LADM-based Israeli Country Profile: Toward Implementation of 3D Cadastre Registration

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Key words: LADM, Country Profile, Standard, Land Administration

SUMMARY

Land is a valuable and finite resource, particularly in a small country such as Israel. A variety of drives, such as: urbanization and smart utilization of space, is prompting the stakeholders to promote new land policies. These policies should reflect the societal needs and demands as well as factor in and balance between numerous aspects. Furthermore, in recent years the ecological angle, forest and species preservation have become more and more acute, urging in turn for an even stricter land related actions.

In most countries around the world - Israel being no exception - land administration system is a decentralized one, that is to say, multiple organizations and government departments are involved. In Israel the spatial component is under the authority of *Survey of Israel*, whereas the *Land Registry Offices*, with the Ministry of Justice, are in charge of the legal aspects of land administration. However, there are several more players to consider, such as: Israeli Land Authority which is responsible for the managing of approximately 93 percent of all land; the Planning Administration and Planning Commissions - on both national and local levels - which need up-to-date cadastral and land use information for spatial planning, urban and rural development and adequate allocation of land; and finally the entrepreneurs and private citizens, who too require access to the relevant land data. To ensure consistency in access to data, as well as sharing and exchange thereof, institutional interoperability is crucial. Informed decision making, effective and efficient management of land resources and ultimately economic development and sustainability of a country are dependent on it. In order to achieve this cross-organizational coherence a model-driven approach is required.

Land Administration Domain Model (LADM) - ISO 19152 standard, a conceptual model which incorporates both legal and spatial components, offers a common language and provides a solid foundation for establishing a national Spatial Data Infrastructure (SDI).

This paper describes the development of an LADM-based Israeli country profile, in light of the amendment to the Land Law of 1969 which allows the registration of 3D parcels and calls for new affiliated regulations and the utilization of new technologies. An overview of the existing land administration system key components and procedures as well as ongoing and planned enhancements are given.

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1. INTRODUCTION

In this paper another step forward is presented in the development of the LADM-based Israeli Country Profile. As multiple authorities are involved, this is a challenging task. Also, Israel has quite some history in investigating the registration in 3D. This is because of the high pressure on space and therefore 3D solutions are common in the real-world (complex building configurations, tunnels, etc.). An initial country profile, supporting 3D, was presented a few years ago (Felus et al., 2014); see Figure 1.

