

## Questionnaire 3D-Cadastres: status November 2010

Italy



This questionnaire is an activity of the FIG working group 3D-Cadastres 2010-2014. The purpose of the survey is to make a world-wide inventory of the status of 3D-Cadastres at this moment (fall 2010) and the plans/expectations for the near future (2014). By sharing this information, it should be possible to improve cooperation, learn from each other and support future developments. For more information on the FIG working group on 3D-Cadastres see the website of this working group [www.gdmc.nl/3DCadastres](http://www.gdmc.nl/3DCadastres). Now a few notes and suggestions, which should be helpful when completing the questionnaire:

- In this questionnaire the concept of 3D-Cadastres with 3D parcels is intended in the broadest possible sense. However, what exactly is (or could be) a 3D parcel is dependent on the legal and organizational context in the specific country (state, province). 3D parcels include land and water spaces, both above and below surface.
- A more formal definition: A 3D parcel is defined as the spatial unit against which (one or more) unique and homogeneous<sup>1</sup> rights (e.g. ownership right or land use right), responsibilities or restrictions are associated to the whole entity, as included in a Land Administration system.
- As the definition above is quite abstract, it is tried in the questions below to be more specific and real world situations are used. Also two example sets of partial/preliminary answers are included from Australia, Queensland and The Netherlands, to support the questions and to be of help when formulation the answers for your jurisdiction.
- A 3D parcel is a 'legal object' describing a part of the space. Often there is a relationship with a real world/physical object, which can also be described in 3D. Please be aware of the difference between these two types of objects and that the focus in the context of 3D-Cadastres is on 3D parcels (spaces of legal objects).
- If a certain question is not relevant or if you have no clue what to respond, do not spend any time on this (and leave the field blank).

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<sup>1</sup> Homogenous means that the same combination of rights equally apply within the whole 3D spatial unit. Unique means that this is the largest spatial unit for which this is true. Making the unit any larger would result in the combination of rights not being homogenous. Making the unit smaller would result in at least 2 neighbour 3D parcels with the same combinations of rights.

## 1. General/applicable 3D real-world situations

This part of the questionnaire refers to the applicable 3D real-world situations to be registered by 3D parcels. It also addressed the types of 3D geometries, which are considered to be valid 3D representations for these parcels.

	Italy 2010	Italy 2014
1.1. Are all 3D parcels constrained to be within one surface (2D) parcel?	Not necessarily, they may concern more than one parcel.	No change
1.2. Are ambulatory <sup>2</sup> boundaries permitted?	Certainly, they may be liable to variation.	No change
1.3. Is it allowed to have 3D parcels not related to physical constructs or objects?" (e.g. airspace, subsurface volumes)	Normally not, there is always a concrete link with an object.	Yes, provided these volumes are liable to produce income or rights (private caves, tunnels, underground shelters, etc).
1.4. Are disconnected parts of a single 3D parcel allowed?	Yes, especially if they are used in common by various subjects.	No change
1.5. Limitation – e.g. must the 3D parcel be described by a boundary definition?	Since these are normally jointly owned buildings, each real estate unit is well defined and such definition is regulated by law. In that part of Italy where the cadastral system applying was formerly Austrian, the boundaries of each real estate unit are clearly defined, graphically and by law.	No change. Note: Each parcel must be defined descriptively in relation to the rights, and geometrically/planimetrically in relation to the consistency. The 3D data may be inferred from the net height of the real estate unit, indication of which is obligatory on planimetries referring to real estate units.
1.6. Are curved surfaces to bound the 3D parcels allowed?	Yes	Yes
1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?	No	No
1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?	No	Yes. Surfaces must be horizontal. Vertical surfaces are not shown in the Cadastre. Inclined surfaces are shown in relation to their

<sup>2</sup> An ambulatory boundary is a boundary of a land parcel which follows the movements of a natural feature such as a river. Its position determined at points of time (when a survey is carried out), but between such "fixes", the definition of the property is the position of the real world natural feature.

		projection on the horizontal plane.
1.9. Is there generic legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	Yes, the Civil Code, articles 1117 to 1121	No change
1.10. Is the legal text available in original language?	Yes	Yes
1.11. Is the legal text (relevant part) available in English translation?	No, but it can be undertaken	Yes
1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?	Yes	Yes
1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series?	No	No
1.14. Are natural resources (groundwater, mining rights) considered as 3D parcels?	No	No
1.15. Are polluted areas considered as 3D parcels (as legal restrictions are associated to these spaces: above and below surface)?	No	No
1.16. Are spatial plans considered as 3D parcels (as rights or restrictions are related to them)? Sometimes also called spatial development plans, zoning plans or physical plans (land use, urban, regional, environmental,...)	No	No. Thematic cartographies are now being brought out which contain the superimposed indication of various locations or limitations of parts of the territory at local, provincial and regional level.
1.17. Any other geometric issues?	Yes	Yes, e.g.: the projections of overhangs or the indication of rights of use (easements, etc.) must be shown using hatched segments, etc. (.....)

