

3rd Questionnaire 3D-Cadastral: Status January 2019



Argentina

This questionnaire is an activity of the FIG working group 3D-Cadastral 2018-2022. The purpose of the survey is to make a world-wide inventory of the status of 3D-Cadastral at this moment and the plans/expectations for the near future (2022). By sharing this information, it should be possible to improve cooperation, learn from each other and support future developments. This is the third time that the questionnaire on 3D-Cadastral is conducted by the FIG working group on 3D-Cadastral. The first time was in 2010 in order to document the status in 2010 and expectations back then for 2014. This was followed by second questionnaire in 2014 (with status 2014 and expectations 2018). The earlier responses have been analysed and reported on (van Oosterom et al. 2011, Karki 2013, van Oosterom et al. 2014). For more information on the FIG working group on 3D-Cadastral see the website www.gdmc.nl/3DCadastral. Now a few notes and suggestions,:

- 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-Cadastral 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 and 2014 are available on-line at <http://www.gdmc.nl/3DCadastral/participants/>. Inspecting some of the completed 2010 and 2014 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-Cadastral 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 Rod Thompson, Sudarshan Karki, Alias Abdul Rahman, Hendrik Ploeger, Christiaan Lemmen, Anna Shnaidman, Peter van Oosterom. 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 earlier Questionnaires on 3D-Cadastral, the completed forms will be made available on website of FIG working group on 3D Cadastres.
- Please complete this questionnaire before *15 December 2018* and send it to A.Sznaidman@tudelft.nl (or Anna Shnaidman, TU Delft, OTB, P.O. Box 5043, 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 2018	Expectations 2022
1.1. Are all 3D parcels (3D spatial units in LADM terminology) constrained to be within one surface 2D parcel?	All parcels are constrained to be registered on 2D cadastral parcels.	Same situation in all the topics.
1.2. Are 2D and/or 3D ambulatory ² boundaries permitted?	Yes (“riparian line” at Civil Code)	
1.3.a. Is it allowed to have 3D parcels (spatial units) not related to physical constructs or objects? (e.g. airspace, subsurface volumes)	Each apartment of a building is a discrete parcel and the common volumes extend from the roof, vertically to the space, and from the bottom, vertically downwards.	
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)?	The common volumes are intersected with different restrictions. However, these spaces are not considered parcels.	
1.4. Are disconnected parts of a single 3D parcel allowed?	No	
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).?	Water bodies and rivers, when public spaces, are unbounded (toward the sky, not to the hell). Apartments are related to closed volume. Urban parcels have no upper limit	
1.6. Are curved surfaces to bound the 3D parcels allowed?	There are no 3D parcels yet.	
1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?		
1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?	In most cases the surfaces are horizontal, but in the aeronautical code there are oblique restrictions or, which is the same, at different	

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.

	heights following a line.	
1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	No	
1.10. Is the legal text available in original language?		
1.11. Is the legal text (relevant part) available in English translation?		
1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?	No	
1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series (especially LADM, ISO 19152)?	No	
1.14. Are natural resources (groundwater, mining rights, geo-thermal extraction and storage) shown in your land administration? If yes, are they considered as 3D parcels (spatial units) with RRRs attached? What about mining concessions (could be limited in time)?	Yes No Mining concessions are represented on 2D and limited on time.	
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,...)	Yes (but not for all urban planners).	
1.17. Is there a Marine Cadastre? And if so, are 3D parcels included in this registration. Is the IHO Maritime Limits and Boundaries standard (S121) in use or under implementation?	No	
1.18. Is there any organised legal instrument for the management of common property?	Yes	
1.19. Which agency is responsible for the recording of titles information?	Property Registry of each province (regional government)	
1.20. Which agency is responsible for	Provincial Cadastre (regional	

