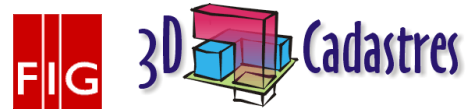


3rd Questionnaire 3D-Cadastres: status November 2018 Switzerland



This questionnaire is an activity of the FIG working group 3D-Cadastres 2018-2022. 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 (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-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. 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-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 and 2014 are available on-line at <http://www.gdmc.nl/3DCadastres/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-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 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-Cadastres, 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.Shnaidman@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?	Until now we don't have 3D parcels in the cadastral map. We only know 3D apartment units (condominiums) (see 3.1). They are described in a separate document, the allocation plan.	The problem is on legal side . Extensive changes to the Civil Code are necessary to introduce the vertical delimitation of landownership.
1.2. Are 2D and/or 3D ambulatory ² boundaries permitted?	No	No
1.3.a. Is it allowed to have 3D parcels (spatial units) not related to physical constructs or objects? (e.g. airspace, subsurface volumes)	No	-
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)?	-	-
1.4. Are disconnected parts of a single 3D parcel allowed?	In general, it is not determined. An apartment unit normally consist of several parts within the same 2D parcel.	Not determined yet (not allowed in 2D)
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).?	-	-
1.6. Are curved surfaces to bound the 3D parcels allowed?	-	-
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?	-	-
1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	The legal definition of property ownership right is 3D, but open: "Land ownership extends upwards into the air and downwards into the ground to the extent determined by the owner's legitimate interest in exercising his or her ownership rights."	-

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.

	That is to say the vertical extension of the parcel can only be delimited individually and not exactly. Therefore, it cannot be documented in 3D.	
1.10. Is the legal text available in original language?	Zivilgesetzbuch, Art. 667, Bst. 1 http://www.admin.ch/opc/de/classified-compilation/19070042/index.html	-
1.11. Is the legal text (relevant part) available in English translation?	Swiss Civil Code, Article 667, let. 1 http://www.admin.ch/opc/en/classified-compilation/19070042/index.html#	-
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 (especially LADM, ISO 19152)?	No	Yes, we will use a formal model, but not necessarily ISO TC211.
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, some. No, not as 3D parcels. No	Yes, some. Not necessarily all in 3D, but probably some. Not necessarily all in 3D, but probably some.
1.15. Are legally restricted spaces, above or below, such as polluted areas considered as 3D parcels?	No	Not necessarily all, but probably some.
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,...)	Until now, not as 3D parcel, but as 2D data with additional height information. Actually, the data model of a first data set of the zoning plan is changed to 3D.	Not necessarily all, but probably some.
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	No change
1.18. Is there any organised legal instrument for the management of common property?	Common property is managed in the same way and with the same instrument as private property.	No change
1.19. Which agency is responsible for the recording of titles information?	The cantonal organized land registry administrations	No change
1.20. Which agency is responsible for recording cadastral transactions?	It is always a licenced land surveyor who is responsible for the correct execution of the cadastral transactions.	No change

	He may operate in the private sector or be employee of the public administration, depending on the cantonal organisation of cadastral surveying. He sends the needed documents to the land registry responsible for the registration.	
1.21. Are transactions for standard 2D lots and 3D lots done by the same agency or titles office?	Yes	No change
1.22. Are there any 3D storage permissions recorded (e.g. underground storage of CO ₂)?	Not yet. A road map for introduction and first studies exist.	Introduction expected.
1.23. Any other geometric issues related to 3D parcels?	-	-

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)	Yes partially, depending on cantonal legislation. The official recommended data model is in 2D with height as an optional attribute.	Revision of the legal bases and technical regulations is probable.
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) Partially yes b) Partially yes c) No d) No	-
2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).	Yes, e.g. conduit networks. It is the responsibility of the cantons and/or municipalities to regulate the details. Regarding the legal bases on federal level, see Verordnung über Geoinformation (GeoIV), Anhang 1 http://www.admin.ch/opc/de/classified-compilation/20071088/index.html#a1	No change
2.4. If so, are they registered as 3D property parcels (spatial units)?	No	No change
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).	You find the links to the relevant regulations on federal level in the appendix 1 of GeoIV http://www.admin.ch/opc/de/classified-compilation/20071088/index.html#a1	No change
2.6. Is the text of laws and regulations (relevant part) available in English translation?	A few, see links above	-
2.7. Do you have example descriptions of typical 3D parcels (spatial units) for networks; either 'prototype' or 'operational'?	Yes	
2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?	The two topics are treated independent.	No change
2.9. Any other geometric issues related to the registration of	-	-

networks?		
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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”.