## 2. Infrastructure/utility networks

This refers to the situation where an infrastructure network is considered to be defined within the cadastre. For example in some jurisdictions, an underground network might be privately constructed for the purpose of leasing space in it for other organisations to run cabling. In this case, a network, or part of that network may be considered to be a real estate object.

	Italy 2010	Italy 2014
2.1. Do you register network parcels? (e.g. subterranean conduit networks)	No. But the rights and geographies of the networked systems are managed by specific bodies, having their own cartographies and data banks	Yes. Existing underground pipelines within private properties are often associated with limitations of the right of ownership, and their overall dimensions must be represented using a hatched segment on 2D cartography.
2.2. If so, can the network structure be traced in the database(s)?	Not with precision, but with cadastral approximation	Yes, but with cadastral approximation. Pilot projects exist (for the time being only at the level of Communes) to set up a Cadastre of the subsoil.
2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).	Yes (see point 2.1)	No change
2.4. If so, are they registered as 3D property parcels?	No	No
2.5. Is the legal text available in original language? If so, give references to relevant document(s).	No	No
2.6. Is the legal text (relevant part) available in English translation?	No	No
2.7. Do you have example descriptions of typical 3D parcels for networks; either 'prototype' or 'operational'?	No	No
2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?	The objects of networks are not assessed together with the other cadastral procedures, so that no intersections exist	No change
2.9. Any other geometric issues?	Yes, in the 2D Cadastre. The road network is recorded as	No change

	<p>a line, the other publicly owned networks (aqueducts of large carrying capacity, cable-pipelines, etc.) with geometrical representation of total dimensions. Lines implying limitations of right (aqueducts, easements, cable pipelines, drainage ditches, crossings etc.) by hatched segments.</p>	
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### 3. Construction/building units

This refers to 3D properties that are related to constructions and apartment (condominium) buildings. The individual units are often defined by the actual walls and structure of a building, rather than by metes and bounds. E.g. “unit 5 on level 6 of ... building”.

	Italy 2010	Italy 2014
3.1. Do you register 3D construction/building units?	Yes	Yes
3.2. If so, what are the most important types? E.g. apartment units, or also other buildings or even more general constructions (infra related; such as bridge, tunnel or even other, such as windmills,..)	The most common are the urban real estate units	All building works (houses, factories, shared premises, shelters, etc.) including relevant works necessary for the normal use of the principal one
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Civil Code	No change
3.4. Is the legal text available in original language?	Yes	Yes
3.5. Is the legal text (relevant part) available in English translation?	No	No
3.6. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?	Yes	Yes
3.7. What would be typical 3D boundaries in an apartment complex: middle of the wall and floor/ceiling, or walls, floors/ceiling as neutral/shared 3D space?	Half of the perimetral or boundary walls between housing units for the 2D boundaries and half the floors of each storey for the 3D boundaries, normally understood as the storey floors	No change
3.8. Is common property inside the building registered? If so, how?	They have been recorded as parts in common use	No change
3.9. Who owns the common property inside the building?	In joint ownership between all the owners of the real estate units	No change
3.10. Who owns the land on which the apartment is built?	In joint ownership between all the owners of the real estate units	No change
3.11. Any other geometric issues?	The parts in common of the jointly owned building may concern different uses and more and various	No change

	geometrical dimensions, suffice it to consider the big real estate complexes where the parts used in common are jointly owned among a number of co-owners.	
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#### 4. X/Y Coordinates

	Italy 2010	Italy 2014
4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)	Not for 3D representations	Yes, but only as regards the position of the building. Using the Pregeo system of registration, the building is positioned on 2D maps with reference to a fixed system of coordinates.
4.2. Are the cadastral database coordinates authoritative?	Yes	Yes
4.3. If not, what is the authoritative source of X/Y coordinates?	/	/
4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?	Yes	Yes
4.5. What is the spatial reference system for X/Y Coordinates?	There are two main ones, the Gauss Boaga and the Cassam Soldner.	No change
4.6. Any other X/Y coordinate issues?	Many and diversified systems exist, of which only two serve as reference for the Cadastre. The stable points of reference belong to a national network managed by the IGM (Military Geographic Institute), which is responsible for national geographical maps.	No change



