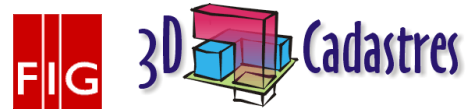


3rd Questionnaire 3D-Cadastral: status January 2019



Germany

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, 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-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.Shaidman@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?	Yes	No changes expected
1.2. Are 2D and/or 3D ambulatory ² boundaries permitted?	Yes, that is possible at rivers, but only when the movement of the boundary was caused by natural influences and not by manmade actions. Only applicable to 2D boundaries	No changes expected
1.3.a. Is it allowed to have 3D parcels (spatial units) not related to physical constructs or objects? (e.g. airspace, subsurface volumes)	If we would introduce 3D parcels we would not restrict them to constructions, since we have a lot of right and restrictions referring to subsurface.	
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)?		Potentially collection of rights and restrictions
1.4. Are disconnected parts of a single 3D parcel allowed?	Currently no restrictions in 2D	Disconnected parts of parcels will not be created in future anymore and will also be removed case by case. This applies to 2D parcels and also for 3D one day, when they would be introduced.
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).?	Currently no restrictions	
1.6. Are curved surfaces to bound the 3D parcels allowed?	Currently no restrictions	Due to technical reasons (data model, database), curved boundaries will be removed. So, it is unlikely that those will be introduced for 3D parcels
1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any	No	

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.

other constraint?		
1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?	Currently no restrictions	
1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	No	No changes expected
1.10. Is the legal text available in original language?	No	
1.11. Is the legal text (relevant part) available in English translation?	No	
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)?	Only for 2D, based on ISO/TC211 standards and complied to LADM. 3D information only applies to buildings, not parcels	No changes expected
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)?	No	No changes expected
1.15. Are legally restricted spaces, above or below, such as polluted areas considered as 3D parcels?	No	No changes expected
1.16. Are spatial plans considered as 3D parcels (as rights or restrictions are related to them)? Sometimes also called spatial development plans, zoning plans or physical plans (land use, urban, regional, environmental,...)	No	No changes expected
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?	Sea use objects (e.g. offshore wind farms) are collected but no Marine Cadastre and 3D parcels respectively. S121 not implemented	No changes expected
1.18. Is there any organised legal instrument for the management of common property?	Yes. Common property is legally managed by contracts. The legally defined rights of a common property are booked in the land register	No changes expected
1.19. Which agency is responsible for the recording of titles information?	The agency of the land register under the ministry of justice	No changes expected

1.20. Which agency is responsible for recording cadastral transactions?	The administration for surveying and cadastre with branches all over the country	No changes expected
1.21. Are transactions for standard 2D lots and 3D lots done by the same agency or titles office?	If we would have those, yes	
1.22. Are there any 3D storage permissions recorded (e.g. underground storage of CO ₂)?	No	No changes expected
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)	No	No changes expected
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?		
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).	Yes Energiewirtschaftsgesetz (EnWG)	
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	
2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?	Not applicable	
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 2018	Expectations 2022
3.1. Do you register legal spaces for 3D construction/building units (separate from the land)?	Yes, but related to 2D data and not as 3D data sets	No changes expected
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,..)	Apartment units	
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Regulation for land registries (“Grundbuchordnung” and regulation for establishing and maintaining the cadastre (“Vermessungs- und Katastergesetz”, Gebäudeübernahmeverordnung GÜVO).	
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?	The unit is defined as follows: - Ground plan is related to the intersection of the walls with the ground surface. - All the walls are vertical to the floor plan. - Cantilevered floors can protrude from the plan. - Underground floors are not covered Ground plan is defined by law.	
3.8. Is common property inside the building registered? If so, how?	Yes	
3.9. Who owns the common property	Each party with specific shares	