	Status 2018	Expectations 2022
3.1. Do you register legal spaces for 3D construction/building units (separate from the land)?	Yes, but not totally separate. There is always a connection of the condominium with a 2D parcel.	We introduce the digital 3D documentation of condominiums.
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,...)	Generally apartment units / condominiums. These 3D units are described by division plans, which are part of the supporting documents in the land register (usually still paper, often scanned and managed electronically). The Canton of Geneva documents all apartment units digitally in 3D since 2014. There exist also digital 3D data of buildings in several bigger cities, some large and complex buildings and general constructions.	No change expected.
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Yes. Civil Code, Article Art. 712a ff.	No change
3.4. Is the legal text available in original language?	Yes. Zivilgesetzbuch http://www.admin.ch/opc/de/classified-compilation/19070042/index.html	
3.5. Is the legal text (relevant part) available in English translation?	Yes. Civil Code http://www.admin.ch/opc/en/classified-compilation/19070042/index.html#	
3.6. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?	Yes, this is operational in Geneva. There are a prototype as well as a technical recommendation on federal level.	-
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?	Walls, floors/ceiling are shared 3D space. Civil Code Art 712b	-
3.8. Is common property inside the building registered? If so, how?	Yes. The documentation exists as division plans, which are part of the supporting documents in the land register. Usually still on paper, often scanned and managed electronically. Even digital 3D documentation exist in the canton of Geneva.	No change.
3.9. Who owns the common property inside the building?	Condominium association, the corporate of the condominium owners	No change.
3.10. Who owns the land on which the apartment is built?	Condominium association, the corporate of the condominium owners	No change.
3.11. Do you allow sub-division of apartments or apartment	No sub-division of apartments, but of apartment blocks.	No change.

blocks?		
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	No change.
3.13. What is the numbering convention for apartments (please specify in terms of cadastral parcel as well as street addressing)	Normally the apartment units are numbered continuously within the 2D cadastral parcel. They all have the same address, as long as they use the same main entrance of the building.	No change.
3.14. Any other geometric issues?	-	-

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?)	Yes In an absolute spatial reference (system see 4.5)	No change
4.2. Are the cadastral database coordinates authoritative?	In general yes, with one exception.	No change
4.3. If not, what is the authoritative source of X/Y coordinates?	Exception: In officially defined areas with permanent soil displacements, the boundary marks in the terrain are authoritative.	No change
4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?	Yes, only very few	No change
4.5. What is the spatial reference system for X/Y Coordinates?	Reference system CH1903+ with reference frame LV95	No change
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.)?	Coordinates and north arrow, Municipality and parcel number, property borders and corners, neighbouring lots, address (street name and house number)	No change
4.7. Have there been any changes made in the way cadastral information is recorded and represented from a historical point of view?	1993: start implementation of completely digital data management 2018: introduction of the new spatial reference system	-
4.8. Any other X/Y coordinate issues?	-	-

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?	The existing 3D parcels (condominiums) do normally not have height information in meters, but in floor numbers. The information is stored on paper map (ev. scanned).	
5.2. Are height values reduced to a standard datum (absolute)? If so, what is the spatial reference system for this 3 rd ordinate?	We use the new swiss height reference system as described here https://www.swisstopo.admin.ch/en/knowledge-facts/surveying-geodesy/faq.html	
5.3. In principle possible to store both relative and absolute height values?	No	
5.4. Is the earth surface (elevation) explicitly stored (in the DCDB or other accessible register)?	Yes, there is a layer in the CDM with the elevation model of the terrain.	Will probably change
5.5. What is the source of height values for the 2D surface parcel?	(unclear question)	-
5.6. How is elevation information recorded in the cadastral plan or database?	As height curves and spot elevation.	-
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.)?	It is often used e.g. for overview plans or for general project in civil construction.	Yes
5.8. Any other 3rd dimension ordinate value issues?	-	-

6. Temporal Issues

	Status 2018	Expectations 2022
6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?	No	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).	There are time-limited building rights.	No
6.4. Are there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?	No	Yes, the intention is to complement the data model in this respect.
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?	Not affected by tides.	No change
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.	No marine cadaster	No change
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)?	The time-limited building rights exist, but until today they are not extinguished automatically.	
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, it is possible based on the cadastral plan and by means of several additional documents.	The intention is to complement the data model in this respect.
6.9. For Cadastral transactions, how far in time do buyers need to make a search to ensure the title or deed is legal?	An inquiry that can be answered immediately and definitively by the local land registry.	No change
6.10. Any other temporal issues?		