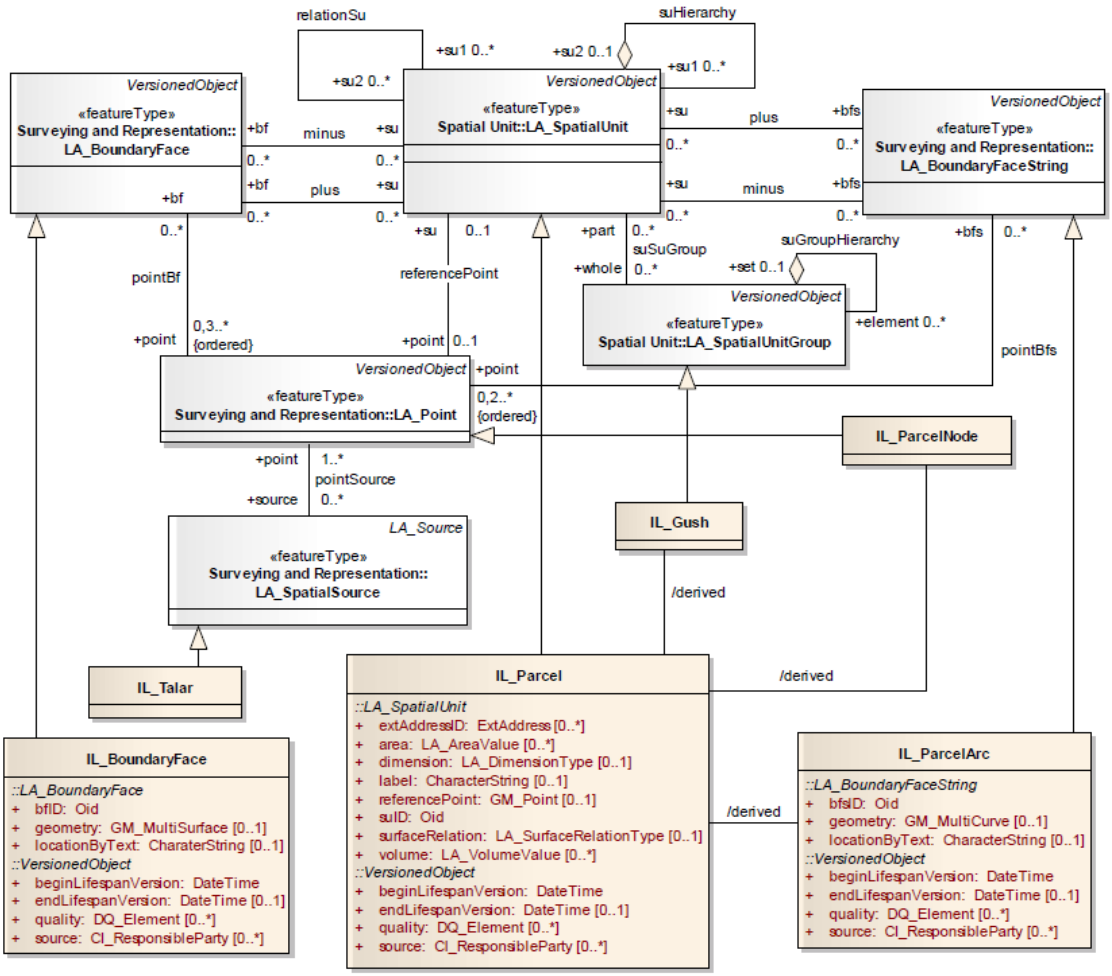

Figure 1. The initial country profile (Felus et al., 2014)

A nice historic example is shown in Figure 2: a 3D ownership model of the spaces near the Church of the Holy Sepulchre with the colors indicating the owner. Despite this nice historic example (and there are more, e.g. the historic Templars' Tunnel in Old Acre), the majority of 3D cases are related to modern-time solutions. Therefore, by the end of last year there was the amendment to the Land Law of 1969 which allows the registration of 3D parcels. This provides now the solid legal foundation for 3D registration. In addition, within ISO TC211 the process started to revise LADM, IS19152:2012 (van Oosterom et al., 2019). In this context, the next version of the country profile was developed.

The remainder of this paper is organized as follows. In section 2, a brief summary of Land Admiration in Israel is presented with a brief historic summary and introducing the most relevant organizations. Next, in section 3 the development of the new version of the country profile is presented. Finally, section 4 contains the main conclusions and future work.