## 5. Z Coordinates/height representation

	Italy 2010	Italy 2014
5.1. Are the Z coordinates of 3D parcels relative to local ground?	No	No
5.2. Are Z coordinates reduced to a standard datum (absolute)? If so, what is the spatial reference system for the Z coordinate?	No	No
5.3. In principle possible to store both relative and absolute Z coordinate?	The Pregeo procedure for cartographic updating of the 2D Cadastre has recently come to foresee indication of the elevation data on the fiducial points and on the most significant elements plotted on the spot. This information is relative and not correlated to a “Z” system of absolute type.	Sharpening and improvement of elevation data
5.4. Is the earth surface (height) explicitly stored (in the DCDB or other accessible register)?	The altimetric values of stable points of reference (especially those of the IGM network) are registered, but not made known and available so as to be readily accessed by the public..	No change
5.5. What is the source of elevation for the 2D surface parcel?	The trigonometric points of the principal networks of reference	No change
5.6. Any other Z coordinate issues?	No	No

## 6. Temporal Issues

	Italy 2010	Italy 2014
6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?	Joint ownerships exist that assign rights within a time frame, but these are not decisive for definition of a parcel.	No change
6.2. Are moving parcels allowed?	No	No
6.3. Are there any limitations on the range of temporal limits? (e.g. only on 3D apartments).	No	No
6.4. Are there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?	No	No
6.5. In the case of tidal boundaries, what happens to the 3D ambulatory parcel if the 2D land parcel changes extent due to the movement of High Water Mark?	This question is dealt with in art. 941 of the Civil Code. The land converging and building up in a natural manner subsequently and imperceptibly on farms situated beside the banks of rivers, lakes, etc. as a result of variations in the natural flow of the water come to be gained by or taken away from the owner of the remaining part of the farm.	No change
6.6. Any other temporal issues?	No	No

## 7. Rights, Restrictions and Responsibilities

	Italy 2010	Italy 2014
7.1. Range of RRR on 3D parcels.	Yes	Yes
7.2. Are there any limitations on the range of rights? (e.g. subterranean parcels must be owned by Govt).	No	No
7.3. Any other RRR issues?	Yes. Private ownership of the soil extends to the subsoil, save the limitations deriving from the laws safeguarding the environment, the landscape, on antiquities, water etc., and to the space above the soil up to the limit of its utilisation in accordance with town-planning regulations.	No change
7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)	Yes	Yes
7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles.	Civil Code	Yes
7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?	Yes	Yes
7.7. What applications do you foresee for 3D cadastre?	What is important is to clearly define the exclusive ownership and that of common use, through the millesimal division of the portions.	No change

## 8. DCDB (The Cadastral Database)

	Italy 2010	Italy 2014
8.1. Does the DCDB contain representation of 3D parcels (in any form)?	Yes	Yes
8.2. If so, how are they represented (in the DCDB)?	Geometrically on different levels	No change
8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?	Representation on a map is conventionally referred to 1.20 m from ground level with continuous lines, with any departures from the lines inside and outside, above or below, indicated by a hatched or a dotted line	No Change
8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?	Yes, through planimetric elaboration which consists of the overall representation of all the owned parts constituting a building distinguished by storeys and classified by numbers subordinate to that of the parcel and through the Plan of co-ownership fractionation in the areas where the former Austrian Cadastre applies.	No change
8.5. Is it possible to manage a 3D topological structure in the DCDB?	No	No
8.6. Are constraints/rules defined for valid 3D objects (closed volume, no overlap, no gap in 3D)? What about rules for a mix of 2D and 3D representations?	No	No
8.7. How can internal and external user query and visualize the 3D content supporting rotating, slicing, transparency, perspective (3D web/view service, 3D pdf documents,..)?	By carrying out appropriate verifications on the Land Register (for the maps) and on the Register of Buildings for the planimetries of the real estate units	No change
8.8. What Spatial DBMS software	The software is that of	No change

do you use? Any 3D capabilities included and used?	the Agency for the Territory	
8.9. Do you have any validation rules for 3D representation in the database?	Yes	Yes
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	DOCFA and PREGEO are the systems used for updating and modification, while visualisation takes place using the cadastral IT system, which for the moment does not have any 3D functionality	No change
8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?	Access is through Sister (which is the IT system used by the Agency for the Territory), through Geoweb which is the telematic services company reserved to the category of Surveyors and through other private companies having a special agreement with the Agency.	No change
8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?	Yes	Yes
8.13. How do you query 3D objects in your DCDB?	According to standard procedures for objects and subjects	No change
8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	Yes, but the interrogation becomes complex	No change
8.15. Any other DCDB issues?	Yes	Yes

