

# Questionnaire 3D-Cadastres: status November 2010

## Indonesia



This questionnaire is an activity of the FIG working group 3D-Cadastres 2010-2014. The purpose of the survey is to make a world-wide inventory of the status of 3D-Cadastres at this moment (fall 2010) and the plans/expectations for the near future (2014). By sharing this information, it should be possible to improve cooperation, learn from each other and support future developments. For more information on the FIG working group on 3D-Cadastres see the website of this working group [www.gdmc.nl/3DCadastres](http://www.gdmc.nl/3DCadastres). Now a few notes and suggestions, which should be helpful when completing the questionnaire:

- In this questionnaire the concept of 3D-Cadastres with 3D parcels 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 homogeneous<sup>1</sup> rights (e.g. ownership right or 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 below to be more specific and real world situations are used. Also two example sets of partial/preliminary answers are included from Australia, Queensland and The Netherlands, to support the questions and to be of 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 3D parcels (spaces of legal objects).
- 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).

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<sup>1</sup> 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.

|                                                                                                                           | Indonesia 2010 <sup>2</sup>                                                                                                                                                                                                                                                                                                 | Indonesia 2014                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1. Are all 3D parcels constrained to be within one surface (2D) parcel?                                                 | Land Office will grant Ownership Rights for Apartment Unit (applied for house/settlement and commercial buildings). The individual rights will only be granted as long as there is a certificate on the 2D parcel where apartment is built. 3D construction of infrastructure and utilities are not registered by cadastre. | There are some efforts to renew the Act and the regulation but so far no news. Ideally, Hybrid cadastre (cadastre map plus 3D outlines and footprints on top of the 2D surface).        |
| 1.2. Are ambulatory <sup>3</sup> boundaries permitted?                                                                    | 3D terrain is not stored in the cadastre database, everything is 2D. This includes features like rivers that follow terrain.                                                                                                                                                                                                | 2D map will be sufficient as a reference (considering there is only about 50% parcels registered across the countries) but 3D details projected on top of 3D will enhance the database. |
| 1.3. Is it allowed to have 3D parcels not related to physical constructs or objects?" (e.g. airspace, subsurface volumes) | In practice, many buildings have been built not related to 2D cadastre objects (e.g., joint bridge with commercial units connecting two building crossing the street)                                                                                                                                                       | The regulation and the methods to register such constructs should be available very soon.                                                                                               |
| 1.4. Are disconnected parts of a single 3D parcel allowed?                                                                | In practice, yes                                                                                                                                                                                                                                                                                                            | Yes.                                                                                                                                                                                    |
| 1.5. Limitation – e.g. must the 3D parcel be described by a boundary definition?                                          | No                                                                                                                                                                                                                                                                                                                          | No                                                                                                                                                                                      |

<sup>2</sup> Based on Act no. 16 1985 and Govt Regulation no 4/1988

<sup>3</sup> 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.

|                                                                                                                                                                                                                                  |                                                                                         |                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------|
| 1.6. Are curved surfaces to bound the 3D parcels allowed?                                                                                                                                                                        | Yes                                                                                     | Yes                        |
| 1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?                                                                                                                                     | No restrictions                                                                         | No restrictions            |
| 1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?                                                                                                                                                   | No                                                                                      | No                         |
| 1.9. Is there generic legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).                                                                                             | See footnote 2 (Act n0. 16 1985 and govt regulation no 4 1988)                          | Would be better if renewed |
| 1.10. Is the legal text available in original language?                                                                                                                                                                          | Yes                                                                                     |                            |
| 1.11. Is the legal text (relevant part) available in English translation?                                                                                                                                                        | NA                                                                                      |                            |
| 1.12. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?                                                                                                                               | Not completely done. Only in terms of data acquisition and storage (aditya et. al 2009) | ?                          |
| 1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series?                                                                                                                                    | No                                                                                      | No                         |
| 1.14. Are natural resources (groundwater, mining rights) considered as 3D parcels?                                                                                                                                               | No                                                                                      | No                         |
| 1.15. Are polluted areas considered as 3D parcels (as legal restrictions are associated to these spaces: above and below surface)?                                                                                               | No                                                                                      | No                         |
| 1.16. Are spatial plans considered as 3D parcels (as rights or restrictions are related to them)? Sometimes also called spatial development plans, zoning plans or physical plans (land use, urban, regional, environmental,...) | No                                                                                      | No                         |
| 1.17. Any other geometric issues?                                                                                                                                                                                                |                                                                                         |                            |

