

New Cadastral Processes for Town Planning aim at expediting Land Registration

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Cadaster

SUMMARY

The State of Israel has suffered in the last decade from a housing crisis where house prices are very high. Thus, there is a necessity to expedite the preparation and approval of town plans for purposes of developing residential neighborhoods. This has created a need in Israel for new cadaster processes that enable accurate design and for shortening the time required for registration of rights in the land.

The Survey of Israel (SOI) manages the Cadaster database of Israel (the NCDB -National Cadaster data base). This database contains information of all registration and subdivision (mutation) plans (see figure B) and other cadastral maps which are approved for registration. This database contains Cadastral Maps from different periods (1930-2017). As a result, this database is heterogeneous, containing data measured using different methods, belonging to different periods and range in accuracy from 5 centimeters to 5 meters.

In the past, digitized data of blocks and parcels from the NCDB were used for town planning. According to the survey regulation subdivision (mutation) plans are approved following the approval of the town plan. Thus, if the Town Plan design is not accurate enough, adjustment problems have accrued while preparing the subdivision plans.

To solve this problem a new process was developed (BDM): Boundary Documentation Map. The BDM is prepared by reconstruction of parcels boundaries. This process requires field surveys, calculations and transformations. The PDB is submitted to the SOI for verification and approval as an official paper that documents boundaries. The BDM is then used as the basis for accurate design and the preparation of design maps. This situation allows the design to be based on optimal cadastral. It also saves the need to change boundaries in the detailed design phase. Moreover, it accelerates the registration process (approximately a year) as described in the article.

Next, a subdivision plan that follows the BDM and is based on coordinates has a Quick Queue, because creating the subdivision based on accurate basis parcels is much faster. The quality control includes topological, structural and logical testing only and is done automatically.

The article describes the new process and the benefits of using an accurate cadastral database during preparing town plans.

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1. Introduction- Cadaster In Israel, key players

The land registration method accepted in Israel is based on the Torrens principles (Registration of Titles). The state, through the services of the Survey of Israel, SOI, is responsible for the description of the land parcel boundaries as registered in the Land Registry Office (Forrai et al., 2004).

The establishment of the land settlement in the country has started following the First World War, in the early years of the British mandate in Palestine. At present, some 3% of the area of the country is still not settled. Rights to land are registered as a result of the original land settlement. Any change in the land register should be initiated by a municipal plan and carried out through a so-called subdivision plan prepared by a licensed surveyor.

In Israel, there are a number of governmental agencies are involved in the land administration process. The "main actors" include:

- The Land Settlement and Registration Department in the Ministry of Justice,
- The Survey of Israel in the Housing and Construction Ministry,
- The Israel Land Authority with the Finance Ministry, responsible for managing 93% of the public land in Israel
- The Planning Authority of the Finance Ministry, involved through the municipal committees of planning and construction
- The Ministry of Construction and Housing, responsible for major development projects in the country, and is one of the main clients of fast, exact and secure registration of rights.
- Finally, the Ministry of Finance which is connected both through state budgeting and as the head of an inter-ministry committee for land registration improvement, composed of all the agencies mentioned in this paragraph.

In cadastral surveying and mapping practice, the government is represented by the Survey of Israel. SOI is the top professional geodetic and surveying authority in the country, setting standards, initiating legislations, licensing surveyors, supporting and initiating research and development, actively managing and maintaining the national geodetic infrastructure (including current geodetic datum based on permanent GNSS stations network), the national GIS, and is responsible for topographical and cadastral mapping.

The cadastral surveying practice in Israel involves both the governmental and private sectors. Although the part of the government authorities is still relatively dominant, there is a growing trend of deeper involvement of the private resources in the process.

The private sector (which is composed of some 700 active licensed surveyors) carries out a great variety of tasks, amongst them geodetic control network densification, engineering measurements, topography, photogrammetry, GIS related updating and – particularly – cadastral measurement and mapping. One of the most important tasks of the cadastral surveyor's is the preparation of subdivision plans, which serve, as previously mentioned, as the required technical documentation for any change in land registration.

2. Israel Cadastral Layer

Land settlement, covers today about 97% of the State of Israel and includes about 16,000 blocks that contain 800,000 parcels (figures 1, 2). The annual number of new subdivision plans approved by the SOI is 1400-1700 plans. The cadaster layer is a puzzle of Registration Blocks and Subdivision Plans. The accuracy of this layer is 5 cm to 5 meters.

