

Questionnaire 3D-Cadastres: status September 2014 Greece



This questionnaire is an activity of the FIG working group 3D-Cadastres 2014-2018. The purpose of the survey is to make a world-wide inventory of the status of 3D-Cadastres at this moment and the plans/expectations for the near future (2018). By sharing this information, it should be possible to improve cooperation, learn from each other and support future developments. This is the second time that the questionnaire on 3D-Cadastres is conducted by the FIG working group on 3D-Cadastres. The first time was in 2010 in order to document the status in 2010 and expectations back then for 2014. The responses have been analysed (van Oosterom et al. 2011, Karki 2013). For more information on the FIG working group on 3D-Cadastres see the website www.gdmc.nl/3DCadastres. Now a few notes and suggestions, which should be helpful when completing the questionnaire:

- The conceptual model used as background for the 3D Cadastres questionnaire is the ISO 19152 standard (ISO, 2012): the Land Administration Domain Model (LADM).
- In this questionnaire the concept of 3D-Cadastres with 3D parcels (or 3D spatial units in LADM terminology) 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 homogeneous¹ rights (e.g. ownership right, lease or other 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 to be more specific and real world situations are used. Many examples with partial/preliminary answers from 2010 are available on-line at <http://www.gdmc.nl/3DCadastres/participants/>. Inspecting some of the completed 2010 questionnaires from different other countries might 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 spaces of the legal objects and not the registration of the physical objects as such.
- 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).
- The questionnaire has been prepared by a mixed Australian (Rod Thompson/Sudarshan Karki)/Dutch (Jantien Stoter/Hendrik Ploeger/Christiaan Lemmen/Peter van Oosterom) team. The questionnaire is grouped in the number of blocks. This has no meaning in the sense of priority and it is often the case that a question could belong to multiple blocks. Please do not feel disturbed by this.
- Similar to the Questionnaire 3D-Cadastres, the completed forms will be made available on website of FIG working group on 3D Cadastres.
- Please complete this questionnaire before *1 October 2014* and send it to P.J.M.vanOosterom@tudelft.nl (or Peter van Oosterom, TU Delft, OTB, P.O. Box 5030, 2600 GA Delft, The Netherlands).

¹ 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.

	Status 2014	Expectations 2018
1.1. Are all 3D parcels (3D spatial units in LADM terminology) constrained to be within one surface 2D parcel?	Yes (but with limited exceptions described in Greek Civil Code)	
1.2. Are 2D and/or 3D ambulatory ² boundaries permitted?	Yes (2D ambulatory boundaries)	
1.3.a. Is it allowed to have 3D parcels (spatial units) not related to physical constructs or objects? (e.g. airspace, subsurface volumes)	Only provisions for encroachments between neighbours are stipulated in the C.C and the reconstituted right of superficies –for limited situations but in contradictory framework-	
1.3.b. If 1.3.a positive: approximately what proportion of new 3D parcels (spatial units) would involve such cases (not related to physical object)?	Limited cases such as SRPO, underground parking lots and potential floor rate	
1.4. Are disconnected parts of a single 3D parcel allowed?	Mainly in case of condominium	
1.5. Spatial limitation – e.g. must the 3D parcel be related to a closed volume or is it allowed to have ‘open’ or unbounded 3D parcels (e.g. towards the sky).?	Greek C.C. stipulates that ownership extends above and below the surface, however the land owner cannot object unless he has practical interest in opposing against it	
1.6. Are curved surfaces to bound the 3D parcels allowed?	Undefined	
1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?	Undefined	
1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?	Undefined	
1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	Horizontal Property Law 3741/1929, Civil Code Articles 1001,1002,1010, Law 3986/2011 (right of superficies)	
1.10. Is the legal text available in original language?	Yes	
1.11. Is the legal text (relevant part) available in English translation?	Unofficial translation may exist for part of the laws	

² 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.

1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?	Condominiums, special real property objects in regions that customary law applies	
1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series (especially LADM, ISO 19152)?		
1.14. Are natural resources (groundwater, mining rights) shown in your land administration? If yes, are they considered as 3D parcels (spatial units) with RRRs attached?	No (not operationally)	The Law regulating cadastral operation stipulates recording of mining rights but not as 3D parcels
1.15. Are legally restricted spaces, above or below, such as polluted areas considered as 3D parcels?	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	
1.17. Any other geometric issues related to 3D parcels?	No	

2. Infrastructure/utility networks

This refers to the situation where an infrastructure network is considered to be defined within the land administration. 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.

