Creation of 3D City Models and Sustainability of the Project; Türkiye Example

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SUMMARY

Modern technology is being used to build smart city systems, which aim to improve the liveability and management of cities. Three-dimensional city models are a key component of these systems and are utilized in a wide range of applications, including engineering projects, city planning, land management, green development, disaster management, tax collecting, and the preservation of natural and cultural resources.

Regarding 3D data management, numerous modelling standards exist globally. Because of this, national and international standards for the creation of 3D building models were investigated, and it was discovered that the CityGML model was the most widely used standard. After conducting examinations in accordance with the cadastral 2034 vision, it was determined that there are advantages and disadvantages to using the CityGML standard with regard to the land registry and cadastre system in Turkey. For instance, while it is the ideal option for showcasing and keeping models, it is missing the equivalent of building sections like condominiums. Because of this, a TKGM CityGML standard was established in accordance with the project's requirements.

Additionally, TKGM established the TKGM 3D City Models Management Information System, which includes a model for hosting, integrating, sharing, monitoring, and ensuring continuity of the production processes of three-dimensional data produced or to be produced by TKGM. This information system consists of the production phase, the control and verification phase consisting of 400 different control items, ensuring sustainability through the integration of TKGM and Spatial Address Registration System, data sharing and 3D presentation phases.

As part of the project, building models from oblique aerial photos were merged with scanned and vectorized architectural projects from the General Directorate of Land Registry and Cadastre's

inventory. The integrated models are displayed online and are synchronised with their real-world positions. By the end of 2026, all architectural projects included in the land registry inventory are intended to be modelled. However, it has been determined that it is critical to integrate future buildings into the system without adding additional burden to cadastral and registration studies. In this context, before the construction of new buildings begins, before the easement or condominium is established, three-dimensional models in GML format have been included in the system, whose control has been completed by the relevant institution.

The 3D GML data includes the world coordinate values of the reference point, province, district, neighbourhood, island, and parcel information, allowing the model to be moved to 3D real world coordinates. In addition to this, there is information on the number of floors above and below the building's road, as well as roof projection and floor seating areas. Also included are details about the building's total number of independent sections, their locations, floor numbers, and facade details. Following verification, a building summary form is generated from the created GML models, and the developed system allows the municipality, land registry, and cadastre to provide controls and digital data transfer both automatically and manually.