

4th Questionnaire on 3D Land Administration: status December 2022 Greece



This questionnaire is an activity of the **FIG Working Group 3D Land Administration 2022-2026**. The purpose of the survey is to make a world-wide inventory of the status of 3D Land Administration Systems/ Cadastres at this moment (2022) and the plans/ expectations for the near future (2026).

This is the first time that the questionnaire 3D-Land Administration is conducted as a successor of the questionnaire on 3D-Cadastres that was conducted three times by the FIG working group on 3D-Cadastres. The first time was in 2010 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) and the third one conducted in 2018 (status of 2018 and plans for 2022).

The earlier responses have been analysed and reported on [van Oosterom et al. 2011](#), [Karki 2013](#), [van Oosterom et al. 2014](#) and [Shnaidman et al., 2019](#). The results of the three earlier questionnaires are available via the participants pages of the 3D Land Administration Working Group website: <http://www.gdmc.nl/3DCadastres/participants/>.

The purpose of this survey is to make a **world-wide inventory of the status of 3D Land Administration** at the current moment and the plans/ expectations for the near future (2026). By sharing this information, it should be **possible to improve cooperation, learn from each other and support future developments**.

A few notes and suggestions, which shall be helpful when completing the questionnaire, are given below:

- The conceptual model used as background for the 3D Land Administration questionnaire is the **ISO 19152:2012 standard** (ISO, 2012), the **Land Administration Domain Model (LADM)**. A new edition of the LADM is **under further development in ISO/TC 211** and is being developed as multipart standard, comprised by the following parts: **Part 1** – Generic Conceptual Model; **Part 2** – Land Registration; **Part 3** – Marine Georegulation; **Part 4** – Valuation Information; **Part 5** – Spatial Plan Information and **Part 6** – Implementations.
- In this questionnaire the concept of 3D Land Administration 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 of the specific country/ state/ province. Therefore, **3D parcels include land and water spaces, both above and below the earth's 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),*

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 (ISO19152:2012).

responsibilities or restrictions are associated to the whole entity, as included in a Land Administration system.”

- 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 Land Administration is on the spaces of the legal objects and not the registration of the physical objects as such.
- As the definition above is quite abstract, at the questions below, more specific and real-world examples are being used. Inspecting some of the completed 2010, 2014 and 2018 questionnaires from other countries might help when formulation the answers for your jurisdiction.
- 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).
- Similar to the earlier Questionnaires on 3D- Land Administration, the completed forms will be made available on website of FIG Working Group on 3D Land Administration.
- Please complete this questionnaire before 15 December 2022 and send it to E.Kalogianni@tudelft.nl (the word document completed, or the link with the google document completed) and state as email subject **“Completed FIG Questionnaire on 3D Land Administration 2022-2026 for xxx”** and at the “xxx” name the country.

The questionnaire has been prepared by Peter van Oosterom, Eftychia Kalogianni, Abdullah Kara, Rod Thompson, Sudarshan Karki, Anna Shnaidman, Alias Abdul Rahman, Hendrik Ploeger, Christiaan Lemmen. The questionnaire is grouped in various 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.

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.

Questions	Status 2022	Expectations 2026
1.1. Are all 3D parcels (3D spatial units in LADM terminology) constrained to be within one surface 2D parcel?	There are no 3D parcels represented in the Hellenic Cadastre. If there are rights that refer to areas of space above or below the surface of the earth (e.g. mining rights) those are represented as 2D objects on a separate layer. Of course, such a representation is independent of the cadastral parcel layer and there are no constraints imposed on the corresponding polygons	No change expected until 2026
1.2. Are 2D and/ or 3D ambulatory ² boundaries permitted?	No, they are not. Feature boundaries are fixed.	No change expected until 2026
1.3. Regarding the legal/ physical relation of 3D objects: (a) Is it allowed to have 3D parcels (spatial units) not related to physical constructs or objects? (e.g. airspace, subsurface volumes) (b) If 1.3.a positive: approximately what proportion of new 3D parcels (spatial units) would involve such cases (not related to physical object)?	There are no 3D objects in the Hellenic Cadastre. Even in that case, however, the definition of spatial units do not necessarily coincide with physical objects. It is the legal objects, as defined in the deeds, that are represented in the cadaster.	No change expected until 2026
1.4. Are disconnected parts of a single 3D parcel allowed?	There are no 3D parcels in the Hellenic Cadastre. The 3 rd dimension is expressed verbally or in a codified way (e.g. a condominium on the 1 st floor of a building. However, even in the 2D situation, disconnected parts of a single property unit are allowed. That should hold if 3D objects were introduced	No change expected until 2026

