3D Cadastral Modelling for Registration of Sectional Rights, Tax Collection and Integration into the National Land Information Management System in Kenya

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SUMMARY

Pressure on land, especially in the Central Business Districts has led to overlapping of land rights and interlocking constructions. Even when the creation of the property rights to match these developments are available within the existing legislation, describing and integrating them in the cadastral registration systems poses a challenge. Currently, the challenge with 3D Cadastral properties is how to register the overlapping rights and the interlocking constructions in a typical 2D register. In addition, the government would like to collect taxes from the 3D vendors who have purchased rights in the flats in the 3D cadastral blocks. Unfortunately, most of these flats have not been mapped and there are no models for incorporating the ownership with the 3D spaces in the buildings. Also, the existing Architectural plans have not been integrated in the 3D Cadastre hence it is difficult to identify the vendors of the various Architectural units for taxation and other management requirements.

In Kenya for example, several high-rise buildings for residential and commercial purposes have recently sprung up in different parts of the cities and the government would like to incorporate them into the recently launched National Land Information System (NLIMS) for tax collection and other management requirements. This has been a challenge as currently there are no suitable models to incorporate the 3D Cadastre into the NLIMS and even their locations are not available from the government cadastral system.

In order to solve this problem, a partnership research project was conceived between the 8Teq solutions and the Technical University of Kenya, Nairobi to develop a tool for mapping and modeling 3D property rights. (i) develop a 3D cadastral model that would support the registration of sectional properties rights within the 3D buildings, (ii) support efficient tax collection from the mapped units, and (iii) assist in the integration of the 3D cadastral models into the recently launched

LIMS. selection of a residential 17 floor building in Nairobi, provision of geodetic control around the building with both geodetic rover and Reflectorless Total Station, Laser scanning of both the external and inside-building walls, and acquisition of aerial digital imagery with a UAV. The acquired data were processed and visualized through various software and libraries such as the Leica Cyclone Register 360, AutoDesk Recap, Blender, QGIS, PostGresQL, CesiumJS, ThreeJS, Python amongst others. a complete 3D model of the building in its true location on the world globe by cesiumjs, together with sectional plans, 3D Visualization, and maps and locations of all the sectional units inside the building. The authors observed that the product fulfills the original objective of the exercise and have currently been hired to carry out 3D mapping of several flats in Nairobi. The conclusion is that the tool provides a solution to many of the 3D challenges that have not been solved on the ground.