recording cadastral transactions?	government)	
1.21. Are transactions for standard 2D lots and 3D lots done by the same agency or titles office?	There are no 3D lots. All the transactions for 2D lots are done in the same agency.	
1.22. Are there any 3D storage permissions recorded (e.g. underground storage of CO2)?	No	
1.23. 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 2018	Expectations 2022
2.1. Do you register networks as an entity in the land administration? (e.g. subterranean conduit networks)	In some cases.	Same situation in all the topics.
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?	In some cases. In some cases. No at the cadastral authority In some cases.	
2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).	The jurisdiction have private networks, however, there is no specific law associated.	
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?	No.	
2.7. Do you have example descriptions of typical 3D parcels (spatial units) for networks; either 'prototype' or 'operational'?	No 3D parcels yet.	
2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?	The elements are mainly represented by the companies (not by the cadastral authority) as a continuous elements in 2D.	
2.9. Any other geometric issues related to the registration of networks?	Networks are mainly registered as 3D lines (tubes, cables, etc.) and points (valves, telephone poles, gas and electricity meters, etc).	

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 2018	Expectations 2022
3.1. Do you register legal spaces for 3D construction/building units (separate from the land)?	Yes	Same situation in all the topics.
3.2. If so, what are the conditions for doing so, and what are the most important types? E.g. apartment units (at least 2 or more in building), or also other buildings or even more general constructions (infra related; such as bridge, tunnel or even other, such as windmills,...)	The building only.	
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Civil and Commercial Code, several articles (2037 to 2128).	
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 typical 3D parcels yet.	
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?	The walls, columns and the whole structure are common property; therefore, the boundary is the internal part of the wall and ceiling.	
3.8. Is common property inside the building registered? If so, how?	Yes. The cadastral map uses different symbols to represent exclusive private property, common areas, structures and so on.	
3.9. Who owns the common property inside the building?	All the parcel’s owners, in different percentages, which are defined in the condominium or common property	

	act or by laws.	
3.10. Who owns the land on which the apartment is built?	All the owners, in different percentages, which are defined in the condominium or common property act or bylaws.	
3.11. Do you allow sub-division of apartments or apartment blocks?	No.	
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 specify in terms of cadastral parcel as well as street addressing)	Floor number – Unit number	
3.14. Any other geometric issues?	The third dimension of the 2D parcel are represented by the longitudinal and transverse cut of the building and the facade as well.	

4. X/Y Coordinates

	Status 2018	Expectations 2022
4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)	No, even though the national law mentions that the parcels must be georeferenced.	Same situation in all the topics.
4.2. Are the cadastral database coordinates authoritative?	No.	
4.3. If not, what is the authoritative source of X/Y coordinates?	In general, in urban areas, the jurisdictions adopt a relative referencing system (using the corner of the block as the origin). The jurisdictions which have Map Law tend to adopt the same as the cadastral reference system.	
4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?	When a wall exists, it must be represented on the cadastral map, especially when the limit is placed in the middle of one wall or between two walls.	
4.5. What is the spatial reference system for X/Y Coordinates?	The official reference system is defined by the cadastral authority, although they generally use the system of coordinates defined for the whole country by the national authority dedicated to that.	
4.6. When owners receive or purchase a copy of the plan what can they see on the plan to help them identify their parcel/lot (e.g. bearings and distance, identifying corners or recovery marks, neighbouring lots, coordinates etc.)?	Distances and internal angles, some neighbouring lots, no coordinates.	
4.7. Have there been any changes made in the way cadastral information is recorded and represented from a historical point of view?	Not many.	
4.8. Any other X/Y coordinate issues?	Some rural parcels are georeferenced.	

5. Representation of 3rd dimension: height (or depth)

	Status 2018	Expectations 2022
5.1. Are the height values of 3D parcels relative to local ground?	3D Parcel do not exist yet.	Same situation in all the topics.
5.2. Are height values reduced to a standard datum (absolute)? If so, what is the spatial reference system for this 3 rd ordinate?	There is datum, but not applied to cadastral coordinates.	
5.3. In principle possible to store both relative and absolute height values?	There is the values, but not the databases infrastructure	
5.4. Is the earth surface (elevation) explicitly stored (in the DCDB or other accessible register)?	No	
5.5. What is the source of height values for the 2D surface parcel?	Ground level.	
5.6. How is elevation information recorded in the cadastral plan or database?	Across the longitudinal and transverse cut of the building.	
5.7. Do you expect the elevation recorded in cadastral plans to be used for any other purpose (e.g. city models or civil constructions etc.)?	Yes.	
5.8. Any other 3rd dimension ordinate value issues?	No.	