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

1.5. Spatial limitations – e.g. the 3D parcel ‘must be’ related to a closed volume or is it allowed to have ‘open’ or unbounded 3D parcels (e.g. towards the sky)?	Not applicable for the Hellenic Cadastre. Land ownership in Greece extends above and below the ground surface, however, its use is limited to area that can be exploited legally.	No change expected until 2026
1.6. Are curved surfaces to bound the 3D parcels allowed?	Not applicable	No change expected until 2026
1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?	Not applicable	No change expected until 2026
1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?	No	No change expected until 2026
1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	Although there is no specific provision in the Law prescribing 3D parcels, yet there are several laws that indirectly recognize the 3D nature of properties. For example, the Greek Civil Code Articles 954 (superficies solo credit: ownership of a parcel of land also include ownership of all building that have been constructed on it), 1001, 1002, 1010, 1117 and 1118 (servitudes) Law 3741/1929 (On Horizontal Property) and LD 1024/1971 (On Divided Property): individual ownership of a portion of a building and regulated the property rights of the buildings’ co-owners), Law 1024/1971 (the owner of the plot has the right to create and register titles of independent properties that will be erected on the plot in the future) Law 3986/2011 (right of superficies) The same applies for Laws 4447/2016 (for spatial planning and sustainable development); the Mining Code of 1973 and the Regulation Mining and Quarrying Works of 2011; the Hellenic Aviation code; and the Regulation about Unmanned Aerial Systems (GG 3152/B/30.9.2016)	No change expected until 2026

1.10. Is the legal text available in original language? For example, professional or scientific papers/reports, which explain and justify the registration of 3D parcels.	No for 3D parcels explicitly. Only verbal descriptions of immovable properties that have a 3 rd dimension, or the reference to the engineering plans that depict independent properties above and below the ground.	No change expected until 2026
1.11. Is the legal text (relevant part) available in English translation at an official document?	No (Only unofficial translations in publications)	Not planned
1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?	No. There is no prototype	No change expected until 2026
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	No change expected until 2026
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)?	Only mines and certain types of servitudes (e.g. water or gas lines servitudes) are registered in a separate layer at the current system. They are not considered as 3D parcels.	No change expected until 2026
1.15. Are legally restricted spaces, above or below the earth's surface, such as polluted areas considered as 3D parcels?	No	No change expected until 2026
1.16. Are spatial plans considered as 3D parcels (so rights or restrictions are related to them)? Sometimes they are called 'spatial development plans', 'zoning plans' or 'physical plans' (land use, urban, regional, environmental, ...).	No, spatial plans and the rights or restrictions related to them are considered as 2D parcels.	No change expected until 2026

1.17. Regarding the Marine Space: (a) Is there a Marine Cadastre established? And if so, are 3D parcels included in this registration? (b) Is the IHO Maritime Limits and Boundaries standard (S121) in use or under implementation? (c) Is there a Marine Spatial Plan established? And if so, are 3D marine parcels included in this registration?	a) No, there is not a Marine Cadastre b) No, the IHO S-121 is not used/implemented. Greece has been involved in the implementation of 2 Maritime Spatial Planning transboundary Projects aimed at the implementation on the EU Directive 2014/89. On the other hand, Greece has a comprehensive coastal zone management regulatory system that is implemented at the local scale. c) No	No change expected until 2026
1.18. Is there any organised legal instrument for the management of common property? For example, does the law, regulations or systems recognize/require a specific right type for common property?	Yes, there is and it refers to property that belongs to public agencies or to all people Land Registry or Cadastral Office	No change expected until 2026
1.19. Which agency is responsible for the recording of titles information?	Hellenic Cadastre, where applicable, according to the Law 4512/2018 (previously National Cadastre & Mapping Agency SA) or the Registrations and Mortgages System in areas where the Hellenic Cadastre is not in operation yet.	The Hellenic Cadastre is planned to be operational by 2026.
1.20. Which agency is responsible for recording cadastral transactions?	The Hellenic Cadastre, for the areas in which the system is in operation. In the remaining areas there are no "cadastral transactions" but only land transactions that are registered in the "Registrations and Mortgages System"	No change expected until 2026
1.21. Are transactions for standard 2D lots and 3D lots done by the same agency or titles office?	Yes, but only 2D transactions.	No change expected until 2026
1.22. Are there any 3D storage permissions recorded (e.g. underground storage of CO ₂)?	No	No change expected until 2026

1.23 Has there been developed any country profile based on LADM ISO19152³? (a) Does it support 2D spatial units? (b) Does it support also 3D spatial units? (c) Is there any provision to include/ align with the new LADM developments of the second Edition of the standard (inclusion of valuation information, marine spaces, spatial plans, interoperability/ reuse of BIM/IFC, ..)?	There have been some publications from academia in Greece, describing a country profile based on LADM. There have been two related publication (Psomadaki et al., 2016 and Kalogianni et al., 2017), which are both included in the Table 1, of the publication Kalogianni et al., 2021. (a) Yes (b) Yes (c) No	No change expected until 2026
1.24. Any other geometric issues related to 3D parcels?	No.	No change expected until 2026

³ If yes, is it included at the index presented at the Table 1 of the publication Kalogianni et al. 2021? If it is included, are there any further developments/ publications related to it apart from those mentioned at the table? In case there are, could you please provide with a link of a relevant publication?