## 2. Infrastructure/utility networks

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

|                                                                                                                                              | Indonesia 2010 | Indonesia 2014 |
|----------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 2.1. Do you register network parcels? (e.g. subterranean conduit networks)                                                                   | No             | ?              |
| 2.2. If so, can the network structure be traced in the database(s)?                                                                          | No             | ?              |
| 2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).                                                  | No             | ?              |
| 2.4. If so, are they registered as 3D property parcels?                                                                                      | No             | No             |
| 2.5. Is the legal text available in original language? If so, give references to relevant document(s).                                       | No             | No             |
| 2.6. Is the legal text (relevant part) available in English translation?                                                                     | NA             |                |
| 2.7. Do you have example descriptions of typical 3D parcels for networks; either 'prototype' or 'operational'?                               | NA             |                |
| 2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks? | NA             |                |
| 2.9. Any other geometric issues?                                                                                                             | NA             |                |

### 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”.

|                                                                                                                                                                                                              | Indonesia 2010                                                                                                                        | Indonesia 2014 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 3.1. Do you register 3D construction/building units?                                                                                                                                                         | Yes                                                                                                                                   |                |
| 3.2. If so, what are the most important types? E.g. apartment units, or also other buildings or even more general constructions (infra related; such as bridge, tunnel or even other, such as windmills,...) | Apartment units                                                                                                                       |                |
| 3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).                                                                                                       | UU no. 16 1985 and govt regulation 4 1988                                                                                             |                |
| 3.4. Is the legal text available in original language?                                                                                                                                                       | Yes                                                                                                                                   |                |
| 3.5. Is the legal text (relevant part) available in English translation?                                                                                                                                     | NA                                                                                                                                    |                |
| 3.6. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?                                                                                                            | Prototype                                                                                                                             |                |
| 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?                                                 | By boundary derived from walls inner surface (side-by-side), ceilings bottom surface (up-down boundary), and top surface of the floor |                |
| 3.8. Is common property inside the building registered? If so, how?                                                                                                                                          | Yes                                                                                                                                   |                |
| 3.9. Who owns the common property inside the building?                                                                                                                                                       | The community group                                                                                                                   |                |
| 3.10. Who owns the land on which the apartment is built?                                                                                                                                                     | The owner of the parcel can be joint ownership or single ownership (e.g. company)                                                     |                |
| 3.11. Any other geometric issues?                                                                                                                                                                            | NA                                                                                                                                    |                |

#### **4. X/Y Coordinates**

|                                                                                                                            | Indonesia 2010            | Indonesia 2014 |
|----------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------|
| 4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?) | 2D                        |                |
| 4.2. Are the cadastral database coordinates authoritative?                                                                 | Yes                       |                |
| 4.3. If not, what is the authoritative source of X/Y coordinates?                                                          | -                         |                |
| 4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?                                   | Appartment units          |                |
| 4.5. What is the spatial reference system for X/Y Coordinates?                                                             | TM-3                      |                |
| 4.6. Any other X/Y coordinate issues?                                                                                      | Z datum is still an issue |                |

## **5. Z Coordinates/height representation**

|                                                                                                                                  | Indonesia 2010                                                                                 | Indonesia 2014 |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------|
| 5.1. Are the Z coordinates of 3D parcels relative to local ground?                                                               | It is indeed the issue. Lack of vertical reference networks (datum), so local datum is in use. |                |
| 5.2. Are Z coordinates reduced to a standard datum (absolute)? If so, what is the spatial reference system for the Z coordinate? | Mostly no guidelines.                                                                          |                |
| 5.3. In principle possible to store both relative and absolute Z coordinate?                                                     | Yes.                                                                                           |                |
| 5.4. Is the earth surface (height) explicitly stored (in the DCDB or other accessible register)?                                 | No standard                                                                                    |                |
| 5.5. What is the source of elevation for the 2D surface parcel?                                                                  | Local or geometric height                                                                      |                |
| 5.6. Any other Z coordinate issues?                                                                                              | NA                                                                                             |                |

## 6. Temporal Issues

|                                                                                                                                                             | Indonesia 2010              | Indonesia 2014                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------|
| 6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?                                                                                     | No                          |                                          |
| 6.2. Are moving parcels allowed?                                                                                                                            | By law, should be possible. |                                          |
| 6.3. Are there any limitations on the range of temporal limits? (e.g. only on 3D apartments).                                                               | NA                          |                                          |
| 6.4. Are there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?                                  | Not yet                     | Urgently required but Far away from this |
| 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 yet resolved            |                                          |
| 6.6. Any other temporal issues?                                                                                                                             |                             |                                          |