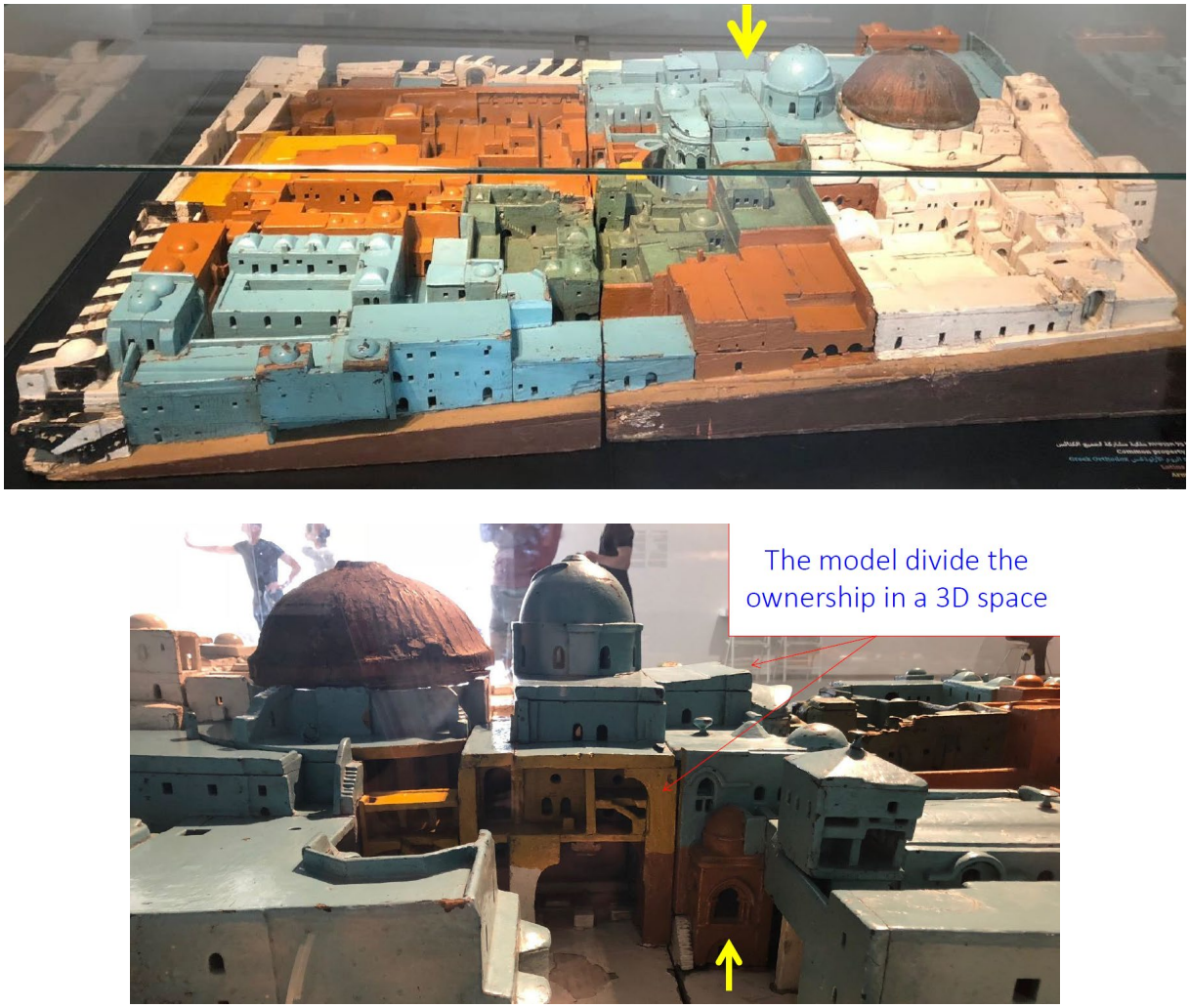

Figure 2. The 3D ownership model of the spaces near the Church of the Holy Sepulchre Scale: 1:96, Date 1862. Colors display the owner: white- common property, blue – Greek orthodox, red – Latin, orange - Armenians, green-Copts, and Gray-Lutheran (source: Yaron Felus)

2. LAND ADMINISTARTION IN ISRAEL

Similar to many countries, the land administration system in Israel is a decentralized one. Several ministries and agencies are involved in the cadastral chain, including the *Ministry of Finance*, the *Ministry of Construction and Housing* and the *Ministry of Justice* each with their own responsibilities and administrative roles.

To be able to navigate within the Israeli Land Administration System, one needs to familiarize oneself with the key stakeholders, the land related processes and the fundamental land laws and regulations as well as with the background of Land Administration development throughout the assorted historical periods. There are three main cadastral eras: (I) Ottoman Empire, (II) British Mandate and finally (III) the State of Israel; during which the man-to-land relationship has evolved and altered, prompted by changing societal needs and perception of land.

I. The Ottoman Empire

The land registration for taxation collection started in 1858 following the publication of the Mecelle civil code which was the foundation for the property related laws. Several land registry bureaus were established, called Tabu [1]. The boundaries were described only verbally, the registration was Deed based, in other words the transactions themselves were the focus of the registry.