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.

Questions	Status 2022	Expectations 2026
2.1. Do you register utility networks as an entity in the land administration? (e.g. subterranean conduit networks)	No. Only servitudes of passage/rights of way are registered in the cadastre.	Not planned
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? (e) in which format are usually the utility networks submitted for registration (i.e. CityGML Utility ADE, IFC, MUDDI, shp, ...)?	(a) No (b) No (c) No (d) Yes (responsibility is not included) (e) dxf	No change expected until 2026
2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).	Yes, private overhead and underground cable networks do exist.	No change expected until 2026
2.4. If so, are they registered as 3D property parcels (spatial units)?	No, they are not registered as 3D spatial units.	No change expected until 2026
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).	Each one of the privately-owned networks is regulated by different agency specified by the Government and issued in the Governmental Gazette (GG).	No change expected until 2026
2.6. Is the text of laws and regulations (relevant part) available in English translation of an official document?	It depends on the network. Some of them have official translations in English.	No change expected until 2026
2.7. Do you have example descriptions of typical 3D parcels (spatial units) for networks; either 'prototype' or 'operational'?	There are no 3D parcels (spatial units or spatial objects). However, descriptions and 3D representations of major underground networks/infrastructures	No change expected until 2026

	(pipelines, telecommunication lines, subway lines) exist and are owned by the competent agencies.	
2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?	The surface parcels and network objects are separate data sets in Greece. There is no intersection of those datasets (at least in the public domain).	No change expected until 2026
2.9. Any other geometric issues related to the registration of networks?	Networks are not registered within the cadastral system in part because of confidentiality and security issues.	No change expected until 2026

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”*.

Questions	Status 2022	Expectations 2026
3.1. Do you register legal spaces for 3D construction/ building units (separate from the land)?	Yes, they are registered separately as independent properties but they are related to the land parcel they belong.	No change expected until 2026
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 only condition is that they should be explicitly specified in a legal document: establishment of divided property. There is no restriction on the types of such division	No change expected until 2026
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Horizontal Property Law (Law 3741/1929 ‘On Horizontal Property’ and LD 1024/1971)	No change expected until 2026
3.4. Is the legal text available in original language?	Yes	No change expected until 2026
3.5. Is the legal text (relevant part) available in English translation at an official document?	No (only unofficial translations in publications)	No change expected until 2026
3.6. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?	Yes, as defined in the corresponding deeds. The specification is made in natural language and is accompanied by the architectural floor plans of the properties. However, no management of that information is made in the cadastral system. Objects are treated at the land parcel level as 2D cadastral parcels.	No change expected until 2026
3.7. Regarding the boundaries’ definition: (a) What would be typical 3D boundaries in an apartment complex: i) middle of the wall and floor/ceiling, ii) interior/ exterior of the wall or iii) walls, floor/ceiling as neutral/ shared 3D space?	(a) Middle of floors, side walls and the ceiling (b) it is stipulated in the Greek Civil Code and Horizontal Property Law (L. 3741/1929)	No change expected until 2026

(b). Is it mentioned in any legislation or is it the convention?		
3.8. Is common property inside the building registered? If so, how?	It is not registered as a separately 'spatial unit'. It is simply described in the deed "Establishment of Divided Property" which is registered as a document in the cadastre or in the Registrations and Mortgages System.	No change expected until 2026
3.9. Who owns the common property inside the building?	All co-owners of the land parcel simultaneously.	No change expected until 2026
3.10. Who owns the land on which the apartment is built?	All owners or co-owners who have ownership rights in the apartments that belong to the land parcel.	No change expected until 2026
3.11. Do you allow sub-division of apartments or apartment blocks?	Yes	No change expected until 2026
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. Once division of a property in apartments is established, ownership to land per se ceases to exist and transfers as well as, other transactions take place in the individual property units (apartments)	No change expected until 2026
3.13. What is the numbering convention for apartments (please specify in terms of cadastral parcel as well as street addressing)	Each apartment gets a unique cadastral number encoding (KAEK) – inter alia- land parcel code, accompanied by the building code, the floor code and the apartment code	No change expected until 2026
3.14. Are there any mandates ⁴ that set specifications on the delivery of design/ construction drawing of properties in BIM-based format, when registering new 3D parcels (from design)?	No	No change expected until 2026
3.15. Are there any operational or in prototype stage platforms. implementations that reuse BIM information from design as cadastral/ land administration input?	No	No change expected until 2026
3.16. Any other geometric issues?	No	No change expected until 2026

⁴ That arise through legislation or from the procurement process.

4. COORDINATES

This refers to the use of **x, y coordinates** and the relevant issues.