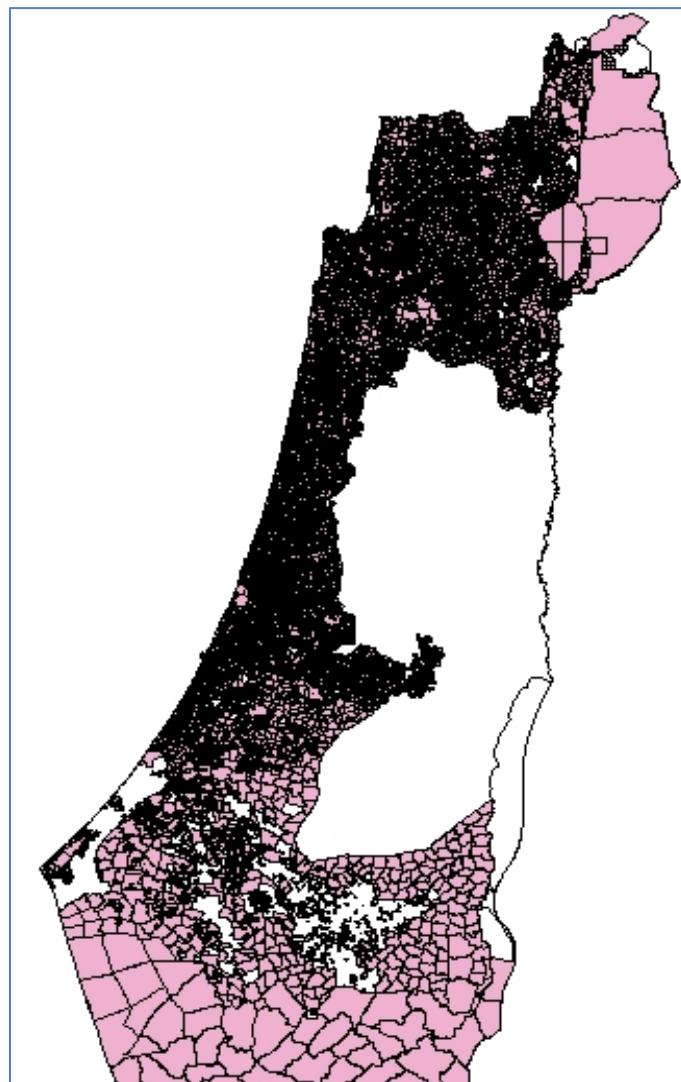


Figure 1 –The Israeli Cadaster Layer

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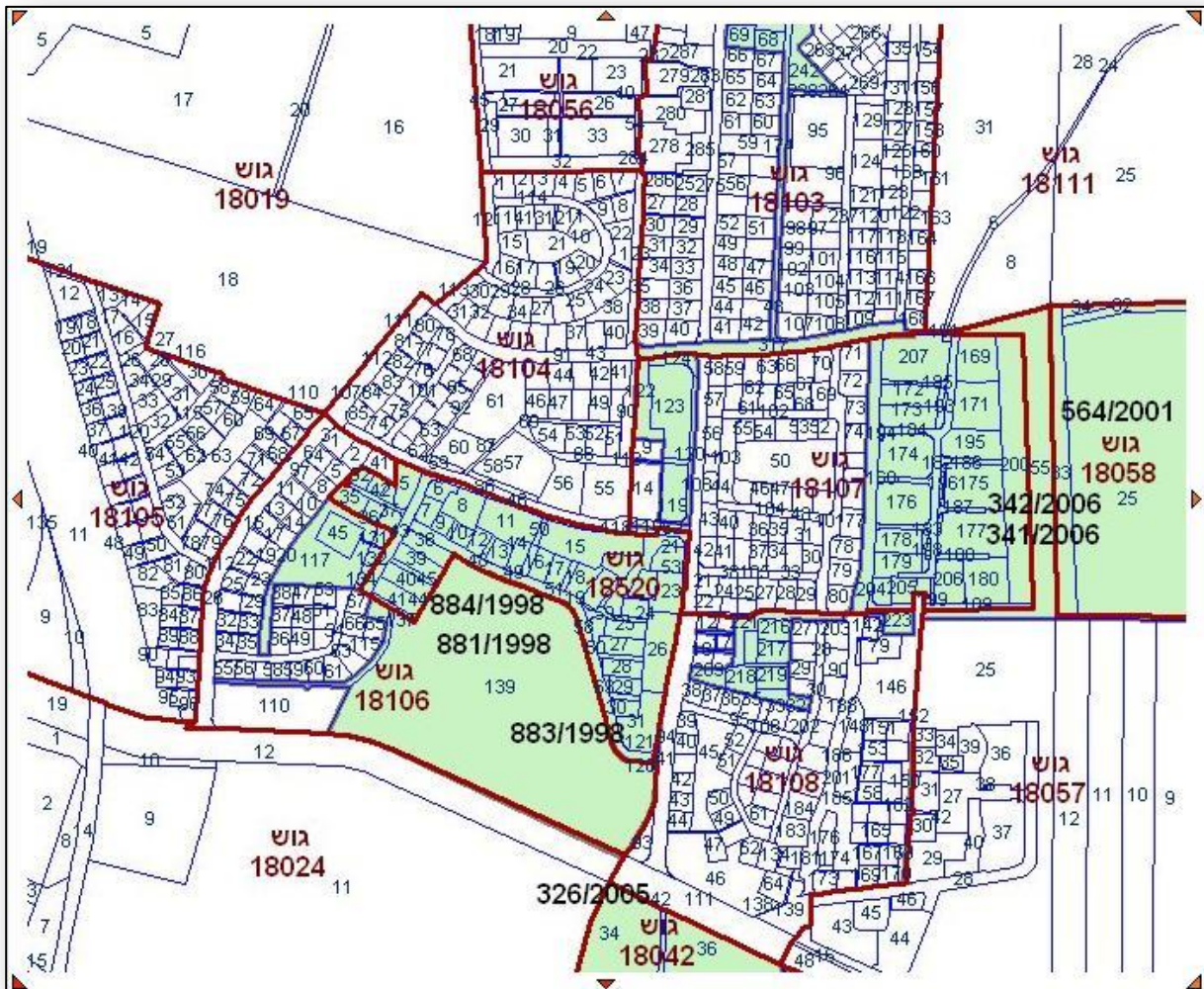


Figure 2–The Israeli Cadaster Layer

3. Israel Cadastral process

Historically, the cadastral database, derived from hand made maps and manual geodetic calculations, was always maintained by the SOI. This database is accessible to surveyors and land professionals by various means (SOI store, and on-line services).

This information, provided by SOI, is a starting point of the cadastral process. Surveyors in Israel