II. British Mandate

In 1920 the British Mandate came into force. Up till 1929, the British administration continued the Turkish way of Deed registration; however, the issuing of the Survey Ordinance commence the Settlement of Land Rights registration accompanied by cadastral mapping as required by Torrens principles. It is important to note that the juridical status of land registry under the Turkish and British (prior to 1929) terms was Prima Facie Evidence. However, the legality of the registry, once the new method was initiated, was raised to Conclusive Evidence. The territory was divided into Registration Blocks, blocks were then further partitioned into smaller units, the basic subject for registration, called Parcels. With the establishment of the State of Israel in 1948 – beginning the third period of cadastral history - the coordinate reference frame, the method of surveying and land registration employed by the Mandate after the Ordinance were adopted.

III. State of Israel

The modern Land Administration system is of a multi-purpose nature while the two most dominant components are the Administrative/Legal – Registry and the Spatial/Technical one – Cadastre. The ministry of Justice is responsible for the registration of Rights, Restrictions and Responsibilities as well as all legal land related processes such as Land Title Settlement.

[1] To this day the land registry offices are colloquially referred to as Tabu.

Similar to other countries which utilize Torrens title registration, the main goal of Land Rights Settlement to is to reflect the de facto situation of parcels' boundaries and property rights related to those lands, including additional valuable information, such as: location, area and use. The original Rights Settlement is performed once, and currently covers approximately 95% of Israeli land. Nevertheless, since the population is constantly growing, old cities expanding, new cities built and ownerships changing hands, there is a perpetual merging or/and division of the initial parcels mainly as a result of spatial/urban planning. Any such change should be properly documented and reflected in the registry as well is in demarcation of boundaries. The process of recording new parcellation and settlement of rights is done based on an approved *mutation/parcellation plan*, prepared by a licensed surveyor, that manifest new planning according to *municipal plans*. Israeli law of planning and building permits initiation of *zoning* and *town plans* by the government, local municipality or any private entrepreneur or person interested in the development of the land (Forrai et al., 2004).

The Survey of Israel - SOI, which is a governmental agency for Mapping, Geodesy, Cadastre and Geoinformatics under the Ministry of Housing and Construction, is responsible for the technical aspect of land registration process. Among SOI's duties lie: cadastral mapping, inspection and approval of mutation plans, including reinstatement of original boundaries and computation of *transformation parameters*. Once a mutation plan is validated as compatible with a town plan, according to survey regulations, by the head of a local municipal authority and "*Approved for Registration*" by the Survey of Israel, it is passed on to the *Land Registry Office* in the Ministry of Justice for registration.

There are three types of Land Registry in Israel: ***Deed*** – approximately 5% of the land has not yet undergo Title Registration process. Therefore, in order to allow land transactions and development of these areas Deed system is administered; ***Title***–the main land registry which records all activities conducted on land registered in accordance with Torrens principles; and the last one is ***Condominium*** registry–real estate property register where each apartment or unit in a condominium defined as a ***sub-parcel***. Once the building is registered as a condominium, the record within either the Deed or Title registry is annulled to prevent redundancy and inconsistency within the records. The process is completed when a uniquely identifying number within a registration block is given to a parcel and its history, and all the owner's rights, restrictions, and responsibilities on the land, are documented in compliance with the 1969 Land Law (Shnaidman, 2015).

Another very important organization is the Israeli Planning Administration - IPA, which is an independent unit within the Ministry of Finance is responsible for the spatial planning. The zones in spatial can be considered legal spaces, and are therefore also part of the bigger land administration picture. In the revision of LADM this aspect is not explicitly addressed with a new spatial planning information package.

3. DEVELOPMENT OF ISRAELI COUNTRY PROFILE

Israel was among the first countries in the world to address the topic of 3D representations in the cadastral registration (Benhamu and Doytsher 2001, Forrai and Kirschner 2001, Grinstein 2001, Sandberg 2001, Benhamu and Doytsher 2003, and Sandberg 2003). This was reinforced by a two year 3D Cadastre R&D project during the years 2002-2004 (Shoshani, Benhamu, Goshen, Denekamp and Bar 2004, Shoshani, Benhamu, Goshen, Denekamp and Bar 2005, Benhamu 2006). However, 3D representation has not yet included in the Israeli registration, but the 3D interest always remained and further studies where conducted, covering both the legal (Caine 2009, Sandberg 2014) and technical (Peres and Benhamu 2009) aspects. In 2014, this finally resulted in an initail country profile (see Section 1).

