

3D RRRs

Since 2008, the number of people living in urban areas has exceeded the rural population on a global scale. As a result of the ongoing migration to cities, office blocks, underground stations, shopping malls, dwellings and other constructions are increasingly built on top of each other, both above and below the surface. Within geoinformation systems, most of such spaces are represented as if we were living in and moving through a flat world. Since the complexity of infrastructures and value of buildings is rising steadily, there is a prevailing to shift registration of rights, restrictions and responsibilities (RRR) from area to volume units. RRR registration in a cadastre is not only necessary to secure rights, but also to support planning, crisis management, taxation, environmental impact assessment and many other land management activities. Although the need to change the cadastre from 2D to 3D has attracted a lot of professional attention since the start of this millennium, so far not one country has a true 3D cadastre in place. Why not? As revealed by the 2nd International Workshop on 3D Cadastres that was held from 16th to 18th November 2011 in Delft, The Netherlands, there are multiple legal, institutional and technical challenges and issues to deal with.

What constitutes a 3D cadastral object? Obviously, it represents a spatial unit with homogenous rights: when moving through the space, no change of ownership, easement, use right or any other right occurs. However, this general observation propounds a set of questions. Should the object represent an office building, dwelling, pipeline or any other tangible object or can it be any volume above or below the surface, even when it is not marked by physical boundaries? How to define the boundaries of a volume? Is it, from a legal point of view, enough to register heights between floors as indicated on construction drawings or should they be accurately measured and, if so, which measurement technologies are suitable: positioning with pseudolites, terrestrial laser scanning, mobile GIS, photogrammetry or airborne Lidar? What should be the reference plane of the height coordinates: street level, geoid or ellipsoid? Compared to the data models for storing 2D data, the data models for storing 3D data are rather complex. Present cadastral data models employ the notion of the flat parcel, and 3D cadastres are being developed by enlarging them. However, they cannot adequately manage the spatial coverage of volumetric RRRs. New data models need to be developed in which the 2D cadastral data models appear as sub-sets of 3D data models, and these in turn should represent the spatial extent of 3D RRRs at sufficiently high detail. Furthermore, software able to handle the complex 3D data models needs further optimisation.

There is also an issue in terms of communication: as a novelty, 3D cadastres require agreement on a common, standardised terminology to avoid 'babel' - a confusion of tongues - among professionals.