## 9. Plans of Survey (including field sketches)

	Italy 2010	Italy 2014
9.1. Do the survey plans carry 3D parcel representations?	Yes	Yes
9.2. If so, how are they represented?	Besides the planimetric geometries, the heights of the individual planes are indicated.	Yes
9.3. Is there specific legislation (regulations) describing the requirements for Plans of Survey in 3D? If so, please give link to the relevant documents.	Yes	Yes
9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?	No	No
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	No	No
9.6. In what format are the 3D parcels submitted for registration; attached to legal document in a single pdf (which has good 3D capabilities) or in an extension of (city)GML for 3D parcels, or....?	In PDF format	No change
9.7. Are the 3D parcels somehow checked for spatial validity; e.g. volume is closed, does not overlap with neighbour volume (and also no unwanted 3D gaps)?	No	No
9.8. Do you have examples of (prototype or production) 3D survey plans available?	No	No
9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D topography)?	No	No
9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning,...)?	Various	No change
9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?	DOCFA	No change
9.12. Can 3D parcels be subdivided, consolidated or nullified?	Yes	Yes

9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?	Yes	Yes
9.14. Any other survey plan issues?	Yes	Yes

## 10. Other Issues

Please include any other issues that may be of interest in an international context. For example, in some foreign jurisdictions 3D parcels can only be separated by horizontal planes.

10.1. Country (State, Province)	ITALY - ROME
10.2. Your name, function/position and your organization	Fausto Savoldi – President of the Consiglio Nazionale Geometri e Geometri Laureati Bruno Razza – Member of the Consiglio Nazionale e Geometri Laureati
10.3. Contact details: address email, telephone	Fausto Savoldi: Piazza Colonna 361, Roma - Italia <a href="mailto:pressavoldi@cng.it">pressavoldi@cng.it</a> ; <a href="mailto:m.scorza@cng.it">m.scorza@cng.it</a> +39 06 4203161 Bruno Razza: Piazza Colonna 361 – Roma – Italia <a href="mailto:b.razza@cng.it">b.razza@cng.it</a> ; <a href="mailto:m.scorza@cng.it">m.scorza@cng.it</a> +393474547586
10.4. Other issues	<p>The 3D Cadastre in Italy is normally represented by the Cadastre of Buildings which keeps an inventory of every building, at whatever floor, level or height. The assessment concerns exclusively the buildings, since the right of ownership of cadastral parcels is normally referred to the surface area of the parcel itself, to its planimetric delimitation and to the rights which may be applied to it, understood as “from the earth to the sky”.</p> <p>Wherever the building itself identifies it, the inventory concerns the whole structure, above and also below the line of the ground.</p> <p>The Cadastre, understood as a photograph or film sequence of places, inventoriable using GIS or similar technical procedures, useful above all for monitoring and management of the territory in Italy, is not at present a concern of the cadastral administration which is competent to receive, draw up and make known data regarding the consistency of rights and their modification.</p> <p>The expectations of 2014 concern the possibility of producing the technical deeds of updating telematically, by means of IT procedures which enable the deed to be approved automatically, as is already the case for the Land Cadastre. In addition, the possibility of “photographing” places completely and of reproducing them efficiently and with precision, imply what is undoubtedly an unfeasible economic commitment, for the present finances of the State. As regards the future, such a possibility depends on the commitment of the local authorities,</p>



	<p>Communes, Provinces and Regions, which could invest in this field.</p> <p>The Government's legislative initiative foresees the achievement of "Fiscal Federalism". This will determine the distribution of economic resources arising from the taxation yield directly for the benefit of the Regional Administrations and in proportion to the effective contributory capacity at local level.</p> <p>The greater availability of resources together with decentralisation, from government to regional level, of certain functions (including parts of cadastral functions) should foster the development of ultra-modern and multidisciplinary information systems (on the territory, services, environment, taxation, etc.), so that it might be appropriate and advantageous for the local administrations to be able to envisage and then set up a 3D cadastral system.</p>
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