and upgrade existing data whereas INSPIRE only aims to make existing data more accessible and more interoperable.

More detailed explanations about the articulation with INSPIRE are available in the annex A.

3.2 Use cases

The theme 'Cadastral Parcels' is the geographic part of a wider information system and process: land administration. Land administration systems should ideally: guarantee ownership and secure tenure, support the land and property tax system, constitute security for credit systems, develop and monitor land markets, protect State lands, reduce land disputes, facilitate land reform, improve urban planning and infrastructure development, support land management based on consideration for the environment and produce statistical data. As such, cadastral and land registration system plays a major social and economic role and are necessary to achieve most of the Sustainable Development Goals.

Examples of use cases include:

a) Real Estate Market. Cadastral data are primarily defined to ensure ownership and to make land market easier and safer.
b) Taxation: cadastral data is used for valuation and taxation of real land properties; the land taxes supply funding to local authorities, enabling them to manage their territory and to offer services to citizens
c) Agriculture. Cadastral data support the Integrated Administration and Control System – Land Parcel Identification System (IACS LPIS) for reimbursement of farmers in the context of Common Agricultural Policy of the European Union that aims at competitiveness of European agricultural products, dealing with climate change and development of the agricultural economy. In addition, relevant to this type of applications are targets 2.3 and 2.4 of SDG 2 "End hunger, achieve food security and improved nutrition and promote sustainable agriculture".
d) Land policy and land reform. Land consolidation projects are necessary in case of excessive fragmentation or abandonment of land for development of agricultural land and creation of competitive agriculture reducing inequalities between urban and rural areas and improving quality of life

e) Environment. Cadastral data may be used to support sustainable use of soils in the context of Proposal for a Directive of the European Parliament and of the Council establishing a framework for the protection of soil and amending Directive 2004/35/EC.

f) Spatial Planning: A background cadastral map is necessary to prepare land planning and also to display regulated areas and so, to make every one aware of the public restrictions that apply on a property. In addition, cadastral parcels are often used as supporting geometries for production of land use and land cover data

g) Statistics. Cadastral data may be used to geocode and integrate information on land cover and land use and to conduct various statistical studies, e.g. land accounting or computation of land use indicators such as soil sealing (by combining cadastral parcels with building footprints).

h) Infrastructure management. Cadastral information is required for the design, construction and management of infrastructures.

i) State Land Management. Cadastral data should enable to know if the land is public or private: this is key information for deciders as the means of action may be quite different according to the land ownership status. In addition, environmentally important lands, generally owned by the State (protected sites, national parks, rivers etc), in case they are derived as State land data from the cadastre, provide the opportunity for protection and policy making towards sustainable development.

j) Disaster management: cadastral data enable to find the owner of a damaged property in order to pay compensations

'Cadastral Parcels' is one of the candidate themes for the point-based statistics, recommended by UN-GGIM: Europe WG B and by the statistical community in general (GEOSTAT-2 project and the Global Statistical Geospatial Framework). The cadastral map is generally the most accurate map on a territory.

NOTE: national regulations aiming to protect personal data may restrict the access to the owner or valuation information.
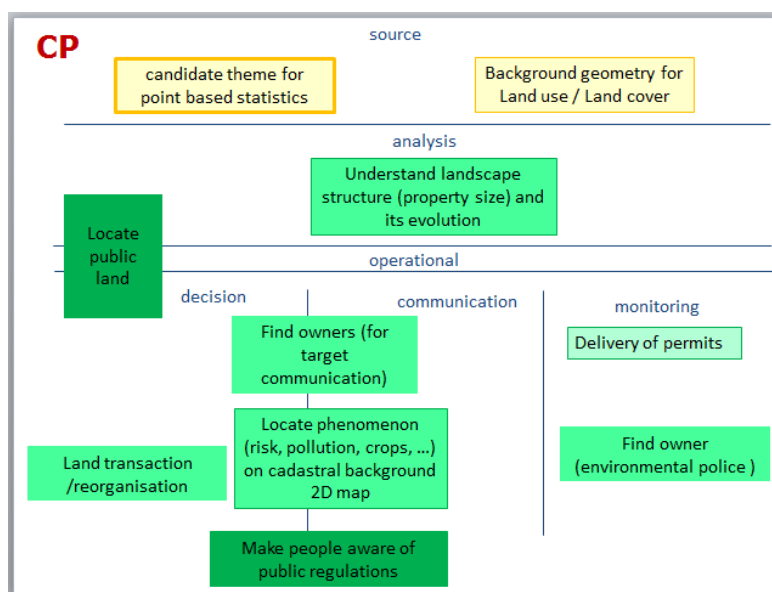