Questions	Status 2022	Expectations 2026
4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)	No, they are indicative and valid within certain accuracy limits. However, survey plans are made using the Hellenic Geodetic Reference System, GGRS'87 as a reference system and are absolute in values. In older survey plans, however, those compiled before 1990, X/Y coordinates were not mandatory or they were expressed in a local system.	No change expected until 2026
4.2. Are the cadastral database coordinates authoritative?	Yes	No change expected until 2026
4.3. If not, what is the authoritative source of X/Y coordinates?	Not applicable	Not applicable
4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?	No, parcels are defined by the coordinates of their boundaries.	No change expected until 2026
4.5. What is the spatial reference system for X/Y Coordinates? (Please, provide the EPSG)	Hellenic Geodetic Reference System 1987 (EPSG: 2100)	No change expected until 2026
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.)?	They see the boundaries of their property, the cadastral code, the cadastral codes of the neighbouring cadastral parcels, the coordinates of the land parcel (optional), the area of the parcel, the range of acceptable values for the area, the street information (if the parcel is in an urban area), and the base orthophotomap that depicts the area of the parcel and its neighbouring area.	No change expected until 2026
4.7. Have there been any changes, w.r.t. the spatial reference system, made in the way cadastral information is recorded and represented from a historical point of view?	No, cadastral information and particularly the geometric information is expressed in the GGRS'87.	No change expected until 2026

4.8. Any other X/Y coordinate issues?	Yes, the coordinates of submitted survey plans in land transactions do not coincide with the coordinates of a land parcel, as it is registered in the cadastral system. If the coordinates of the submitted plan are within a specified range the plan is accepted for registration, however, the coordinates of the parcel in the system are not updated. Thus, there are various sources about the same information, something that in the long run may create problems. If the coordinates of the submitted plan are outside the acceptable limits, then a change in the geometry of the affected parcels is made and the new information is recorded in the system.	No change expected until 2026
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5. REPRESENTATION OF 3rd DIMENSION: HEIGHT (OR DEPTH)

This section refers to the representation and registration of the **third dimension**.

Questions	Status 2022	Expectations 2026
5.1. Are the height values of 3D parcels relative to local ground?	Heights are not registered in the current system.	No change expected until 2026
5.2. Are height values reduced to a standard datum (absolute)? If so, what is the spatial reference system for this 3rd ordinate?	The Hellenic Geodetic Reference System 1987 is used, although Z coordinates are not stored to the cadastral database.	No change expected until 2026
5.3. In principle, is it possible to store both relative and absolute height/depth values?	No, it is not possible	No change expected until 2026
5.4. Is the earth surface (elevation) explicitly stored (in the DCDB or other accessible register)?	The elevation is not stored to the DCDB, although there are DTMs and DEMs available from the Hellenic Cadastre and the Hellenic Military Geography Service.	No change expected until 2026
5.5. What is the source of height values for the 2D surface parcel?	There are no height values for 2D land parcels. If height information is used, nowadays the heights of the GGRS'87 are used.	No change expected until 2026
5.6. How is elevation information recorded in the cadastral plan or database?	There is no recording of the elevation information in a cadastral plan or database.	No change expected until 2026
5.7. Do you expect the elevation recorded in cadastral plans to be used for any other purpose (e.g. development of 3D city models or civil constructions etc.)?	No, because there is no elevation information recorded in the cadastral plans. 3D city models etc. are developed independently.	No change expected until 2026
5.8. Are there any 3D City Model/ Digital Twin developments carried out at a national or city level that can be used for orientation or reference purposes?	Yes, there is an initiative from the city of Athens in the context of the project DUET ⁵ , developing a digital twin (starting from 2D). In addition, several other municipalities have started to move in that direction.	No change expected until 2026
5.9. Any other 3 rd dimension ordinate value issues?	There is a need for a more accurate modelling of the geoid in Greece in order for it to be used for accurate measurement of heights.	No change expected until 2026

⁵ <https://www.digitalurbantwins.com/athens-twin>

6. TEMPORAL ISSUES (4th DIMENSION)

This section refers to the representation and registration of the **fourth dimension**.

Questions	Status 2022	Expectations 2026
6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?	No, temporal limits do not decisively define land parcels	No change expected until 2026
6.2. Are moving parcels allowed?	No	No change expected until 2026
6.3. Are there any limitations on the range of temporal limits? (e.g. only on 3D apartments).	No	No change expected until 2026
6.4. Is there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?	No, the Hellenic Cadastre supports 2D information and the “history” of land parcels and rights. There are some efforts for such integration at the research level.	No change expected until 2026
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 land affected by the High Water Mark becomes public. This, in theory, may affect the ambulatory 3D parcel. However, there are no such 3D parcels in the Hellenic Cadastre	No change expected until 2026
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.	There is no 3D Marine Cadastre in Greece	Not planned
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, long-time leases, limited real-property rights and right of superficies are considered as time-bound rights and are registered in titles.	No change expected until 2026
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, the entire history of changes and transactions for each cadastral entity is saved and available for review.	No change expected until 2026
6.9. For Cadastral transactions, how far in time do buyers need to make a search to ensure the title or deed is legal?	They have to search till they find the first registered title (the minimum timeframe is considered 20 years before the last transaction to prevent adverse possession)	No change expected until 2026
6.10. Are there object classes in the registration that require both real-	Yes	No change expected until 2026

world (or valid) times and database load (or system) times, i.e. bi-temporal support?		
6.11. Any other temporal issues?	Generally, emphasis is placed on the history of transactions in a property object and not so much in the temporal management of information (database transaction times etc.)	No change expected until 2026

7. RIGHTS, RESTRICTIONS AND RESPONSIBILITIES (RRRs)

This section refers to the **RRRs and their registration at the LA system**. At a vast majority of the countries, the restrictions and the responsibilities are not registered at the LAS.