	Status 2014	Expectations 2018
2.1. Do you register networks as an entity in the land administration? (e.g. subterranean conduit networks)	No (the law on Cadastre provides for network registration but it is not operational)	
2.2. If so, then (a) can the network structure be viewed graphically in the land administration? (b) can the network structure be traced in the database(s)? (c) are networks registered by means of a cadastral identifier (such as a 'parcel number')? (d) are RRRs and parties attached to these network objects?	(a) No (b) No (c) No (d) Yes By the time of full implementation of cadastral law such requirements are to be fulfilled	
2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).	Yes	
2.4. If so, are they registered as 3D property parcels (spatial units)?	No	
2.5. Is the text of relevant laws or regulations (question 2.3) available in original language? If so, give references to relevant document(s).		
2.6. Is the text of laws and regulations (relevant part) available in English translation?		
2.7. Do you have example descriptions of typical 3D parcels (spatial units) for networks; either 'prototype' or 'operational'?		
2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?	At the time there are no such issues because networks are not registered	
2.9. Any other geometric issues related to the registration of networks?	No	

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”.

	Status 2014	Expectations 2018
3.1. Do you register 3D construction/building units?	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,...)	Apartment units in condominium schemes	
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Horizontal Property Law	
3.4. Is the legal text available in original language?	Yes	
3.5. Is the legal text (relevant part) available in English translation?	No	
3.6. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?	No	
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? Is it mentioned in any legislation or is it the convention?	Middle of floors/walls/ceilings stipulated in the Greek Civil Code and Horizontal Property Law (3741/1929)	
3.8. Is common property inside the building registered? If so, how?	It is not directly registered but each apartment units’ ownership percentage on the surface parcel and the common property is included in the deeds. Such data is included to the cadastral sheet	
3.9. Who owns the common property inside the building?	Commonly owned by the apartment owners	
3.10. Who owns the land on which the apartment is built?	Commonly owned by the apartment owners	
3.11. Do you allow sub-division of apartments or apartment blocks?	Yes	
3.12. Can the land on which the building is built be sub-divided or sold or mortgaged without the consent of majority of the apartment owners?	No	
3.13. What is the numbering convention for apartments (please	Each apartment gets a unique cadastral number encoding –	

specify in terms of cadastral parcel as well as street addressing)	inter alia- building lot code, building code, floor code and apartment code	
3.14. Any other geometric issues?	No	

4. X/Y Coordinates

	Status 2014	Expectations 2018
4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)	Yes (Greek reference system is used) but older plans in older or arbitrary systems may exist	
4.2. Are the cadastral database coordinates authoritative?	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)?	There are cases that real property is literally described in deeds	
4.5. What is the spatial reference system for X/Y Coordinates?	Greek national reference system (HGRS87)	
4.6. Any other X/Y coordinate issues?	Survey plans in arbitrary or older Greek reference systems may exist or only literal descriptions in deeds may be available	

5. Z Coordinates/height representation

	Status 2014	Expectations 2018
5.1. Are the Z coordinates of 3D parcels relative to local ground?		
5.2. Are Z coordinates reduced to a standard datum (absolute)? If so, what is the spatial reference system for the Z coordinate?	The Greek national reference system is used, although Z coordinates are not stored to the cadastral database	
5.3. In principle possible to store both relative and absolute Z coordinate?	No Z coordinates are stored to the cadastral database	
5.4. Is the earth surface (height) explicitly stored (in the DCDB or other accessible register)?	It is not stored to the DCDB, although there are DTMs and DEMs available in the National Cadastre and Mapping Agency (NCMA) and the Hellenic Military Geography Service	
5.5. What is the source of elevation for the 2D surface parcel?	Trigonometric points of principle reference network – in most cases elevation source is arbitrarily defined-	
5.6. Any other Z coordinate issues?		

6. Temporal Issues

	Status 2014	Expectations 2018
6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?	Temporal limits do not decisively define land parcels	
6.2. Are moving parcels allowed?	Yes	
6.3. Are there any limitations on the range of temporal limits? (e.g. only on 3D apartments).	No	
6.4. Are there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?	Hellenic Cadastre projects provides for temporal data recording (operational in a limited number of cadastral offices)	
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?	Greek C.C. provides for cases of alluvium that land ownership is passed to the owner the land that is extended	
6.6. Any other temporal issues?		