The development of a country profile is a multi-facet process with many stakeholders involved (also see section 2). After studying existing systems, regualtaions and consulting experts from the stakeholders, one of the first steps is selecting the relevant parts/ classes from the LADM standard. This is scoping the information model. Relevant LADM classes are then mapped to their counterpart names in the Ireaeli country profile; see Table 1. This is then used to develop the country profile of which we made two versions: 1. describing the current 2D regsitration and 2. describing the possible future 3D registration. For both, the legal/ adminsitratve part (Party and Administrative packages) are equal. In July 2019 the new country profile was presented to the stakeholders in a meeting and received postive feedback, mainily confriming the model.

Table 1. The Mapping of Key Concepts

National Cadastral DB	LADM	Remark
IL_Block	LA_SpatialUnit Group	
IL_Parcel	LA_SpatilUnit	
IL_Point	LA_Point	
IL_Front	LA_BoundaryFaceString	LA_BoundaryFace for future 3D
IL_SpatialSource	LA_SpatialSource	
IL_AdministrativeSource	LA_AdministartiveSource	In Scope of Land Registry
IL_SubParcel	LA_BAUnit	
IL_Condominium	LA_SpatialUnitGroup	Needs further development

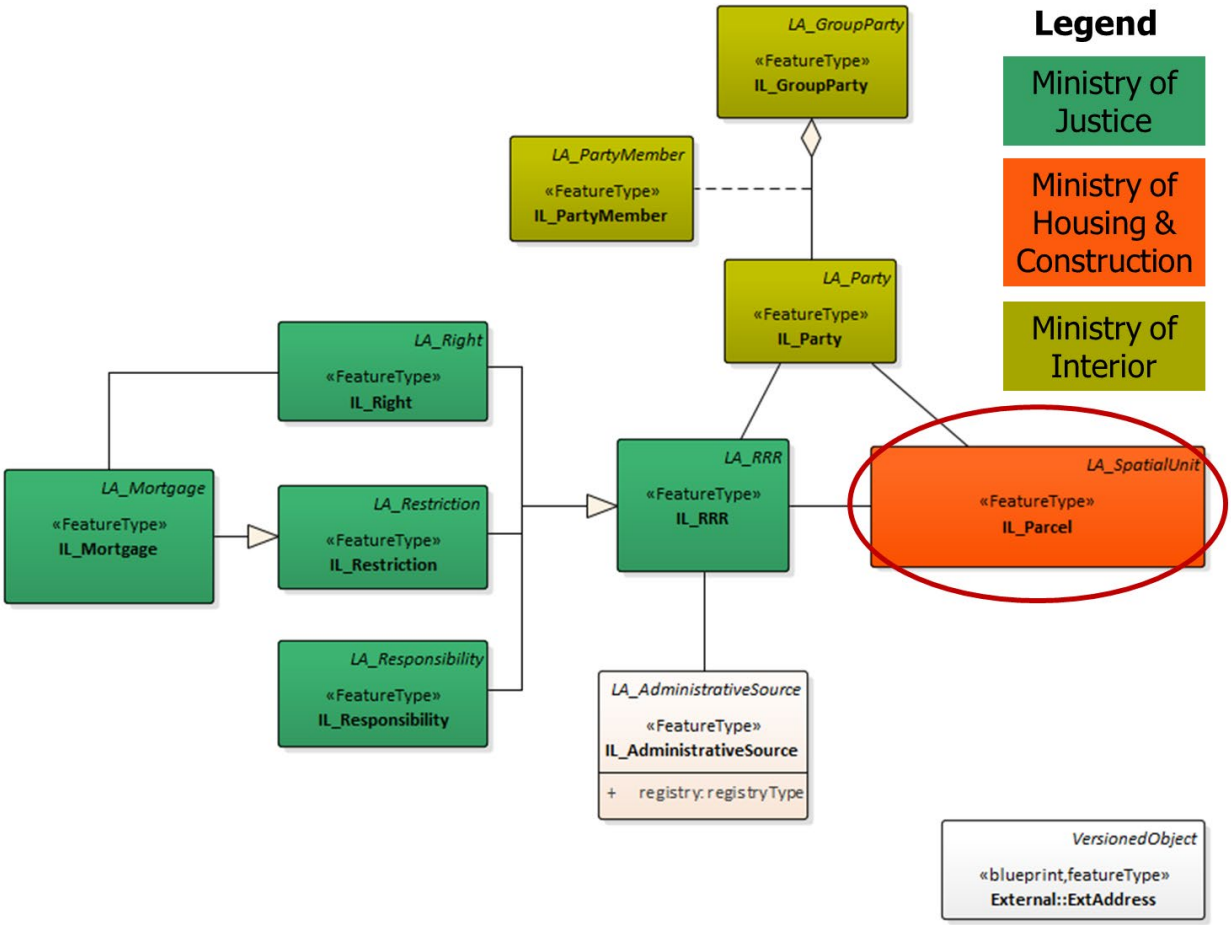

Figure 3. Overview of the new country profile (mainly the Party and Administrative packages)

The party and administrative parts are at class level nearly identical to the ISO standard (LADM, IS19152). The IL_ prefix is used for the country profile and via inheritance there is a direct relation to the standard classes with LA_ prefix. The interesting part is on getting agreement of the involved organizations on the interfaces between the classes. In Figure 3, the legend indicates which ministry is responsible for the maintenance of which classes. This is actually the sketch of a distributed information infrastructure (van Oosterom et al., 2009).

The spatial package part of current system is depicted in Figure 4 (based on a 2D representation). The spatial package part of the future system is depicted in Figure 5 (based on a 3D representation).