6. Temporal Issues

	Status 2018	Expectations 2022
6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?	Yes	Same situation in all the topics.
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).	It is not specified. The concept works better on the cases of water bodies and river boundaries.	
6.4. Are there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?	Only on the research field.	
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?	The tidal boundary is defined by a fixed High Water Mark established only once.	
6.6. In case 3D Marine Cadastre is present and moving boundaries are allowed, how is this represented? E.g. using 4D geometry and topology.	The marine cadastre does not exist yet.	
6.7. Can time bound rights be created and extinguished in the title? (e.g. temporary titles created for a period and when the time is up it can be extinguished)?	Yes, e. g. "Surface rights" (Comercial and Civil Code, 2114 to 2128 articles)	
6.8. Is it possible to identify all the changes made by any operator to the cadastral plans or database and to rollback if there is an error made?	Yes.	
6.9. For Cadastral transactions, how far in time do buyers need to make a search to ensure the title or deed is legal?	It depends of the case.	
6.10. Any other temporal issues?		

7. Rights, Restrictions and Responsibilities

	Status 2018	Expectations 2022
7.1. Range of RRR on 3D parcels.		Same situation in all the topics.
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).	Yes	
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).	Yes	
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.	No	
7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?	Yes	
7.7. What applications do you foresee for 3D land administration?	Nothing specific yet	
7.8. Are the administrative source documents (source of RRRs) title or deed based?	Some of them.	
7.9 Who is responsible for the correctness of the specified 3D boundaries in spatial source documents (which authority)?	Cadastral authority	
7.10. Is registration of 3D parcels done inside the cadastral mapping agency, the land registry or elsewhere?	No 3D parcels yet.	
7.11. Are 3D registrations handled by the same organisation that handles traditional (2D) land administration?	No 3D parcels yet.	
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?	Only 2D.	
7.13. Is the 3D registry separate or integrated with the 2D registry?	No 3D registry yet.	
7.14. Any other RRR issues?		

8. DCDB (The Cadastral Database)

	Status 2018	Expectations 2022
8.0. Is database schema LADM based?	No	Same situation in all the topics.
8.1. Does the DCDB contain representation of 3D parcels (in any form)?	No	
8.2. If so, how are they represented (in the DCDB)?		
8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?		
8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?	Not yet.	
8.5. Is it possible to manage a 3D topological structure in the DCDB?	Not yet.	
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?	Only 2D rules.	
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 3D contents available yet.	
8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?	Several software.	
8.9. Do you have any validation rules for 3D representation in the database?		
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	Several software. No 3D capabilities yet.	
8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?	There are several softwares available for 2D cadastral data visualization. Some of them are connected to the Provincial Spatial Data Infrastructure, where the users can download some data.	

8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?	Mainly as multi-layer	
8.13. How do you query 3D objects in your DCDB?	No 3D objects in the DCDB	
8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	Not yet.	
8.15. Any other DCDB issues?		

9. Plans of Survey (including field sketches)

	Status 2018	Expectations 2022
9.1. Do the survey plans carry 3D parcel representations?	No	Same situation in all the topics.
9.2. If so, how are they represented?		
9.3. Is there specific legislation (regulations) describing the requirements for Plans of Survey in 3D? This could cover: a. accuracy/quality, b. 3D survey method, c. conceptual information model survey plan, d. portrayal rules for graphic representation, e. format or encoding for submission. If so, please give link to the relevant documents.	No	
9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?	Not yet.	
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	Not yet.	
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....?	None	
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)?	Not yet.	
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)?	Real buildings, roads, waterbodies. In some specific cases a height value is provided.	
9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning,...)?	Only in massive surveying 3D data are recorded.	
9.11. What software do you use for creating and processing survey plans?	Several CAD software	