Questions	Status 2022	Expectations 2026
7.1. Please provide the range of RRRs on 3D parcels. If there is an online depository, provide the link.	There are no 3D parcels per se in the Hellenic Cadastre. However, Civil Code stipulates that ownership extends vertically to the space above and below the earth's surface, unless otherwise stipulated by law. RRRs normally are imposed by zoning and land use legislation.	No change expected until 2026
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, space that is outside the range of normal use (e.g. cultivation, residency etc.) is considered to be public and as such they are treated. In that category fall minerals, groundwater, airspace, archaeological monuments etc. The actual limits, however, are not specified clearly.	No change expected until 2026
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).	There are none	No change expected until 2026
7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)	No	No change expected until 2026
7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles.	There is no specific legislation defining 3D RRR types although RRRs with 3D aspects exist (servitudes, utility servitudes, rights of superficies, mines, condominium, Public Law Restrictions)	No change expected until 2026
7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?	Only in case of rights of superficies, lease and mines, as there are no 3D parcels registered	No change expected until 2026
7.7. What applications do you foresee for 3D land administration?	3D land administration, can clearly define property rights	No change for such short period of time. Currently, in

	and restrictions within an evolving urban environment, characterized by an increasing number of multilayer infrastructures and economic activities. Applications related to 3D Land Administration mainly comprise decision-making and planning strongly related to the project's scale (e.g. environmental planning, energy consumption, etc.)	Greece, emphasis is placed in completing the cadastre and put it operation for the whole country.
7.8. Are the administrative source documents (source of RRRs) title or deed based?	Current administrative source documents are deed based.	No change expected until 2026
7.9 Who is responsible for the correctness of the specified 3D boundaries in spatial source documents (which authority)?	None, because there are no 3D boundaries stored in the cadastral system.	No change expected until 2026
7.10. Is registration of 3D parcels done inside the cadastral mapping agency, the land registry or elsewhere?	No, because no 3D information is registered and stored. However, (2D) Cadastral registration is done by Hellenic Cadastre based on data that are submitted by private sector surveyors	No change expected until 2026
7.11. Are 3D registrations handled by the same organisation that handles traditional (2D) land administration?	Not applicable because no 3D registrations are made. So far, however, all activities related to land transactions are handled by a single organization, either the Hellenic Cadastre if the corresponding property is in an area that cadastre is in operation or the Registry Office if it not.	After the completion of the Hellenic Cadastre will be handled by the same organisation (Hellenic Cadastre).
7.12. Do you supply paper-based titles or deeds or proof of ownership? If yes, does this contain depictions of the 2D or 3D parcel?	Yes. The provided documents may include 2D description of the land parcel of interest.	No change expected until 2026
7.13. Is the 3D registry separate or integrated with the 2D registry?	There is no 3D registry	There is no such provision
7.14. Any other RRR issues?	No	No change expected until 2026

8. THE CADASTRAL DATABASE (Digital Cadastral Database - DCDB)

This section refers to the **structure and functionalities of the cadastral database**.

Questions	Status 2022	Expectations 2026
8.0. Is the database schema LADM based?	Yes, the database schema was based in the LADM, at least at it was defined in its early stages in the early 2000's	No change expected until 2026
8.1. Does the DCDB contain representation of 3D parcels (in any form)?	No. There are only separate 2D layers in case of SRPO, mines, which have 3D aspects.	No change expected until 2026
8.2. If so, how are they represented (in the DCDB)?	Not applicable/ They are not represented.	No change expected until 2026
8.3. If so, how are they presented on cadastral "maps" (including screen presentations)?	Only the building footprint is presented on the cadastral maps	No change expected until 2026
8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?	No	No change expected until 2026
8.5. Is it possible to manage a 3D topological structure in the DCDB?	No	No change expected until 2026
8.6. Are constraints/rules defined for valid 3D objects (closed volume, no overlap, no gap in 3D)? What about rules for a mix of 2D and 3D representations?	No	No change expected until 2026
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 is no such functionality in the system right now.	No change expected until 2026
8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?	The DBMS software that is used is Oracle. All spatial aspects are managed by a GIS	No change expected until 2026
8.9. Do you have any validation rules for 3D representation in the database?	No	No change expected until 2026
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	ESRI ArcGIS. No 3D capabilities used	No change expected until 2026
8.11. What web software is used for remote data access/distribution and visualization? Any 3D	A custom-made web software application is used. Cadastral offices (Web clients) are using	No change expected until 2026