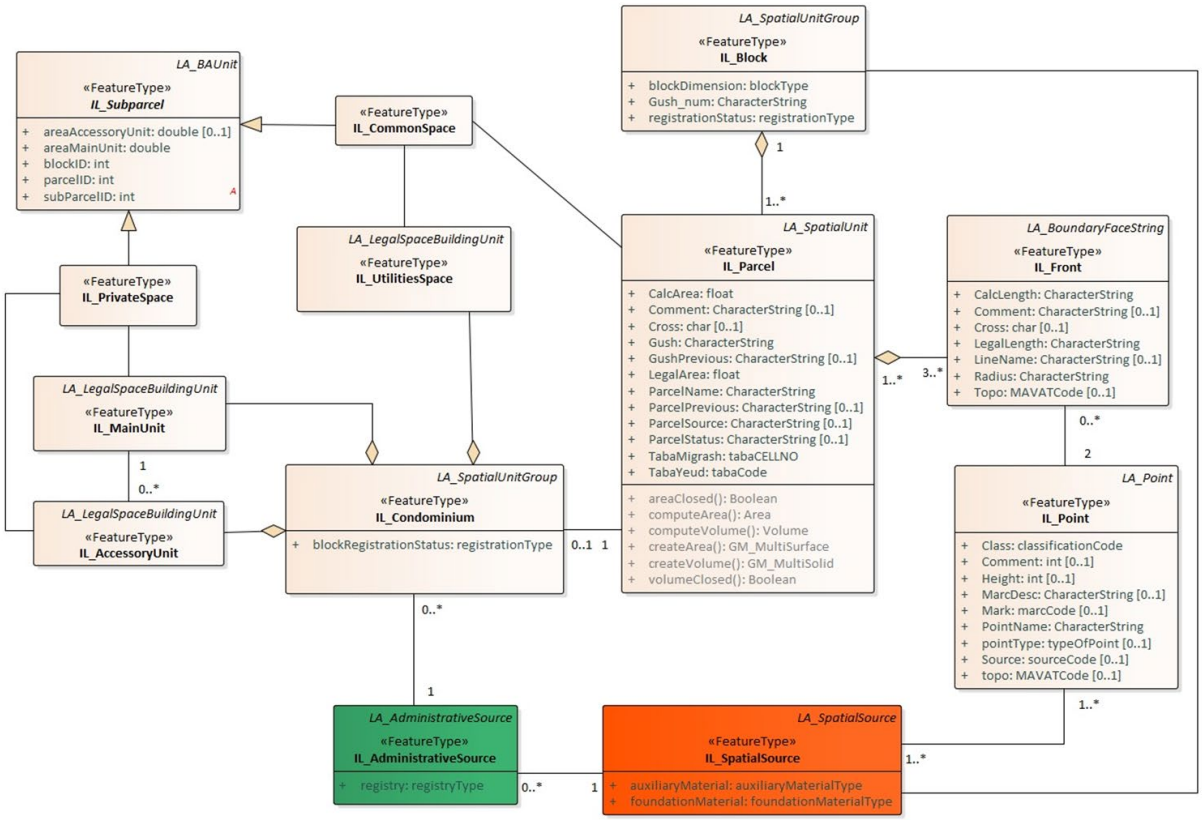

Figure 4. Details of the Current System: 2D Profile of the new country profile (mainly the Spatial Unit Package)