are not advised to "follow the footstep of the original surveyor" since the new methods are more accurate than old ones. Nonetheless, deep knowledge about the land settlement and the following subdivisions is essential in accurate reconstruction of each boundary point. Therefore each surveyor should be familiar with searching data and retrieving it from the national cadastral database as shown in step 1 of Figure 3 (Felus and Lida 2001).

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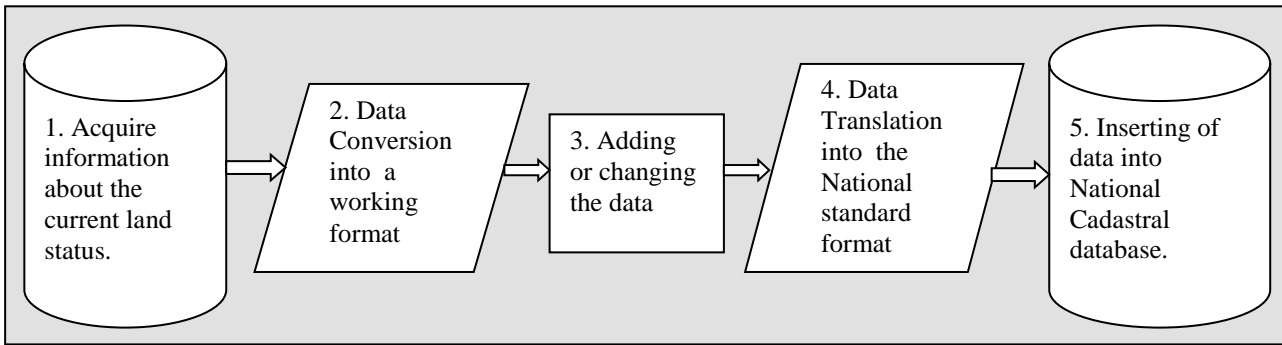


Figure 3. Abstraction of the Israeli Cadastral process.