Any 3D capabilities included and used?		
9.12. Can 3D parcels be subdivided, consolidated or nullified?	Not yet.	
9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?	Not yet.	
9.14. Are the surveyors required to undertake a field survey for 3D cadastral data?	Not yet.	
9.15. Are building construction plans used to compile 3D cadastral information for apartments?	Not yet.	
9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?	Private licensed surveyors, but in some special cases the government surveyors do the fieldwork.	
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.	For each new 2D parcel.	
9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store this in a database)	Not yet.	
9.19. Do the cadastral survey plans differentiate between different types (e.g. volumetric plans, building plans and standard 2D plans)?	Not yet.	
9.20. What are the usual elements shown on the plan (e.g. North Arrow, Marks table, Observation table, Administrative data, Plan face and dimensions etc.?)	Basically, north arrow, graphic of the title description, dimensions of the 2D parcel, buildings, administrative data, plan face and dimensions	
9.21. Are authoritative cadastral surveys carried out by government surveyors or private licensed surveyors or both?	Both.	
9.22. What is the legal description of a cadastral boundary (e.g. coordinates or bearing and distance or lines on plan or any other)?	Mainly distances and inner angles of the parcels.	
9.23. How much time does it usually take for a subdivision process to complete?	It is variable, it could be a couple of weeks on average.	
9.24. What is the legal source for cadastral representation (e.g. cadastral	Provincial Cadastral Law and technical dispositions.	

plans, or DCDB or index plans or descriptive sketch/text etc.?)		
9.25. What is the positional accuracy of the cadastral plans (e.g. boundaries may be accurate but may not be referenced in datum properly)?	It depends on the province.	
9.26. Any other survey plan issues?		

10. Dissemination of 3D Cadastral information

	Status 2018	Expectations 2022
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?	Yes. No.	Same situation in all the topics.
10.2. Are specific file formats or standards used to distribute 3D Cadastral information? (e.g. LandXML, CityGML, BIM/IFC, 3D pdf,...)	No 3D cadastral information	
10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?		
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?		
10.5. Is the 3D Cadastral information accessible in integrated manner with the 2D Cadastral information?		
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)?	Yes.	
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)		
10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?	Most of the 2D cadastral data are available for the public, however, some private data are only available for relevant parties (land surveyors)	
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 2022).

	Status 2018	Expectations 2022
11.1. What is the smallest 2D and 3D parcel that is present/ allowed to be registered in the land administration?	It depends on the Urban Plan, which only mentions 2D dimensions.	Same situation in all the topics.
11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?	It depends on the Urban Plan, which only mentions 2D dimensions. Also exist rural parcels and they can be very large.	
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,...)	About 10m X 30m in urban areas.	
11.4. How many 2D and 3D parcels do you currently have in your land administration?	Parcels registered along the Country in 2016, according to the Federal Council Cadastre: 16.772.384 Urban 2D 1.616.059 Rural 2D	
11.5. Which year did you start registering 3D parcels in the land administration?	1826	
11.6. What is the ratio of 3D parcels in rural vs. urban areas?	10%	
11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.	None.	
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	2.780.400 About 20 millions. 0 44.500.000	
11.9. Approximately what are the proportions of various types of the 3D parcels (related to apartments, subsurface parking, subsurface shopping centres, bridges, tunnels,	No data.	

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 and/or in 2014 the 3D cadastres questionnaire for your jurisdictions was completed (otherwise skip this section).

	Remarks
12.1. Compared to the 2010 and 2014 expectations, which 3D land administration developments did go faster than expected?	None.
12.2. Same question, but now, which developments did go slower than expected?	All of them.
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?	Concept of 3D parcel and 3D property development. Incorporate of a 3D GIS platforms on the cadastral institutions. Incorporate the LADM concepts at the universities.
12.5. In case of not yet fully operational status, were there any 3D Cadastre registration pilots to take steps towards more full implementation?	There are a few isolated research projects, mainly focused on the concepts development.
12.6. In case of known legal barriers, have there been made progress in creating and adopting new legislation to support 3D land administration?	In some provinces, however, no strictly focused on 3D cadastre and land administration.
12.7. 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)	Argentina
13.2. Your name, function/position and your organization	Diego Erba Independent Consultant and Researcher Ramiro Alberdi Professor at National University of Litoral
13.3. Contact details: address email, telephone	B° El Pozo S/N, Ciudad Universitaria Santa Fe. ARGENTINA diegoerba@gmail.com Phone: +57 3117206234 ramiroalb76@gmail.com Phone: +54 4575234
13.4. Other issues	

References

ISO 19152:2012 'Geographic information - Land Administration Domain Model (LADM),
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