7. Rights, Restrictions and Responsibilities

	Status 2014	Expectations 2018
7.1. Range of RRR on 3D parcels.	Civil Code stipulation “ownership extends vertically as far as the owner has no interest in opposing against it”	
7.2. Are there any limitations on the range of rights related to 3D spatial units? (e.g. subterranean parcels must be owned by Govt).	Only in case of lands where ancient antiquities are discovered, mines and rights of superficies	
7.3. Are there any limitations on the range of restrictions or responsibilities related to 3D spatial units? (i.e. currently in use and related to 2D spatial units, but that would not be applicable to 3D).	In case of mines and rights of superficies	
7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)	No	
7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles.	There is no specific legislation defining 3D RRR types although RRRs with 3D aspects exist (easements, utility easements, rights of superficies, mines, condominium)	
7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?	In case of rights of superficies, lease, mines	
7.7. What applications do you foresee for 3D land administration?	The 3D cadastral registration, can clearly define property rights and restrictions within an evolving urban environment, characterized by an increasing number of multilayer infrastructures and economic activities	
7.8. Are the administrative source documents (source of RRRs) title or deed based?	Current administrative source documents are deed based, although after completion of the Hellenic Cadastre project, title based registration will be implemented	
7.9 Who is responsible for the	3D boundaries are not	

correctness of the specified 3D boundaries in spatial source documents (which authority)?	recorded, checks are applied by NCMA	
7.10. Is registration of 3D parcels done inside the cadastral mapping agency, the land registry or elsewhere?	Registration is done by private cadastral surveyors and verified and realised by NCMA	
7.11. Are 3D registrations handled by the same organisation that handles traditional (2D) land administration?	After the completion of the Hellenic Cadastre project will be handled by the same organisation (NCMA)	
7.12. Do you supply paper-based titles or deeds or proof of ownership? If yes, does this contain depictions of the 2D or 3D parcel?	Yes, the cadastral sheet includes legal data regarding real property as well as cadastral drawing presenting real property's boundaries (or building footprint). Survey drawings required in deed registration since 2012	
7.13. Any other RRR issues?		

8. DCDB (The Cadastral Database)

	Status 2014	Expectations 2018
8.0. Is database schema LADM based?	It is compatible to INSPIRE directive	
8.1. Does the DCDB contain representation of 3D parcels (in any form)?	No, although a separate layer will be used to incorporate objects with 3D aspects	
8.2. If so, how are they represented (in the DCDB)?	Currently not represented, projected to be included in a separate layer	
8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?	Only the building footprint is presented on the cadastral maps	
8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?	No	
8.5. Is it possible to manage a 3D topological structure in the DCDB?	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	
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,...)?	There are no such abilities	
8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?	Relational DBMS Oracle 10g.	
8.9. Do you have any validation rules for 3D representation in the database?	No	
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	ArcGIS	
8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?	Virtual Private Network (VPN) connection with cadastral offices, IIS Server ASP.NET	
8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?		
8.13. How do you query 3D objects in your DCDB?	No	

8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	No	
8.15. Any other DCDB issues?		

9. Plans of Survey (including field sketches)

	Status 2014	Expectations 2018
9.1. Do the survey plans carry 3D parcel representations?	Mainly no. In recent plans, point heights are included	
9.2. If so, how are they represented?	Point heights or contours	
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.	The legislation includes regulations for height recording but there is no provision for 3D.	
9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?	No	
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	Not in our case	
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....?	SRPO are registered as dwg at a different layer. Condominium/ apartments are described in deeds and the building's footprint as drawing, submitted in paper format or electronically	
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 (validation checks apply for 2D parcels)	
9.8. Do you have examples of (prototype or production) 3D survey plans available?	No	
9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D topography)?	No	
9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning,...)?	Different forms and techniques are used by the private sector and universities, but not for cadastral registration.	
9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?	Autodesk AutoCAD, ESRI and other tools, no 3D capabilities are used	
9.12. Can 3D parcels be subdivided, consolidated or nullified?	They apply in 2D parcels (including entities with 3D aspects)	
9.13. Is there any existing technical circular or directive to assist Surveyors	Only for collection of height data for 2D survey plans	

in 3D data collection in the field?		
9.14. Are the surveyors required to undertake a field survey for 3D cadastral data?	No	
9.15. Are building construction plans used to compile 3D cadastral information for apartments?	Yes (but not operationally)	
9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?	By private licensed surveyors	
9.17. Are plans of survey created for each new 2D/3D parcel or are they updated in an index map or a cadastral database.	Created for each new parcel, updating the cadastral dB through the cadastral extract .	
9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store this in a database)	Dimensions are shown on survey plans. No provision of isometric views, nor stored in the database	
9.19. Any other survey plan issues?		