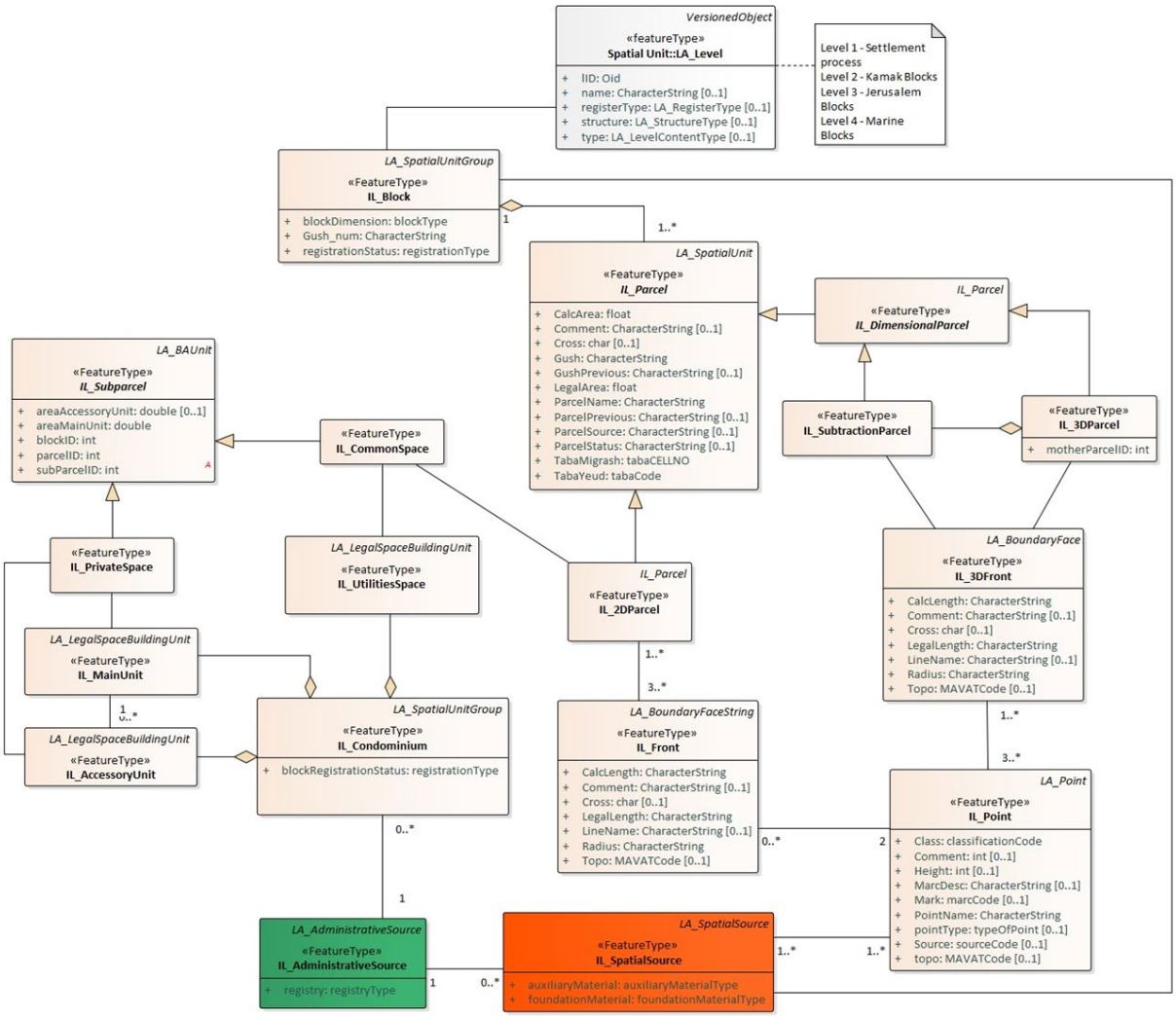

Figure 5. Details of the Future System: #D Profile of the new country profile (mainly the Spatial Unit Package)

4. CONCLUSIONS AND FUTURE WORK

In this paper, we presented the new country profile, which recieved support from the various stakeholders. The country profile reflects a distributed/ multiple organizations Information infrastructre .For the spatial part 2 variants where produced: 2D (current) and 3D (future). Next the steps in the development of this country profile include: conversion to technical model, load sample data, test access/using/updating data via prototypes (and when needed adjust/improve country profile).

Further future work includes extending the model for infrastucture related objects. Before the end of the year 2019, it will be possibe to register infrastructure (electricity, water, gas, sewer,

internet) as 'legal' objects, that is, with the rights, restrictions and responsibilities attached. These objects also do have inherit 3D aspects (above or below the surface). Perhaps for the future work we should consider including IL_LegalSpaceUtilityNetwork in the Isreali LADM country profile.

Finally, during the revision of LADM, the scope of the scandard itself is furter exteneded (van Oosterom et al., 2019) with the spatial planning information package and valuation infromation package. It will be investigated if the packages are also applicable in Israel. If so, the even more stakeholders will be involved.

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BIOGRAPHICAL NOTES

Anna Shnaidman is a former Geophysical Surveys and Research Administrator in the Research Division at the Survey of Israel and a Part-time Lecturer in the Department of Civil Engineering at the Technion - Israeli Institute of Technology. She received her BSc (2008, Cum Laude) and MSc (2010) and PhD (2016) degrees in Mapping and Geo-Information engineering from Israeli Institute of Technology - Technion. Dr. Shnaidman is a Licensed Surveyor as well. Since September 2018 she is a postdoctoral researcher at the 'GIS Technology' Section, Faculty of Architecture and the Built Environment, Delft University of Technology, the Netherlands.