At the final step of the cadastral process (step 5 in Figure1) the new subdivision plan (Figure 4) is submitted to the SOI. SOI checks the accuracy of the reconstructed boundaries and the division process according to the town plan.

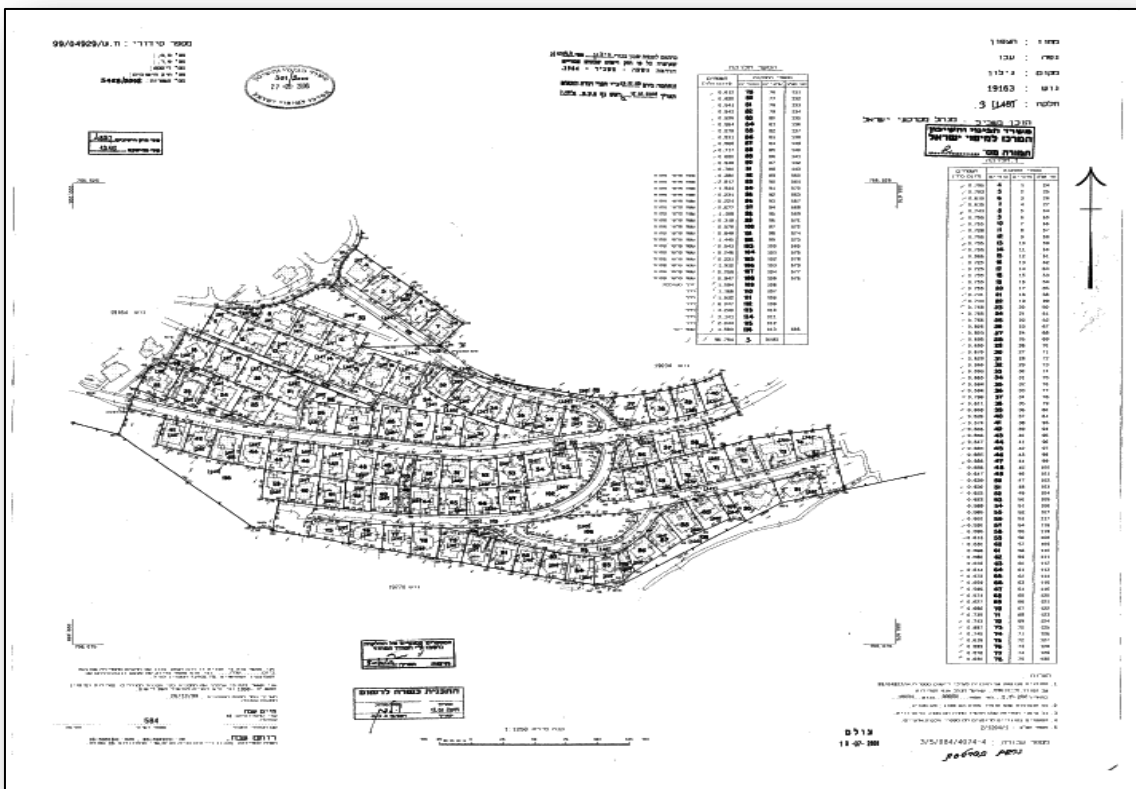


Figure 4-Subdivision Plan

According to the Israeli law, each subdivision plan has to be carefully checked and approved By SOI before starting with its registration procedure. SOI supervises, confirms, coordinates and maintains all cadastral mapping and boundary determination in the country (Klebanov & Forrai 2010). Nonetheless, during the last eight years, a number of private surveyors, nominated by the

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DG of SOI as "supervising surveyors", are also involved with the supervision of subdivision plans prepared by other licensed surveyors (Forrai & Kirschner, 2009).

Following the approval of the SOI, the Subdivision plan is submitted to the Land Registry for statutory registration. This last step sets parcels final numbers and areas in the national databases of the SOI and the Land Registry.

4. Coordinate based Cadastre

It is important to note that each time that a surveyor identifies an authentic boundary or control point which was measured during former relevant cadastral procedures; he has to re-measure this point and adopt its position in the GPS based national geodetic datum. This will in turn, change or re-adjust the cadastral boundary. The old and inaccurate corner coordinates will improve causing technical-, planning-, financial and \ or legal difficulties.