Figure 1: map of use cases for theme 'Cadastral Parcels' (CP)

4   Data content

4.1   Features types and attributes

Core Recommendation 1
Core data should include feature type Cadastral Parcel with following attributes:
- geometry (as surface or as multisurface);
- national cadastral reference.

NOTE 1: The national cadastral reference is generally the full national code of the cadastral parcel. It must ensure the link to the national cadastral register or equivalent. It has to be unique within the national cadastral register.

NOTE 2: from the theme description, cadastral parcels should be "considered as single areas of Earth surface" and so they should be represented as much as possible by "surface". However, in existing data, there are still some parcels composed of several areas. This is why the option "multisurface" has been allowed by INSPIRE. But it is not recommended for new capture of core data (see core recommendation n° 4).

Good Practice 1
All instances of feature type 'Cadastral Parcel' should have a unique and persistent identifier.

NOTE 1: each geospatial cadastral parcel (on the cadastral map) should have a unique and persistent identifier; this role may generally be ensured by the national cadastral reference. However, in some countries, the national cadastral reference is not unique on the cadastral map (a legal or fiscal parcel composed of several geospatial parcels) or not persistent enough (e.g. depending on changes in administrative codes). In these cases, it is worth to provide a "true" identifier (i.e. unique and persistent) in addition to the national cadastral reference.

4.1.1   Estimated accuracy
Existing cadastral data is often quite heterogeneous regarding its accuracy; typically the accuracy may vary according to the data capture methods and so, to the period the survey was conducted.

Good Practice 2
When relevant, the estimated accuracy of cadastral data should be documented using the INSPIRE feature types 'Cadastral Boundary' or 'Cadastral Zoning'.

NOTE: more detailed information about the recommended attributes of CadastralBoundary and CadastralZoning may be found in the annex A.

4.1.2   Temporal aspects
Once features have been captured, it is recommended to keep them in the data base, even after their end in the real world.

Good Practice 3
It is recommended to manage the history of features, using the mechanism provided by the INSPIRE data specifications: versioning and life-cycle attributes.

NOTE 1: the versioning and life-cycle attributes enable change-only updates; they also enable to retrieve the status of geographic cadastral data, at any time of the past (since the adoption of these mechanisms)

NOTE 2: these mechanisms will help to understand the history of cadastral parcels and so will be helpful to solve or even better to prevent land disputes.

NOTE 3: Official statistics in general and for SDG monitoring in particular are about time series. As a result it is necessary to link geographies to certain moments in time. In many countries, cadastral parcels are at the fundament of a hierarchical system of statistical and administrative geographies. As a result a change of a cadastral parcel may result in a change of a statistical geography. It might be useful to trace back in time not only different versions of statistical geographies but also versions of their building blocks i.e. the cadastral parcels.

4.2   Levels of detail

Core theme 'Cadastral Parcels' corresponds to Master level 0 data.

NOTE: the levels of detail are defined by a scale range in the glossary. This notion is important for the themes where there may be several representations of same real world entity. This is not the case of theme Cadastral Parcels: there is generally only one representation of cadastral parcels, very often at scales larger than 1: 5000; so, the theme Cadastral Parcels is considered by default as being at Master level 0 even though smaller scales (e.g. 1: 10 000) may be used for cadastral parcels for instance in remote areas.