7. Rights, Restrictions and Responsibilities

	Status 2018	Expectations 2022
7.1. Range of RRR on 3D parcels.	Not defined	
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).	The deep subterranean space is owned by Government (Canton). But there are no delimited parcels.	No change
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).	No	No change
7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)	No	No change
7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles.	No, handled as "normal" property law and regulations.	No change
7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?	No, you cannot own the space sub-surface/above-surface. But you can define a servitude on a part of the parcel to have the right to use it.	No change
7.7. What applications do you foresee for 3D land administration?	-	Still open
7.8. Are the administrative source documents (source of RRRs) title or deed based?	Title	No change
7.9 Who is responsible for the correctness of the specified 3D boundaries in spatial source documents (which authority)?	The technical office responsible for the content is also responsible for the correct geometric delimitation, today mainly 2D. This will not change for 3D geometry.	No change
7.10. Is registration of 3D parcels done inside the cadastral mapping agency, the land registry or elsewhere?	It depends on the kind of 3D parcel. The cadastral mapping agency and the land registry are responsible for the correct documentation and registration of land ownership. But they do not treat other cadastre information like e.g. utility network.	If there are 3D registrations, they will be handled by the same organizations. E.g. the ownership right by cadastral mapping agency and the land registry.
7.11. Are 3D registrations handled by the same organisation that handles traditional (2D) land administration?	Yes	Yes
7.12. Do you supply paper-based titles or deeds or proof of ownership? If yes,	In general the land register is digital.	No change.

does this contain depictions of the 2D or 3D parcel?	Only for condominiums the additional documents are paper-based, some contain 3D depictions, but they are not mandatory.	
7.13. Is the 3D registry separate or integrated with the 2D registry?	Integrated	No change.
7.14. Any other RRR issues?	The PLR cadastre (public law restriction) is under construction. It is based on 2D data. Two prototypes were made with 3D restrictions.	open

8. DCDB (The Cadastral Database)

	Status 2018	Expectations 2022
8.0. Is database schema LADM based?	No	No
8.1. Does the DCDB contain representation of 3D parcels (in any form)?	No	This may change.
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?	No	This may change.
8.5. Is it possible to manage a 3D topological structure in the DCDB?	No	This may change.
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	This may change.
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,...)?	Not possible	This may change.
8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?	Open, no restrictions.	No change
8.9. Do you have any validation rules for 3D representation in the database?	No	This may change.
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	Open, no restrictions. The data model is described in INTERLIS.	No change
8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?	Open, no restrictions.	No change
8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?	Digital data collections are based on a standardized data model, which is object-oriented and structured in layers.	No change
8.13. How do you query 3D objects in your DCDB?	-	This may change.
8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	No	This may change.
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. There are separate division plans for condominiums.	
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	This may change.
9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?	-	
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	Yes, but only condominiums referring the situation within the building (e.g. 1 st floor left).	No change.
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....?	Condominiums are documented on paper for registration, because of the needed public authentication.	This will change. Soon the legal document may be digital.
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)?	-	This may change.
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)?	-	-
9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning,...)?	We don't prescribe acquisition methods.	No change.
9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?	We don't prescribe software.	No change.
9.12. Can 3D parcels be subdivided, consolidated or nullified?	-	This may change.

9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?	No	This may change.
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 controlled by the surveyor.	
9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?	In almost all Cantons 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.	Updated in a cadastral database.	
9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store this in a database)	No	This may change.
9.19. Do the cadastral survey plans differentiate between different types (e.g. volumetric plans, building plans and standard 2D plans)?	No	This may change.
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.?)	-	-
9.21. Are authoritative cadastral surveys carried out by government surveyors or private licensed surveyors or both?	In almost all Cantons by private licensed surveyors. Some cantons and/or communities like bigger cities have their own licensed surveyors.	No change.
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)?	Parcel: coordinates Condominium: physical building (walls, ceiling etc.)	No change.
9.23. How much time does it usually take for a subdivision process to complete?	-	
9.24. What is the legal source for cadastral representation (e.g. cadastral plans, or DCDB or index plans or descriptive sketch/text etc.?)	2D parcel: DCDB Condominium: the verbal description in the contract (not the allocation plan!)	No change
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)?	The cadastral surveying is now being done in absolute coordinates (Swiss reference system CH03+), with exception of the areas with known existing tensions.	