10. Dissemination of 3D Cadastral information

	Status 2014	Expectations 2018
10.1. Is there a general purpose web-based dissemination of 2D cadastral (graphical or text) information (e.g. a portal for the public or for professionals)? If yes, does it include 3D data?	Portal of National Cadastre and Mapping Agency. No 3D data provisions included	
10.2. Are specific file formats or standards used to distribute 3D Cadastral information? (e.g. LandXML, CityGML, BIM/IFC, 3D pdf,...)	No	
10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?	No	
10.4. Are there specific cartographic styling rules for 3D cadastral maps (models; e.g. as disseminated in 3D pdf)? If yes, are there 3D specific cartographic rules developed or being developed?	No	
10.5. Is the 3D Cadastral information accessible in integrated manner with the 2D Cadastral information?	3D property entities (condominium, mines SRPO) are registered to the 2D DCDB	
10.6. Are there specific symbols on the 2D cadastral map (paper, digital or web-based) indicating the presence of 3D Cadastral objects (and in web-context perhaps even linked)?	Specific symbols are used to depict presence of 3D cadastral objects (in case of SRPO)	
10.7. Is the legal information (RRRs and Parties) available in integrated manner in dissemination portal with the 3D Cadastral objects? (even if source of legal data may be a different organization, but then use information infrastructure approach)	It available under access restrictions	
10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?	Only to relevant parties	
10.9. Any other 3D cadastral information dissemination issues?		

11. Statistical information

This part of the questionnaire refers to statistical information (and is most relevant for jurisdictions with parts of 3D Cadastre registration operational, but all are encouraged to complete this section, and especially the expectations for 2018).

	Status 2014	Expectations 2018
11.1. What is the smallest 2D and 3D parcel that is present/ allowed to be registered in the land administration?	Urban planning regulations define the smallest 2D parcel on which a construction is allowed to be built but smaller parcels are not forbidden. No provisions regarding 3D parcels	
11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?	No limitations for 2D parcels. No provisions for 3D parcels	
11.3. What is the typical (or average) size of 2D and 3D parcels which are registered in the land administration? Subdivide by nature of 3D parcel when relevant (e.g. related to building, apartment, airspace, tunnel,...)		
11.4. How many 2D and 3D parcels do you currently have in your land administration?	Only 2D parcels exist	
11.5. Which year did you start registering 3D parcels in the land administration?	No 3D parcels are registered. Units with 3D aspects (e.g. SRPO, mines) recorded since 2010	
11.6. What is the ratio of 3D parcels in rural vs. urban areas?	The ration of urban vs rural land is 1/ 4.6	
11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.		
11.8. Please provide the following data: (a) Size of jurisdiction in square kilometres (b) Current number of 2D parcels (c) Current number of 3D parcels (d) Current population	(a) 131 944 sq.km (b,c) Approximately 38 000 000 rights including 2D parcels, 3D parcels (although there is no legislation introducing 3D property in Greece), and joint rights (d) 10 815 197 (census 2011)	
11.9. Approximately what are the proportions of various types of the 3D parcels (related to apartments, subsurface parking, subsurface shopping centres, bridges, tunnels, airspace, utility networks, etc)?		
11.10. Approximately what surface area		

of the jurisdiction is affected by 3D parcels (the total area of all the footprint of all 3D parcels).		
11.11. Any other interesting statistical fact(s)?		

12. Reflection

This section is only relevant in case also in 2010 the 3D cadastres questionnaire for your jurisdictions was completed (otherwise skip this section).

	Remarks
12.1. Compared to the 2010 expectations, which 3D land administration developments did go faster than expected?	
12.2. Same question, but now, which developments did go slower than expected?	
12.3. If some (limited) form of 3D Land administration functionality has become available, what are the observed benefits? And for who?	
12.4. What are the (top-3) challenges of issues to be addressed to realize further 3D Land administration progress?	
12.5. Any other reflections?	

13. 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.

	Remarks
13.1. Country (State, Province)	Greece
13.2. Your name, function/position and your organization	Efi Dimopoulou, Dr Surveyor Engineer NTUA, Associate Professor NTU of Athens Dimitrios Kitsakis, Surveyor Engineer NTUA, PhD Candidate NTUA
13.3. Contact details: address email, telephone	efi@survey.ntua.gr School of Rural & Surveying Engineering 9, Iroon Polytechniou, 15780 Zografou, GREECE tel. 00302107722679, fax 00302107722677 mob.0030 6937424666 demetrio@central.ntua.gr School of Rural & Surveying Engineering 9, Iroon Polytechniou, 15780 Zografou, GREECE tel. 00306949725897
13.4. Other issues	In Greece there are currently no provisions regarding 3D Cadastre. 3D real property features are managed mostly by Horizontal Property Law, Civil Code and Mineral Code. The Law on Cadastre regulates registration of SRPO, which do have 3D aspects, and provides only for their presentation on the 2D cadastral map; additionally it does not provide for other 3D property entities that exist in Greece (such as condominiums and underground networks) Restrictions due to archaeological, environmental and urban planning laws are to be incorporated to the Hellenic Cadastre, although such procedure is stalling.

References

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