4.3   Geographical extent

Core Recommendation 2
Core data for theme 'Cadastral Parcels' should be available on whole territory, according to national law.

NOTE 1: this recommendation aims to encourage the achievement of cadastre under elaboration, in countries where whole territory is not yet surveyed.

NOTE 2: as core data is specified in this deliverable as vector data, this recommendation also aims to encourage complete vectorisation of cadastral data for countries with remaining raster data only.

Good Practice 4
Data for theme 'Cadastral Parcels' should be available on whole land territory, including public domain.

NOTE 1: for countries where cadastre does not include public domain (or other parts of territory), this recommendation would imply change in national regulation and survey of missing areas.

NOTE 2: public domain is generally not submitted to taxation and to land market but inclusion of land under public domain in the national cadastre is necessary to get the benefits of a multi-purpose cadastre.

    o   These benefits include better public land management, e.g. securing investments on public land, enabling to know easily the public land manager or owner (State, local authorities…), facilitating delivery of permissions for use. Cadastration of public domain may be an opportunity to make inventory of abandoned public land (without any current use) and to decide of its future use: keep it as public land for future (use e.g. land reserve for protected areas or social habitat) or move it to land market.

    o   In addition, inclusion of land under public domain in the national cadastre would ensure whole partition of land territory; therefore, it would enable the creation of administrative and of other managed or regulated areas by aggregation of cadastral parcels; it would also enable the efficient use of cadastral parcels as supporting geometries for land use or land cover data.

4.4   Data capture

According to INSPIRE **definition**, cadastral parcels are "areas defined in cadastral registers or equivalent". However, this definition is quite wide and in some countries, cadastral registers contain not only cadastral parcels but other kinds of areas (e.g. sub-parcels, building units, basic property units).

Core data is limited to cadastral parcels, i.e. to the areas corresponding both to the definition and to the **description** of the theme (chapter 3.1.1).

Core Recommendation 3
All the cadastral parcels corresponding both to the definition and description of the theme (cf. chapter 3.1.1) are considered as core data and should be captured.

Guidelines are provided in clause 10 (Data capture) of INSPIRE Data specifications for theme Cadastral Parcels. These guidelines also apply for core data.

Good Practice 5
If in a country, cadastral register or equivalent contains cadastral parcels and other kinds of areas, it is recommended to store and to deliver them in separate feature types.

NOTE: regarding this theme, only the cadastral parcels themselves are considered as core data.

Core Recommendation 4
In case of new survey, it is recommended to capture cadastral parcels as single surface.

NOTE: INSPIRE data specification allows surface or multi-surface for geometry of cadastral parcels but recommends the use of surface. This recommendation is also relevant for core data.

4.5   Quality

4.5.1   Absolute accuracy

Core Recommendation 5
Cadastral parcels should have in general an absolute accuracy of 1 metre or better in urban areas and of 2.5 metres or better in rural areas. In case of new surveys, it is recommended to use methods enabling absolute accuracy better than 50 cm.

NOTE 1: accuracy is here defined as the mean value of positional uncertainties.

NOTE 2: INSPIRE recommends the target of 1 m or better in urban areas and of 2.5 m in rural areas but allows adaptation to context of the Member States (accuracy generally depends on the density of human activities). This possible adaptation is also relevant for core data: in isolated, mountainous and low economic value areas the expectations of the accuracy of survey may be lower.

NOTE 3: however, in practice, most existing data have much better accuracy; this trend has to be encouraged; the above core recommendation aims only to provide minimum requirements.

4.5.2   Topologic consistency

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

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

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

4.5.3   Temporal consistency

Core Recommendation 7
There should be temporal consistency between the cadastral parcel in the spatial data set (cadastral map) and the cadastral parcel in the land registry (if any) or in reality.