inside the building?	established in the land registry file.	
3.10. Who owns the land on which the apartment is built?	Each party with specific shares established in the land registry file.	
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, each apartment owner has a part-ownership of the property, regulated in a separate law (WEG).	
3.13. What is the numbering convention for apartments (please specify in terms of cadastral parcel as well as street addressing)	The building has an address with a specific house number. The apartments are numbered in a separate allocation plan which is part of the legal contract.	
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 (absolute CRS)	No changes needed
4.2. Are the cadastral database coordinates authoritative?	Yes	No changes needed
4.3. If not, what is the authoritative source of X/Y coordinates?		
4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?	Yes, in some old cases, but usually the geometry is recorded	Those definitions will be removed case by case
4.5. What is the spatial reference system for X/Y Coordinates?	ETRS89, UTM projection	No changes expected
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.)?		
4.7. Have there been any changes made in the way cadastral information is recorded and represented from a historical point of view?		
4.8. Any other X/Y coordinate issues?	No	

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?	There is no cadastral parcels right now	
5.2. Are height values reduced to a standard datum (absolute)? If so, what is the spatial reference system for this 3 rd ordinate?	No	No changes expected
5.3. In principle possible to store both relative and absolute height values?	Yes	No changes expected
5.4. Is the earth surface (elevation) explicitly stored (in the DCDB or other accessible register)?	Not in the DCDB	
5.5. What is the source of height values for the 2D surface parcel?	Sea level	No changes expected
5.6. How is elevation information recorded in the cadastral plan or database?		
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.)?		
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)?	Historical parcels are stored in the data base. Future parcels (e.g. for spatial planning) are out of scope	No changes expected
6.2. Are moving parcels allowed?	No	
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?	No	
6.5. In the case of tidal boundaries, what happens to the 3D ambulatory parcel if the 2D land parcel changes extent due to the movement of High Water Mark?	Not applicable	
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.		
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)?		
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?		
6.9. For Cadastral transactions, how far in time do buyers need to make a search to ensure the title or deed is legal?		
6.10. Any other temporal issues?	Long-term storage of data in general	First solution on archiving cadastral data

7. Rights, Restrictions and Responsibilities

	Status 2018	Expectations 2022
7.1. Range of RRR on 3D parcels.	No regulation	No changes expected
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).	No	
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	
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?	Could be used but not owned	No changes expected
7.7. What applications do you foresee for 3D land administration?	No	
7.8. Are the administrative source documents (source of RRRs) title or deed based?	Title based	No changes expected
7.9 Who is responsible for the correctness of the specified 3D boundaries in spatial source documents (which authority)?		
7.10. Is registration of 3D parcels done inside the cadastral mapping agency, the land registry or elsewhere?		
7.11. Are 3D registrations handled by the same organisation that handles traditional (2D) land administration?		
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?		
7.13. Is the 3D registry separate or integrated with the 2D registry?		
7.14. Any other RRR issues?		

8. DCDB (The Cadastral Database)

	Status 2018	Expectations 2022
8.0. Is database schema LADM based?	No, but compatible	No changes expected
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?	Yes, in the latest version a 3D package was added which can be the basis for any 3D data, theoretically also for 3D parcels	No changes expected
8.5. Is it possible to manage a 3D topological structure in the DCDB?	Yes	
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?	Yes, for buildings but not for 3D parcels	No changes expected
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,...)?	Only with the standard interface (WFS based); no specific filters for 3D	
8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?	It could be any software. This depends on the implementation (software vendors). The data model is independent from the software	
8.9. Do you have any validation rules for 3D representation in the database?	Yes	This will be also part of the validator (test suite), which is currently under development
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	Software for 2D/2.5D, that was developed by own Cadastral Department based on Open Source (2.5D mean, there are objects provided with height-relevant attributes (for example roof type, relative height to the ground), only for buildings, constructions);	

	3D-Software for buildings BuildingReconstruction (virtualcitySYSTEMS)	
8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?	Standard web services	A 3D portrayal service specification is currently under development
8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?	Object-relational database	
8.13. How do you query 3D objects in your DCDB?	With the usual data query language	
8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	Possible for any object	
8.15. Any other DCDB issues?	No	