Moreover, the improvement of the national geodetic infrastructure and the cadastral measurement techniques based on it make it possible to determine coordinates of cadastral boundary points, at any time, with a 2-5 centimeter accuracy. On the basis of these coordinates, parcel areas can be computed more accurately than the previously registered ones (Felus 2007). The new possibilities coincide with the public demand for determination of accurate boundaries and their registration.

In principle, a new land settlement (based on modern satellite geodetic field measurement) would be desirable and could basically contribute to a very efficient cadastral practice in the future. Unfortunately, this solution is not feasible. Land settlement is a difficult procedure, composed of legal and technical components. As mentioned, even nearly 90 years of cadastral practice was not sufficient to finish the "first round" of the original land settlement.

Therefore, a "quasi-new arrangement" was proposed, the legal Coordinate Based Cadaster (CBC) (Steinberg, 2001). The idea is to create an optimal set of parcel boundary point coordinates within a cadastral block (adjusted with neighboring blocks, in the current, accurate geodetic datum), and to legislate a new rule stating that authentic field marks will no more determine the position of cadastral boundaries but the "legal coordinates".

This solution that was developed is a new classification system for boundary points, which ranks them by quality and by their legal status. The new ranking is described in detailed by the Director General Instructions. This new ranking allows efficient management of cadastral data at boundary point's level resolution

The key concept is that points at rank 1 are legally determined by its coordinates alone. Any other contradicting evidence is inferior to the coordinate's values. These regulations presents a major step towards Coordinate Based Cadastre, which will pave the way to a multi-dimensional Cadastre, and to an overall more efficient Cadastre.

5. Cadastre For Town Planning

5.1 Needs.

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The growth in Israeli population, projected to rise to nine million by 2020 and to more than thirteen million by 2050, accentuates the urgent need to find new solutions for building new infrastructures, while preserving the remaining open spaces. Therefore, Israel has a particular interest to design and approve many town plans all over the country. After approving town plan there is unnecessary to prepare and approve subdivision plan and perform the registration according to these plans. The current process was inefficient creating inconsistencies between the approved town plan and the existing cadastral database. Moreover the process was serial and therefore was long. There was a need to change the process and make it parallel while more accurate.

5.2 Old Cadastral aim at Town Plans Process (Figure D left column)

In the past, Town Plans (also known as zoning plan, showing the new allocation of land use, urban design, natural resources, transportation, and infrastructure) were based on inaccurate cadastre boundaries. The cadaster was based on digitation of registered Block and Subdivision maps. This caused many problems during the detailed design and zoning plans preparation.

The new Surveying Regulations requires a good agreement between town plan and subdivision plan. The criteria of good agreements are less than 3% of the area of parcel or 10 square meters the larger one.

There were cases that town plans had to be redesigned because of it and because the changes of the parcel boundaries location while determine them accurately in the subdivision plan. Land registration process was a serial process (figure 5 left column) and took a lot of time. This situation reveals that registration of new parcels were ongoing about several years after occupancy the flats and rights of residence were not guaranteed.

Even in cases that the approved town plan was based on inaccurate Cadaster, the process can be shortened by reviewing the subdivision plan while approval by the head of the local design & construction committee (figure 5 right column).

5.3 Modern Town Plans Cadastral Process (Figure D right column)

The most difficult and continuous stage of preparing and reviewing subdivision plans is reconstruction of parcels boundaries in purpose to determine parcels boundaries accurately in the new GPS-based geodetic datum (IG05/12) (The New Israeli Survey Regulations, Vadim FISHBEIN, Yaron FELUS, Shimon BARAZANI, Ronen REGEV, FIG Article 2017)

. This process requires calculations of an old measurement and surveying material and field measurements.

A new surveying instrument was developed, the **Boundary Description Map (BDM)** which basically an accurate representation of the current cadastre.

The preparation of a BDM in IG05/12 grid during preparing the town plan, will ensure that the design will be accurate and lack of mistakes model (Steinberg and Even-Tzur, 2006). Reviewing subdivision plan that is based on modern Cadastre is taking less time. Most of the Quality Assurance (QA) checks are computerized and there is no waiting in line before QA. The time requires for reviewing a Subdivision plan following approval town plan according to this process is shorter by about 12-24 months.

Figure 6 presents the process of approving a town-plan with the preparation of BDM during the process. This presents a seamless and flawless process where the planning and cadastre process are intermixed.

This procedure will allow preparing and approving the subdivision plan within two months after approving the town plan. Procedure of registration will be shorter by 12-24 months.