NOTE 1: for instance, in case of parcel splitting, once the national cadastral reference of the new parcels are available in the land registry for land transaction, the geometry of the new parcels shall be captured in the spatial data set and made available for users.

NOTE 2: in some countries, land registry is not mandatory; however, once a new parcel national cadastral reference may be used for land transaction, the new parcel has also to be available in the cadastral map.

NOTE 3: in practice, in some national systems, a delay of a few days is necessary to ensure this update. Such short delays are considered acceptable by most users.

5   Other recommendations

5.1   Coordinate Reference System (CRS)

5.1.1   Case of 2D data

Good Practice 6
Core data should be stored and managed in a CRS based on datum ETRS89 in areas within its geographical scope, either using geographic or projected coordinates.

NOTE 1: geographical scope of ETRS-89 excludes over-sea territories, such as Canary Islands or French Guyana or Madeira Islands and Azores Islands. In these cases, it is recommended to use a CRS based on ITRS (International Terrestrial Reference System).

NOTE 2: storing and managing data in CRS based on international datum facilitates the import of measures from modern sensors, ensures that data is managed in a well-maintained geodetic framework and of course, facilitates the export of data into international CRS (e.g. those mandated by INSPIRE).

5.1.2   Case of 2.5D data

Good Practice 7

If cadastral parcels are captured as 2.5D data, it is recommended to use for the Z coordinate a gravity-related height, ideally given in EVRS as vertical component of the Coordinate Reference System.

NOTE 1: EVRS states for European Vertical Reference System.

NOTE 2: cadastral parcels are expected to be often captured as 2D data.

5.2   Metadata

Good Practice 8

Core data should be documented by metadata for discovery and evaluation, as stated in the INSPIRE Technical Guidelines for metadata and for interoperability.

NOTE: this is a legal obligation for the Member states belonging to the European Union. For the other countries, this is a way to make their data easily manageable by transnational users.

Cadastral parcels are large scale data, mainly used at local level, by users (more or less) aware of the main characteristics of their national cadastral system. However, cadastral data is more and more required by foreign users (investors, potential private buyers) and by cross-border or pan-European use cases.

Good Practice 9

It is recommended to document the main characteristics of the cadastral system. These main characteristics include the conditions of access and use to the cadastral parcel data but also to the land registry (if any), the geographic extent of the cadastral parcel data, the composition rule for the national cadastral reference, the general quality status and the production and maintenance process of cadastral parcel data.

NOTE 1: There may be several ways to publish these characteristics. For instance, the recommended information may be integrated in the relevant elements of metadata (such as abstract, lineage, conditions of access and use); it may also be explained in a national cadastral data specification document. Ideally, the documentation should be available both in national language and in English.

NOTE 2: the information about the geographic extent should specify how much cadastral parcels are forming a partition of territory: if land public domain and if marine cadastre are included or not,

which coastline has been used for delineating the land territory, if cadastral gaps or overlaps between cadastral parcels are allowed by national regulation.

NOTE 3: the composition rule for the national cadastral reference is of specific interest when cadastral data includes Cadastral Zonings; in this case, it is recommended to explain the administrative division, e.g. from municipality to parcel.

NOTE 4: the general quality status should explain if there are topological issues (topological gaps and overlaps, multi-surface parcels), if there is some temporal inconsistency between land registry and cadastral map and how the geometric accuracy is documented (at data set level, at cadastral zoning level, at parcel boundary level, not at all).

5.3   Delivery

It is expected that core data will be made available through improved existing products (or new products) or as INSPIRE data, and perhaps as specific core products (delivery issues still have to be investigated by the working group).

> Good Practice 10
> Core data should be made available according to the INSPIRE Technical Guidelines for interoperability, for metadata and for services.

NOTE: this is a legal obligation for the Member states belonging to the European Union. For the other countries, this is a way to make their data easily manageable by transnational users.