9. Plans of Survey (including field sketches)

	Status 2018	Expectations 2022
9.1. Do the survey plans carry 3D parcel representations?	Yes, since 2012: - Number of floors - Relative heights of eaves and ridge lines. - Direction of the ridge lines - roof type	No changes expected
9.2. If so, how are they represented?	geometric objects and attributes	
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)?	Yes	
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	No	
9.6. In what format are the 3D parcels submitted for registration; attached to legal document in a single pdf (which has good 3D capabilities) or in an extension of (city)GML for 3D parcels, or....?	CityGML AAA-Model (XML/GML)	
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, with the exception of the discharge software	
9.8. Do you have examples of (prototype or production) 3D survey plans available?	Yes, as part of the internal data capture regulation (MiA-GÜVO Appendix 1)	
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,...)?	- Terrestrial surveying - laser scanning	

9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?	- own development - BuildingReconstruction (virtualcitysystems GmbH)	
9.12. Can 3D parcels be subdivided, consolidated or nullified?	Yes	
9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?	Yes	
9.14. Are the surveyors required to undertake a field survey for 3D cadastral data?	Yes	
9.15. Are building construction plans used to compile 3D cadastral information for apartments?	No	
9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?	Both	
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.	survey plans are created for each new 2D parcel and for new or changed buildings	
9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store this in a database)	No	3D PDF as a separate product
9.19. Do the cadastral survey plans differentiate between different types (e.g. volumetric plans, building plans and standard 2D plans)?		
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?		
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)?		
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.?)		
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)?		
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?	Public: http://geoportal.bayern.de/bayernatlas/ Webshop for professionals: https://geoportal.bayern.de/geodatenonline/ Web: buildings in LoD1 and LoD2 as perspective view and download	
10.2. Are specific file formats or standards used to distribute 3D Cadastral information? (e.g. LandXML, CityGML, BIM/IFC, 3D pdf,...)	CityGML, 3D-Shape, KML, DXF, On demand: VRML, 3DS, 3D-PDF	
10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?	Yes	
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?	Yes	
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, number of floors	ridgelines
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	Yes, same as 2D	

approach)		
10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?	Both	
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?	Parcels: 0,1 m ² Buildings: (2D and 3D same) closed building: 13 m ² open building: 35 m ² possible exceptions	
11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?	Unknown	
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,...)	2D: unknown	
11.4. How many 2D and 3D parcels do you currently have in your land administration?	2D-parcels: ca. 10 400 000 3D-parcels: 0	
11.5. Which year did you start registering 3D parcels in the land administration?	3D: No parcels, only buildings in 2012	
11.6. What is the ratio of 3D parcels in rural vs. urban areas?	3D: No parcels, only buildings	
11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.	3D: No parcels, only buildings	
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) 70.551,57 km ² (b) 10 400 000 (c) 0 (d) 12 604 000	
11.9. Approximately what are the proportions of various types of the 3D parcels (related to apartments, subsurface parking, subsurface shopping centres, bridges, tunnels, airspace, utility networks, etc)?	Unknown, since we don't have 3D parcels	
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)?	Calculation of 3D parcels is technically possible by combining the digital terrain model (mesh width 1 m) and the 2D parcels (coverage 100%).	

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?	
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. In case of not yet fully operational status, were there any 3D Cadastre registration pilots to take steps towards more full implementation?	
12.6. In case of known legal barriers, have there been made progress in creating and adopting new legislation to support 3D 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)	Germany
13.2. Your name, function/position and your organization	Markus Seifert DVW WG Geoinformation, Bavarian Agency for Digitization, High Speed Internet and Surveying
13.3. Contact details: address email, telephone	Markus.Seifert@ldbv.bayern.de
13.4. Other issues	

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