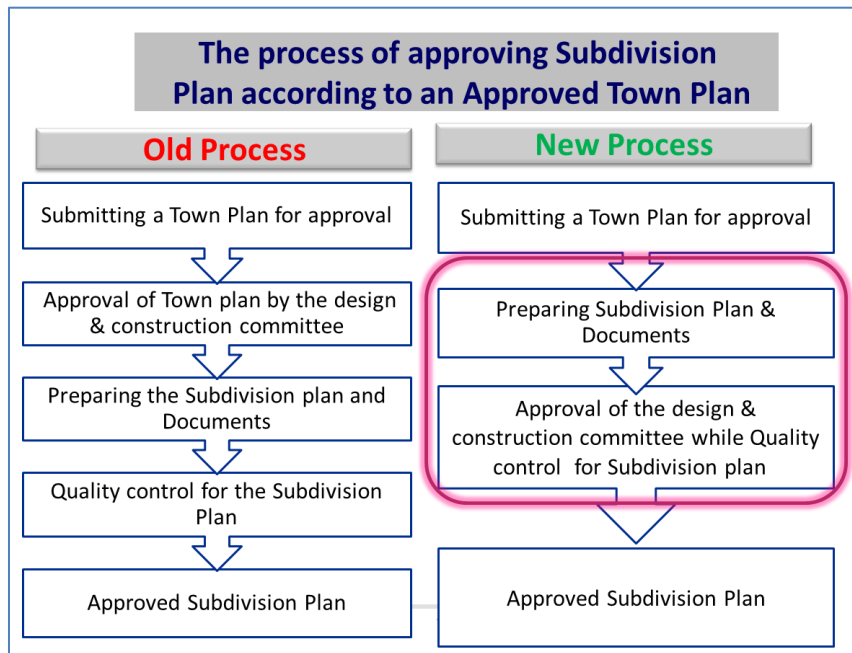


Figure 5-Process of Approving Subdivision Plan According to approved Town Plan

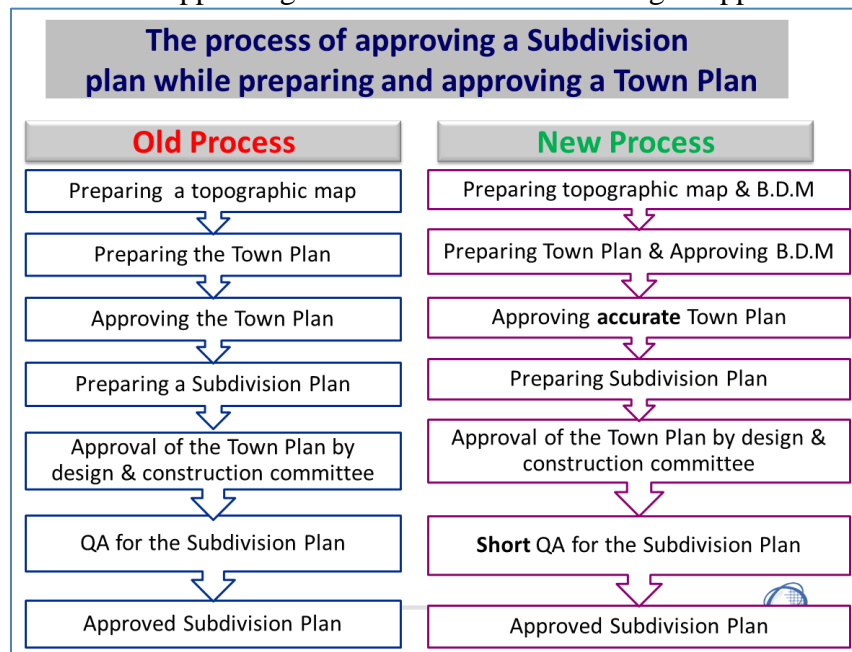


Figure 6-Process of approving a Subdivision Plan while preparing and approving a Town Plan