> Good Practice 11
> It is recommended to ensure an easy access, for authorised users, to the information related on cadastral parcels that is stored in the land or in the taxation information system.

NOTE 1: several use cases of theme "cadastral parcel" require access to ownership status and to the owner's name. However, some national regulations, aiming to protect personal data by not allowing direct or indirect association with persons, may restrict the provision of the link between the cadastral parcel and its owner(s) only to authorized users. In any case, access conditions to cadastral data, both spatial and legal, should be clearly stated in metadata information.

A key information for users relates to the legal status of the cadastral boundary; this legal status is connected to the quality and accuracy of the surveying. There are two options: either the State guarantees the cadastral boundary providing liability if a user suffers a loss from any incorrect registration of the boundary or publishes a disclaimer striving to absolve it from any litigation risk. This disclaimer is usually included in the text of the license, either open or not.

> Good Practice 12
> The warranty by the State for the cadastral boundary or the disclaimer should be included in the license (or in the metadata).

6 Considerations for future

6.1 Extent of geospatial data

The current recommendations of this document focus on encouraging cadastral parcels forming a partition of land territory. This is considered as today first priority and reasonable ambition.

However, some countries have already engaged themselves in the constitution of marine cadastre. Surveying the rights, responsibilities and restrictions applying to the public maritime domain may boost the blue economy and contributes to sustainable development of sea. Nevertheless, lack of common definition of marine parcels, differences in the legal system of rights at sea, no uniform interest in Europe at the moment, further research needed on the content and registration process, multiplicity of stakeholders and actors involved, sparse engagement of cadastral authorities, financial issues are some of the difficulties showing that for the time being marine cadastre could not be included in core data. Having cadastral parcels forming a whole partition of national territory (land and sea) might become ambition of core data but only in a few years.

There is also an increasing trend to register the rights, responsibilities and restrictions not only at earth surface but also over and under this earth surface, i.e. as 3D data. As for marine cadastre, the subject does not look yet mature enough today but this new cadastral geographic data might become ambition of core data within a few years.

6.2 Better interoperability of land registries

Due to INSPIRE and to this core data recommendations, it is expected to get a relatively homogeneous European coverage of geospatial cadastral data but there is also need of some interoperability between the land registries. The first aim would be to harmonise the conditions of access to the European land registries (as required by the e-Justice initiative and its Land Registry Interconnection portal). On another hand, the ISO 19152 standard "Land Administration Domain Model" offers common understanding and vocabulary about the main concepts of a legal cadastre. Some minimum interoperability of land registries might also be an objective of Geographic Information Management in future.

6.3 Consistency with administrative boundaries

Data on cadastral parcels is generally consistent with large scale data on administrative units, i.e. the relative position of cadastral parcels and administrative boundaries is the same in the real world and in data. Typically, administrative boundaries are generally sharing geometry with cadastral boundaries.

However, issues may occur with international boundaries. The trend is to get high accuracy and legally agreed international boundaries between neighbour countries in Europe. During the official delineation process, the consistency with cadastral parcels may be lost as neighbour countries had likely different initial representations of the common international boundary.
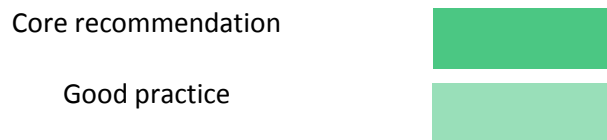
Getting high accuracy and legally agreed international boundaries on whole Europe is a time-consuming process and it is a good practice to be encouraged. Then, in a later step, data producers should think about restoring the consistency between the cadastral boundaries and the agreed international administrative boundaries.

7   Annex A: Relationship with INSPIRE

7.1   Data model

The UML models provided in this annex are only graphical illustrations of the core recommendations and of the good practices present in this document.