capabilities included and used?	the application through VPN connection for all the stages of the cadastral process. Established GIS Server (ArcSDE, ArcIMS) and IIS Server (.NET Application), connected to Oracle DB.	
8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?	Object oriented data model	No change expected until 2026
8.13. How do you query 3D objects in your DCDB?	Not applicable	No change expected until 2026
8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	No	No change expected until 2026
8.15. Any other DCDB issues?	Due to limitations in the original database design, several spatio-temporal queries cannot be answered. Also, for the same reason, certain key relationships among the entities are not captured and, as a result the real domain is not accurately represented in the database. Finally, there are several issues on how information is classified and the database fields are filled and, consequently, information homogeneity problems are created. Due to these shortcomings and the lack of strict rules for recording information, a substantial amount of information is stored in an unstructured text format (as "Comments")	No change expected until 2026

9. PLANS OF SURVEY (INCLUDING FIELD SKETCHES)

This section poses questions about the data acquisition process and **cadastral survey plans**.

Questions	Status 2022	Expectations 2026
9.1. Do the survey plans carry 3D parcel representations?	No, only 2D information is depicted on the plans related to cadastral surveying	No change expected until 2026
9.2. If so, how are they represented?	There is no representation of the 3 rd dimension	No change expected until 2026
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.	The legislation specifies the contents of a general purpose topographic plan (for building permits, for construction works etc). However, those specifications do not apply for plans that are submitted to the cadastre. Plans for cadastral surveying are simplified and contain only horizontal information. Thus, in response to the questions: a) No specific legislation for cadastral surveying plan for 3D objects. There is regulation that guides the accuracy /quality of topographic plans for the general case b) No, surveyors are supposed to use whatever method is appropriate for each case c) No, there is no such provision. d) No, portrayal rules and graphic representation follows the general rules e) No, it is no applicable because there is no provision to submit 3D plans to the cadastre The legislation that specifies the content and characteristics of topographic plans is Law 4495/2017, Article 39 "Specifications for compiling a topographic plan and a plan of coverage"(Governmental Gazette Issue no A'	No change expected until 2026

	167/03.11.2017)	
9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?	No	No change expected until 2026
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	No	No change expected until 2026
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....?	Condominium/ apartments are described in deeds (text) and the building comprising the condominium is submitted in .dxf and .pdf. Building's footprint, mines and SRPOs is submitted in paper format or electronically (.dxf and .pdf).	No change expected until 2026
9.7. Are the 3D parcels somehow checked for spatial validity; e.g. volume is closed, does not overlap with neighbour volume (and also no unwanted 3D gaps)?	No (validation checks apply only for 2D parcels).	No change expected until 2026
9.8. Do you have examples of (prototype or production) 3D survey plans available?	No	No change expected until 2026
9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D topography)?	No	No change expected until 2026
9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning, ...)?	Different forms and techniques are used for data acquisition (terrestrial surveying, sketches, drawings and orthophotos).	No change expected until 2026
9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?	CAD software with custom-made plugins (for error validation and topological checking). In addition, the ESRI ArcGIS and QGIS are used, without use of 3D capabilities, however.	No change expected until 2026
9.12. Can 3D parcels be subdivided, consolidated or nullified?	No, as they do not exist	No change expected until 2026
9.13. Is there any existing technical circular or directive to assist surveyors in 3D data collection in the field?	No, only the general principles of carrying out surveys. As it was mentioned above those surveys refer primarily to the depiction of features and characteristics in 2D.	No change expected until 2026
9.14. Are the surveyors required to undertake a field survey for 3D cadastral data?	No, only 2D surveys are required	No change expected until 2026
9.15. Are building construction plans used to compile 3D cadastral	No, there is requirement or provision so far for storing 3D	No change expected until 2026

information for apartments?	information in the cadastre	
9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?	By private licensed surveyors and licensed civil engineers.	No change expected until 2026
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.	Plans of survey are created for each parcel (2D) independently of each other. The cadastral index map is updated only if the plans submitted for registration present significant differences (outside of specification limits) in the objects that they represent	No change expected until 2026
9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store this in a database)	Dimensions are depicted or are inferred from the scale of the plans. No provision of isometric views exist. In addition, no 3D information is stored in the cadastral database.	No change expected until 2026
9.19. Do the cadastral survey plans differentiate between different types (e.g. volumetric plans, building plans and standard 2D plans)?	No	No change expected until 2026
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.?)	The following are shown: Neighbouring lots' boundaries, coordinates of the parcel, KAEK (unique ID), privately owned space in vertical ownerships (if any), servitudes (if any), mineral or SRPOs boundaries, administrative boundaries, road names, North arrow.	No change expected until 2026
9.21. Are authoritative cadastral surveys carried out by government surveyors or private licensed surveyors or both?	By private licensed surveyors, civil engineers and architects.	No change expected until 2026
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)?	Coordinates of boundaries and other related characteristics in GGRS'87.	No change expected until 2026
9.23. How much time does it usually take for a subdivision process to complete?	Approximately five months in total	The time will be probably reduced in the future
9.24. What is the legal source for cadastral representation (e.g. cadastral plans, or DCDB or index plans or descriptive sketch/text etc.?)	The DCDB along with the textual description on the deeds	No change expected until 2026