	The absolute positional accuracy varies. In rural areas, it is very high (5 cm), but is much lower (meters) in the mountains.	
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, two portals with data for the whole country (2D) and several portals operated by Cantons. Usually there is no 3D data. There are exceptions, such as e.g. the canton of Geneva for professionals.	
10.2. Are specific file formats or standards used to distribute 3D Cadastral information? (e.g. LandXML, CityGML, BIM/IFC, 3D pdf,...)	On federal level: 2D INTERLIS, for 3D exists no standards Canton of Geneva: Multipatch Esri, 3DS, CityGML, kmz, obj etc.	To be defined
10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?	Yes, a few cantons have some rather general styling rules for the allocation maps.	Yes, a new federal recommendation
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	Yes, a new federal recommendation
10.5. Is the 3D Cadastral information accessible in integrated manner with the 2D Cadastral information?	On federal level: No In 2 cantons (Geneva and Neuchâtel): Yes	No change
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)?	On federal level: No In 2 cantons (Geneva and Neuchâtel): Yes, for some objects	No change
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)	No	May change
10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?	2D normally to general public 3D to relevant parties	No change
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?	The smallest 2D parcel present is 1m ² .	No change expected.
11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?	There are no known limitations.	No change expected.
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,...)	A typical 2D parcel is around 700 m ² . A typical 2D parcel subdivided by several 3D parcels (condominiums) is about 1'500 m ² and contains about 10 - 20 apartments.	More condominiums per 2D parcel.
11.4. How many 2D and 3D parcels do you currently have in your land administration?	2D: approx. 4'560'000 3D (condominiums): about 1'200'000	2D: growth declines, 3D: growth is increasing
11.5. Which year did you start registering 3D parcels in the land administration?	1965	-
11.6. What is the ratio of 3D parcels in rural vs. urban areas?	Depends on the definition of rural and urban, but probably close to 0% vs. 100%.	More 3D parcels in rural areas.
11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.	Every bigger city like Zürich, Geneva, Basel, Bern etc.	No change.
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	41'285 km ² b) 4'560'000 c) 1'200'000 d) 8'530'000	c) and d) are still increasing
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)?	Today the only 3D parcels are apartments.	This may change.
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).	< 1 %	
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?	• Even more techniques for data acquisition. • 3D point clouds! Should we integrate them in the cadastre? How?
12.2. Same question, but now, which developments did go slower than expected?	• The amendment of the legal framework towards a 3D cadastre is and will be slow. However, the need of people working in the sector of construction and other users of the underground is still there. • Still some important questions regarding 3D GIS have not been answered, like “clean” topology. • BIM is still not standardized in the Swiss context and has probably not been accepted for this reason.
12.3. If some (limited) form of 3D Land administration functionality has become available, what are the observed benefits? And for who?	• In some cantons: Digitally accessible data in land register for authorised users like licensed surveyors, notaries etc. (mostly scanned documentations of condominiums, 3D data only in canton of Geneva). • In Geneva various administration offices (e.g. statistical office), the real estate sector and others benefit from the available official digital data. • In several cities: City models for planning.
12.4. What are the (top-3) challenges of issues to be addressed to realize further 3D Land administration progress?	• Adaptation of the legal basis and development of the data model of cadastral surveying (DCDB). • Convince lawyers of the need to change the legal system to introduce a vertical limitation of a parcel. • Education and training of professionals
12.5. In case of not yet fully operational status, were there any 3D Cadastre registration pilots to take steps towards more full implementation?	Yes, pilots for a digital documentation of condominiums.
12.6. In case of known legal barriers, have there been made progress in creating and adopting new legislation to support 3D land administration?	Yes. There is an understanding for the engineer’s need.
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)	Switzerland
13.2. Your name, function/position and your organization	Helena Åström Boss Project manager Digital documentation of condominiums / 3D property cadastre Federal Office of Topography swisstopo Federal Directorate of Cadastral Surveying
13.3. Contact details: address email, telephone	Seftigenstrasse 264 CH - 3084 Wabern helena.astroem@swisstopo.ch +41 58 464 04 21
13.4. Other issues	Contact Geneva: laurent.niggeler@etat.ge.ch

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