Peter van Oosterom obtained an MSc in Technical Computer Science in 1985 from Delft University of Technology, the Netherlands. In 1990, he received a PhD from Leiden University. From 1985 until 1995, he worked at the TNO-FEL laboratory in The Hague. From 1995 until 2000 he was senior information manager at the Dutch Cadastre, where he was involved in the renewal of the Cadastral (Geographic) database. Since 2000, he is professor at the Delft University of Technology, and head of the 'GIS Technology' Section, Faculty of Architecture and the Built Environment, Delft University of Technology, the Netherlands. He is the current chair of the FIG Working Group on '3D Cadastres'.

Shimon Barzani was born in 1968. He holds a BSc from Technion University, Israel (Civil Engineering and Geodesy). He is a Professional Surveyor in Israel. He is currently Deputy Director General, Cadaster at The Survey of Israel.

Anat Marcovich is GIS project manager, the Israel Planning Administration (IPA), an independent unit within the Israel Ministry of Finance. Its primary mission is to plan and regulate land use and development in the State of Israel through the formulation and execution of national and regional planning policies.

Shuli Shoham works at the Land Registry and Settlement of Rights, Isreal Ministry of Justice. This department conducts the following activities: 1. Keeping the Land Registers (The Deeds Registers, The Rights Register, The Cooperative Houses (Condominiums) Register), 2. Certification of Transactions and other actions with regard to land and the registration thereof in the Land Registers, 3. Registration of Buildings in the Cooperative Houses Register (Condominiums), 4. Deciding disputes as between apartment owners in condominiums, 5. Settlement of Rights of Title to Land within the Territories of the State.

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