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)?	Absolute positional accuracy: <u>- for urban areas:</u> RMSE_x ≤ 0.50m RMSE_y ≤ 0.50m RMSE_{xy} ≤ 0.71m <u>- for rural areas:</u> RMSE_x ≤ 1.00m RMSE_y ≤ 1.00m RMSE_{xy} ≤ 1.41m	No change expected until 2026
9.26. Any other survey plan issues?	-The main problem with the survey plans, as they are specified by the legal and institutional framework, is that they are too demanding, too costly and too superficial, for majority of the immovable properties involved in land transactions. In many cases, the cost of compiling a proper topographic plan EXCEEDS the value of the property at hand, particularly in rural areas. In addition, to avoid the cost and the time required to make a change in the geometric characteristics of a parcels, owners and involved professionals adjust the data so that they are conformant with cadastral registrations. Reality, however, may be different.	No change expected until 2026

10. DISSEMINATION OF 3D LAND ADMINISTRATION INFORMATION

This section refers to the **dissemination of 3D LA-related information** and the advances in this domain.

Questions	Status 2022	Expectations 2026
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, please provide the link and refer it includes 3D data?	Yes, the 2D cadastral map of the land parcels is available through the Hellenic Cadastre's "open data" and INSPIRE geoportals (https://data.ktimatologio.gr/ , https://www.ktimatologio.gr/el/e-services/geopyli-inspire-ellinikoy-ktimatologioy) No 3D information is provided because it is not registered. Professionals (lawyers, engineers, notaries), however, have selective access to the registration information, as well.	Access is expected to increase in the coming years. More information will be provided, more people would have access
10.2. Are there specific file formats or standards used to distribute 3D LA/ Cadastral information? (e.g. LandXML, CityGML, BIM/IFC, 3D pdf, ...)	There is no specific format, since there is no 3D cadastral information registered.	No change expected until 2026
10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?	No.	No change expected until 2026
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, there are no 3D cadastral maps.	No change expected until 2026
10.5. Is the 3D Cadastral information accessible in integrated manner with the 2D Cadastral information?	3D cadastral information, per se, is not registered. In that case, there is no issue about accessibility in an "integrated manner". However, registered property objects that extend above or below the surface of the Earth (e.g. condominiums, mines SRPO) are integrated in the DCDB and may be accessed both through the cadastral map or though thematic information.	No change expected until 2026
10.6. Are there specific symbols on	Yes, there are specific cartographic	No change expected until

the 2D cadastral map (paper, digital or web-based) indicating the presence of 3D Cadastral objects (and in web-context perhaps even linked)?	symbols that are used to depict such entities and differentiate them from other map features. The symbols are defined in the technical specifications of the cadastre.	2026
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)	There is selective accessibility only for RRRs related to entities represented as 2D objects. Such accessibility is provided only to legal professionals, however. https://www.ktimatologio.gr/el/e-services/professionals	Accessibility is expected to increase
10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?	Cadastral maps are available to everyone. Registration information is available only to professionals (engineers, lawyers, notaries, etc.) Individuals have access only to information that refers to their own properties and their own property rights. Not the properties and property rights of other individuals. The competent Governmental authorities, however, have access to all information (e.g. taxation auditors, public sector inspectors etc.)	Accessibility is expected to increase. More data available, more people would have access. The demand for information would drive this change. In addition, the “Unified Digital Map” would act as enabler in the change.
10.9. Any other 3D cadastral information dissemination issues?	In general, access to cadastral information is restricted, basically, only to certain privileged professions (legal professionals, engineers, public servants), excluding, unnecessarily, direct access to all citizens (as the Civil Code entails). In particular, access is not provided to real estate agents who are the primary potential users of cadastral information. This situation reduces, unnecessarily, the full exploitation of cadastral data and services and, most importantly, streamlines the demand for cadastral information requests through the privileged set of professionals. In an egalitarian society such a streamlining is difficult to justify.	Many existing restrictions would cease to exist because of the demand of people for better services. In addition, the initial hesitations about the use of cadastral data would be overcome as the domain matures, the influences of EU policies on High Value Data and Open Data become more evident and other success use cases from other countries become known

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 2026).