The recommendations for content are represented by highlighted the selected attributes in the following way:

Core recommendation

Good practice

7.1.1   Attributes

Core Recommendation 1

Core data should include feature type Cadastral Parcel with following attributes:
- geometry (as surface or as multisurface);
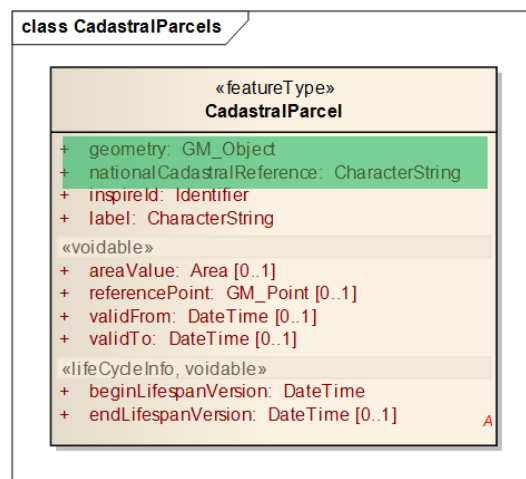**- national cadastral reference.**

Figure 2: core content for theme 'Cadastral Parcels'

NOTE: The INSPIRE data model includes four mandatory attributes whereas the core data recommendation includes only two attributes. This is not inconsistent:

- the label will in general be derived from the nationalCadastralReference (and so, does not need to be stored in a production database);
- in many countries, the inspireId may also be built from the nationalCadastralReference and so is not absolutely necessary.

7.1.2   Unique and persistent identifier

Good practice 1
All instances of feature type 'Cadastral Parcel' should have a unique and persistent identifier.
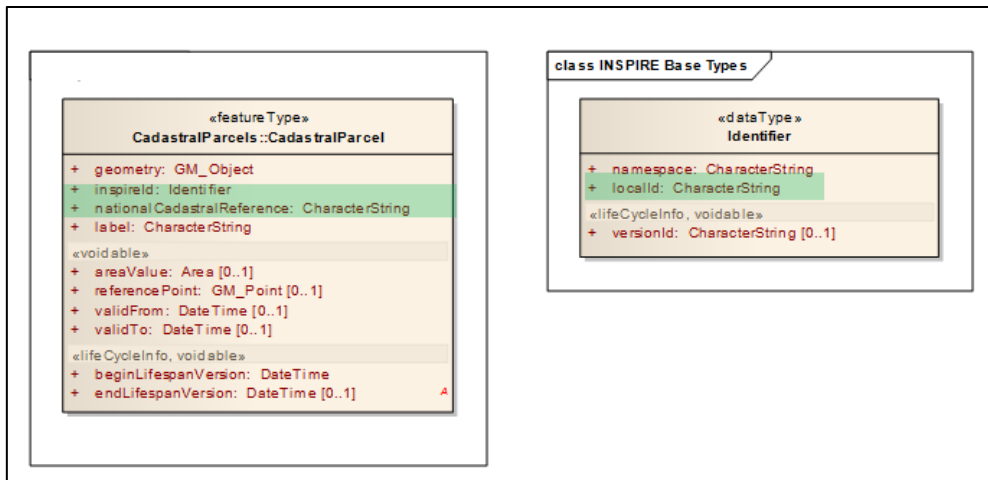
Figure 3: unique and persistent identifier

NOTE 1: the role of persistent identifier may be played by the national cadastral reference if it is unique and persistent. If it is not the case, it is worth to provide a "true" identifier (i.e. unique and persistent) in addition to the national cadastral reference. This "true" identifier would be the local identifier (localId) to be used to build the INSPIRE identifier (inspireId).