## 7. Rights, Restrictions and Responsibilities

|                                                                                                                                               | Indonesia 2010                                                                                                                | Indonesia 2014 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------|
| 7.1. Range of RRR on 3D parcels.                                                                                                              | No definition yet                                                                                                             |                |
| 7.2. Are there any limitations on the range of rights?<br>(e.g. subterranean parcels must be owned by Govt).                                  | No                                                                                                                            |                |
| 7.3. Any other RRR issues?                                                                                                                    | Shared use over the state rights is an example of issues                                                                      |                |
| 7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)                                                                        | No                                                                                                                            |                |
| 7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles. | No                                                                                                                            |                |
| 7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?                                | Yes.                                                                                                                          |                |
| 7.7. What applications do you foresee for 3D cadastre?                                                                                        | Good coverage of 2d map database in combination with good link and representation of 3D apartment units is urgently required. |                |

## 8. DCDB (The Cadastral Database)

|                                                                                                                                                                                 | Indonesia 2010                                                                  | Indonesia 2014               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------|
| 8.1. Does the DCDB contain representation of 3D parcels (in any form)?                                                                                                          | No                                                                              | One of issues to be resolved |
| 8.2. If so, how are they represented (in the DCDB)?                                                                                                                             | 2D parcels only                                                                 |                              |
| 8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?                                                                                        | As a link (attachment only)                                                     |                              |
| 8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?                                                                                                       | Certainly not. But we propose the prototype to integrate 2d and 3D construction |                              |
| 8.5. Is it possible to manage a 3D topological structure in the DCDB?                                                                                                           | No                                                                              |                              |
| 8.6. Are constraints/rules defined for valid 3D objects (closed volume, no overlap, no gap in 3D)? What about rules for a mix of 2D and 3D representations?                     | No                                                                              |                              |
| 8.7. How can internal and external user query and visualize the 3D content supporting rotating, slicing, transparency, perspective (3D web/view service, 3D pdf documents,...)? | No                                                                              |                              |
| 8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?                                                                                              | PostgreSQL PostGIS                                                              |                              |
| 8.9. Do you have any validation rules for 3D representation in the database?                                                                                                    |                                                                                 |                              |
| 8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?                          | AutoCAD3D                                                                       |                              |
| 8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?                                                   | GoogleEarth and X3D                                                             |                              |
| 8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?                                                                                       | Object-relational DB                                                            |                              |
| 8.13. How do you query 3D objects in your DCDB?                                                                                                                                 | Postgis limited function                                                        |                              |
| 8.14. Is it possible to query                                                                                                                                                   | Possible                                                                        |                              |

|                                                                           |  |  |
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| neighbourhood parcels to a 3D object, vertically as well as horizontally? |  |  |
| 8.15. Any other DCDB issues?                                              |  |  |

## 9. Plans of Survey (including field sketches)

|                                                                                                                                                                                                        | Indonesia 2010                                                                                                             | Indonesia 2014 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------|
| 9.1. Do the survey plans carry 3D parcel representations?                                                                                                                                              | Yes in 2008 we collaborate with BPN to develop the methods                                                                 |                |
| 9.2. If so, how are they represented?                                                                                                                                                                  | Distance measurement for inner building and engineering survey for outer building including survey for spatial referencing |                |
| 9.3. Is there specific legislation (regulations) describing the requirements for Plans of Survey in 3D? If so, please give link to the relevant documents.                                             | 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)?                                                                    | Yes                                                                                                                        |                |
| 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....? | Coordinates                                                                                                                |                |
| 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)?                                            | Sketches and input as distances and coordinates                                                                            |                |
| 9.8. Do you have examples of (prototype or production) 3D survey plans available?                                                                                                                      | Yes on paper                                                                                                               |                |
| 9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D topography)?                                                                                         | Yes                                                                                                                        |                |
| 9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning,...)?                                                                      | CAD and cadastral surveys plus topographical surveys                                                                       |                |
| 9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included                                                                                                  | AutoCAD 3D                                                                                                                 |                |

|                                                                                                                     |     |  |
|---------------------------------------------------------------------------------------------------------------------|-----|--|
| and used?                                                                                                           |     |  |
| 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? | No  |  |
| 9.14. Any other survey plan issues?                                                                                 |     |  |

## 10. 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.

|                                                          |                                                                               |
|----------------------------------------------------------|-------------------------------------------------------------------------------|
| 10.1. Country (State, Province)                          | Indonesia                                                                     |
| 10.2. Your name, function/position and your organization | Trias Aditya<br>Researcher at Geodetic and Geomatics Engineering, UGM         |
| 10.3. Contact details: address email, telephone          | Jl. Grafika NO. 2 Yogyakarta 55281 Indonesia<br>e-mail: triasaditya@ugm.ac.id |
| 10.4. Other issues                                       |                                                                               |

**Aditya, T., Subaryono, Waljiyanto, Istarno, Raharja, U., Diyono, Muryamto, R., Iswanto, F.** 2009. *Understanding the Urgency for 3D Cadastre in Indonesia: Development & Visualization of a Hybrid 3D Cadastre Model*. **South East Asian Survey Congress**, August 4-7 2009, Bali.