Questions	Status 2022	Expectations 2026
11.1. What is the smallest 2D and 3D parcel that is present/ allowed to be registered in the land administration?	There is no low limit on the size of the parcels that can be registered. All parcels are registered, no matter what their size is.	No change expected until 2026
11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?	There is no upper limit on the size of the parcels that can be registered. All parcels are registered, no matter what their size is.	No change expected until 2026
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,...)	In urban areas and settlements the average parcel size is approximately 250 sq. meters in rural areas (outside the built areas) the average size is approximately 5.000 sq. meters	No change expected until 2026
11.4. How many 2D and 3D parcels do you currently have in your land administration?	Approximately 4.000.000 2D land parcels in the areas where cadastre is in operation	It is expected that until 2026, approximately 10.000.000 2D land parcels will be registered, referring to the areas where cadastre would be in operation.
11.5. Which year did you start registering 3D parcels in the land administration?	There is no registration of 3D parcels yet. Entities that have a 3D aspect (e.g. SRPO, mines) are recorded in the beginning of the development of the cadastre (since the mid 1990's)	NA
11.6. What is the ratio of 3D parcels in rural vs. urban areas?	There are no 3D parcels. Therefore, there is no reliable way to make an estimation of the requested ratio.	No change expected until 2026
11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.	Currently, there are no 3D parcels per se defined. However, in major metropolitan areas (Athens, Thessalonica) and in main urban centres there is a large number of immovable properties and rights that could be subject for 3D representation.	No change expected until 2026

11.8. Please provide the following data: (a) Size of jurisdiction in square kilometres (b) Current number of 2D parcels (c) Current number of 3D parcels (d) Current population	(a) 131.944 sq.km (b) ~12.000.000 (c) zero (d) 10,43 million (census 2021)	No change expected until 2026
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)?	The vast majority (~80%) is apartments. Everything else has a much smaller share in the distribution of 3D parcels	No change expected until 2026
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).	Less than 5% of the country's total area	No change expected until 2026
11.11. Any other interesting statistical fact(s)?	No	

12. REFLECTION

This section is only relevant in case also one of the previous questionnaires for your jurisdiction (2010, 2014 and/ or 2018) was completed (otherwise skip this section).

Statements	Remarks
12.1. Compared to the 2010, 2014, and 2018 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 LA/ Cadastre registration pilots to take steps towards a more complete 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

At this section, 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).

Contact Details & other issues	Remarks
13.1. Country (State, Province)	Greece
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13.4. Other issues	In Greece there are currently no legal provisions regarding 3D Cadastre. 3D real property features are managed and influenced mostly by Horizontal Property Law, Civil Code, Mineral Code, Aviation Code as well as by the relevant Laws regulating archaeological and environmental protection and spatial planning zones. The Law on Cadastre regulates registration of the SRPOs and the mines, which do have 3D aspects, and provides only for their depiction on the 2D cadastral map. Additionally, it does not provide for any other 3D property entities that exist in Greece (such as condominiums and underground networks) regulated by specific law and codes. Restrictions due to archaeological, environmental and urban planning laws are to be incorporated to the Hellenic Cadastre, although such procedure is to be put in force after the completion of the cadastral survey process (expected in 2025-2028).

REFERENCES

ISO 19152:2012 'Geographic information - Land Administration Domain Model (LADM), http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51206.

Kalogianni, E., Janečka, K., Kalantari, M., Dimopoulou, E., Bydłosz, J., Radulović, A., Vučić, N., Sladić, D., Govedarica, M., Lemmen, C.H.J. and van Oosterom, P.J.M. (2021). Methodology for the development of LADM country profiles, In: Land Use Policy, Elsevier, 105(105380), pp. 1-12, 2021. Available at: http://www.gdmc.nl/publications/2021/LUP_CountryProfile.pdf

Karki, S. (2013). 3D Cadastre Implementation Issues in Australia. MSc Thesis, University of Southern Queensland (Master of Spatial Science Research), 162 p., Available at: http://eprints.usq.edu.au/23560/1/Karki_2013_whole.pdf.

Shnaidman, A., van Oosterom, P.J.M., Lemmen, C.H.J., Ploeger, H., Karki, S. and Abdul Rahman, A. (2019). Analysis of the Third FIG 3D Cadastres Questionnaire: Status in 2018 and Expectations for 2022, Proceedings FIG Working Week 2019: Geospatial Information for a Smarter Life and Environmental Resilience. Available at: <https://repository.tudelft.nl/islandora/object/uuid%3A1c65db49-404c-4b88-8b78-11dca1bc151b>

van Oosterom, P.J.M., Stoter, J., Ploeger, H., Thompson, R. and Karki, S. (2011). World-wide Inventory of the Status of 3D Cadastres in 2010 and Expectations for 2014. presented at the FIG Working Week 2011, Marrakech, 21 p. Available at: http://www.gdmc.nl/3DCadastres/literature/3Dcad_2011_02.pdf.

van Oosterom, P.J.M., Stoter, J., Ploeger, H., Lemmen, C.H.J., Thompson, R. and Karki, S. (2014), Initial Analysis of the Second FIG 3D Cadastres Questionnaire: Status in 2014 and Expectations for 2018, In: Proceedings 4th International Workshop on 3D Cadastres, pp. 55-74, Available at: http://www.gdmc.nl/publications/2014/Second_FIG_3D_Cadastres_Questionnaire.pdf.