NOTE 2: INSPIRE makes distinction between external identifier of the feature that has to be unique and persistent (called also primary key in database syntax) and the thematic identifier that is used to ensure the link to another dataset (called also secondary key in database syntax). Typically, for CadastralParcels, the national cadastral reference is the thematic identifier ensuring link to cadastral registry whereas the inspireId is the external identifier. The INSPIRE data specification generally allow to use the national cadastral reference (if good enough) as local identifier but, it may be worth to manage two different attributes in the production database, each of them playing a unique role (inspireId as external identifier and nationalCadastralReference as thematic identifier).

7.1.3 History of features

Good practice 3
It is recommended to manage the history of features, using the mechanism provided by the INSPIRE data specifications: versioning and life-cycle attributes.
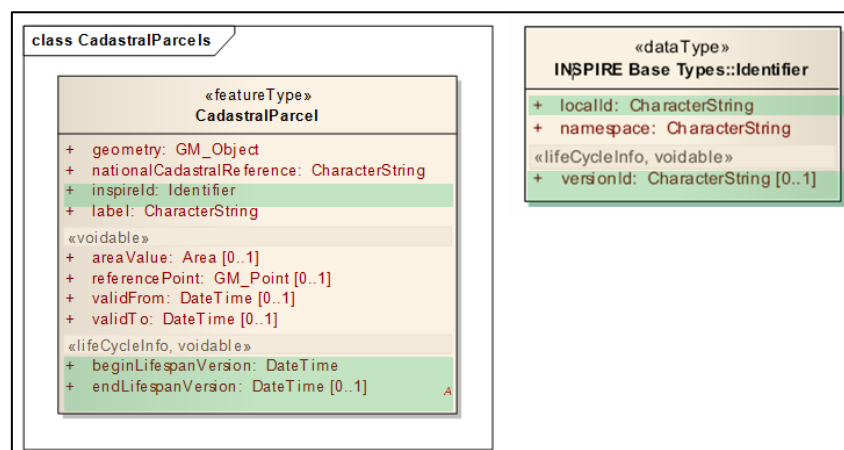

Figure 4: temporal attributes to manage history of features

NOTE: in the data type "Identifier", the namespace is generally a constant value that doesn't need to be stored at feature level.

7.1.4 Estimated accuracy

Good practice 2
When relevant, the estimated accuracy of cadastral data should be documented using the INSPIRE feature types Cadastral Boundary or Cadastral Zoning.
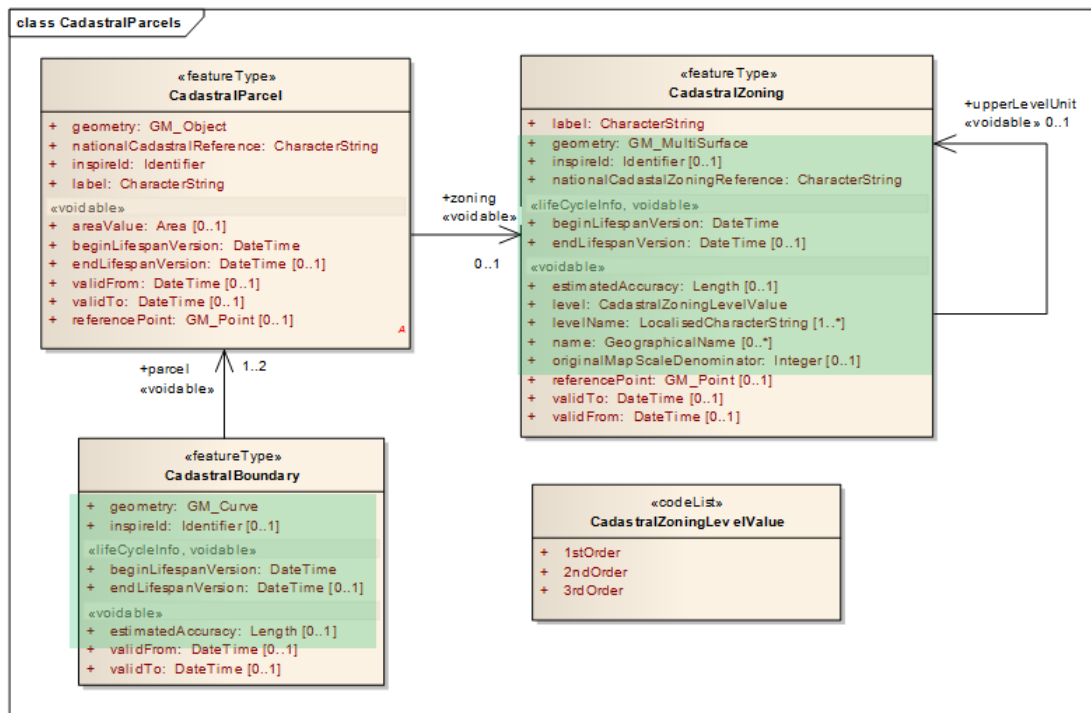

