

Integration Between 3D Spatial Planning and 3D Land Administration for Sustainable Development

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Abstract:

The statistics show that the population density in urban areas has increased in recent years. The number of multi-layered buildings consequently augmented to meet the needs of the citizens who reside in the urban areas because these areas are limited in terms of horizontal growth. The planning decisions are further important for efficient use of the urban areas. It is significant to mention at this point that two-dimensional (2D) planning approaches that often benefit from 2D spatial data from various contexts such as transportation, cadastre, and land use might be insufficient to provide a powerful basis (Emamgholian et al., 2024). Therefore, there is a growing interest in three-dimensional (3D) spatial planning that aims to enable scientific decisions by considering the complexity of the built environment through exploiting the 3D geoinformation and analyses (Guler, 2023). The increased existence of 3D geoinformation regarding urban areas triggers the interest in 3D spatial planning. The more enhanced analyses that cover several topics such as shadow analysis, renewable energy, and environmental effects can be achieved using 3D geoinformation (Biljecki et al., 2015).

On the other hand, the land administration that deals with how to better exploit from surface and subsurface of the lands by considering the different counterparts such as development and valuation is essential for sustainable development. The land administration systems (LAS) enable to management of rights, restrictions, and responsibilities (RRRs) regarding the lands and buildings/facilities spatially and semantically by using the geoinformation. Even though these systems are widely developed and implemented based on the use of 2D geoinformation, the above-mentioned complexity of the urban areas is the driving force to evolve LAS such that they can manage cadastral RRRs in 3D (Guler and Yomralioğlu, 2022). To achieve this, the use of 3D geoinformation for implementing 3D LAS can provide a strong opportunity.

The special interest can be directed thereby to integration between 3D spatial planning and 3D land administration for realizing the sustainable development of urban areas. This integration can be inevitable because 3D spatial planning and 3D land administration not only need each other they also benefit from each other for comprehensively managing the urban areas. For example, 3D spatial planning considers the subsurface in the urban areas to better benefit from the lands. In this regard, 3D land administration that covers the cadastral information regarding the subsurface is fundamental. The aforementioned integration is also important for the digitalization of building permitting that is one of the essential public services for the sustainability of the built environment. To do so, there is a strong need for spatial data standards that cover the required features and attributes from both 3D spatial planning and 3D land administration. It is important to note that 3D expresses the data that is formatted based on standards such as CityGML, IFC, and CityJSON rather than 2D data that contains the height information as an attribute. This paper thus aims to provide insights regarding the efficient integration of 3D spatial planning and 3D land administration by using the 3D geoinformation, through analyzing the current efforts in these topics.

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