Figure 5: documenting accuracy of cadastral data

NOTE 1: in addition to the attribute 'estimatedAccuracy', the attribute 'originalMapscaleDenominator' may also contribute to give an idea of data quality, as it provides the initial resolution of data.

NOTE 2: in INSPIRE, the name of CadastralZoning is defined as data type GeographicalName. For core data, it is enough to capture the spelling (as CharacterString) and key metadata attributes, such as language and status (cf. deliverable about theme GeographicalName).

7.1.5 Alternative implementation data model

In the INSPIRE data model, the information about national cadastral reference is supplied through a single attribute (nationalCadastralReference) whereas in existing data, it is often derived from several attributes, such as municipality code, section code, parcel number. Both implementations are suitable for core data production.

7.2 Other topics

7.2.1 Main ambitions

The "Core data recommendations for content" document is pushing two main ambitions for cadastral parcels:

- Cadastral parcels forming a partition of land territory
- Cadastral parcels allowing easy and reliable link to cadastral registry.

The first ambition is totally consistent with the INSPIRE description of theme Cadastral Parcels; it is expressed through core recommendations and good practices that are widely coming from INSPIRE data specifications: use single areas - prefer surface to multi-surface - , ensure completeness and topological consistency. But core data is going further than INSPIRE by recommending availability of cadastral parcels data on whole land territory.

The second ambition is more specific to core data. Whereas INSPIRE focused on cadastral parcels used as locators for geo-information, core data includes the land market use cases and so clearly recognizes the need to find the owner of a parcel. This is why the "Core data recommendations for content" document includes recommendations about temporal consistency between cadastral map and cadastral registry or about documenting the access rights to the cadastral registry.

8 Annex B: Methodology

Core data specifications have been elaborated based on one hand on user requirements (with focus on the ones related to SDG) and on the other hand on INSPIRE data specifications.

The work has begun by an analysis of the INSPIRE data specifications and by a comparison between the INSPIRE context (focus on environmental policies) and the core data context (focus on Sustainable Development Goals).

This initial analysis enabled the identification of candidate proposals for core data, regarding mainly the geographic scope and the quality. To check the relevance and feasibility of these proposals, a questionnaire was sent to the cadastral data producers (with the help of the EuroGeographics Cadastre & Land Registration Knowledge Exchange Network or CLR KEN). This questionnaire was answered by 20 countries.

The results of the questionnaire showed general agreement from the cadastral community regarding the WG A proposals but also enabled to refine these proposals. For instance, the initial envisaged target for accuracy (1m in urban areas and 2,5 m in rural areas) has been kept but better accuracy has been recommended for new surveys, based on the questionnaire results.

WG A presented its proposals to the cadastral community during two meetings, one on 17-18 November 2016 in Bratislava (joint meeting CLR KEN, PCC -, EULIS) - together with the questionnaire results - and one on 5-6 October 2017 in Vienna (Common Vision Conference). In both cases, no one expressed disagreements or reserves about the proposals of UN: GGIM: Europe WG A regarding the theme Cadastral Parcels.