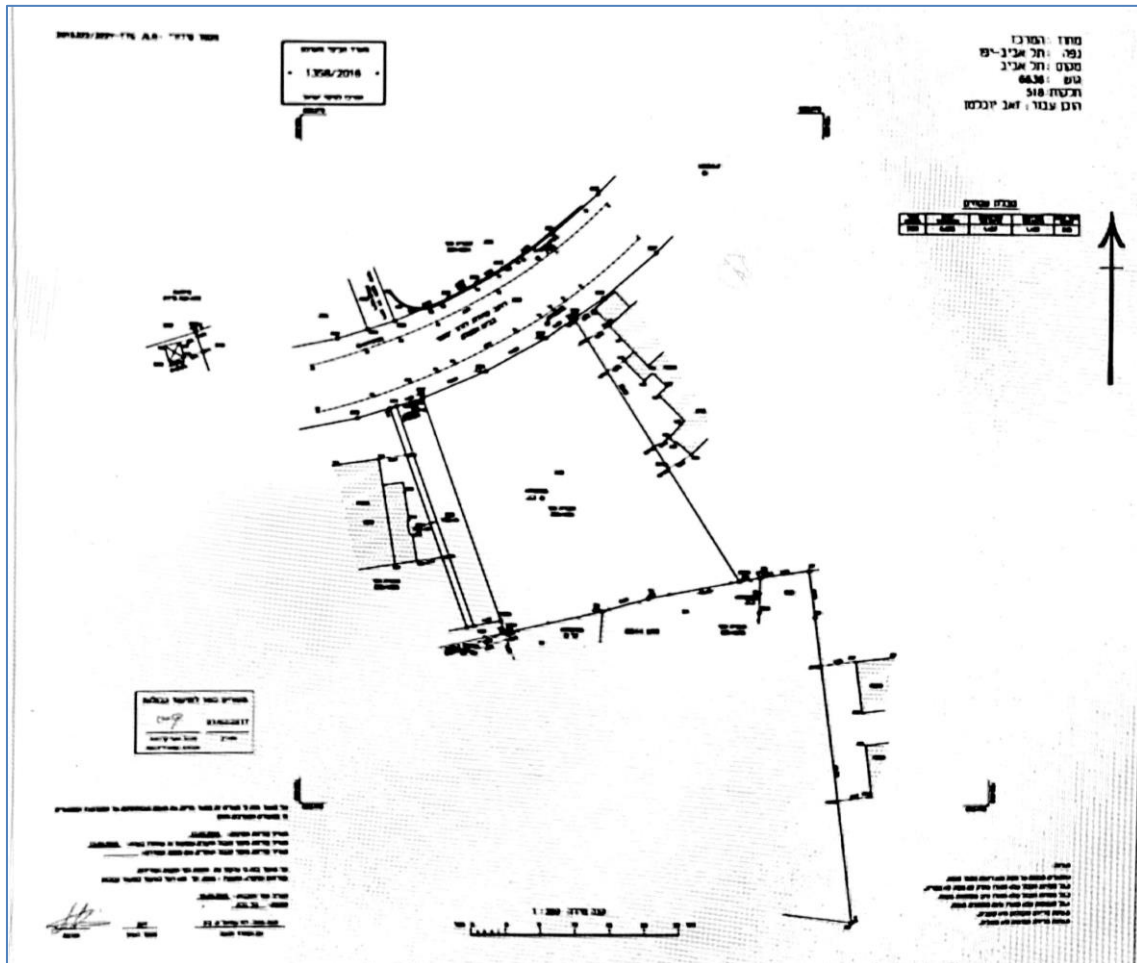


Figure 7 - Boundary Description Map (BDM) representing existing cadastre.

6. CONCLUDING REMARKS

The Survey of Israel is undergoing a revolution in its way of thinking and its ways of activity. The Cadastral process is no longer separated from the planning phase. On the contrary, an accurate cadastral layer is the basic information required for proper planning and the preparation of a town plan. Moreover, ownership registration should be an imperative step in the preparation of a plan and in setting the scene for land development and construction.

This article presented a new procedure aimed at making this vision more applicative.

REFERENCES

1. Forrai, J., Murkes, S., Vosnesensky, L. and Klebanov, M., (2004), Development of a Better Cadastral Practice at the Survey of Israel, FIG Working Week Athens, Greece, May 22-27, 2004
2. Forrai J, Kirschner G., Klebanov M. and Shaked R. (2004) Classification of Licensed Surveyors FIG Working Week 2004, Athens, Greece, May 22-27, 2004 at: https://www.fig.net/resources/proceedings/fig_proceedings/athens/papers/ts04/ts04_1_forrai_et_al.pdf
3. Felus Y.A., and Lida O. (2001), On-line expert system for the Israeli cadastral system. *Geomatica* 55(1):39-46
4. Felus Y .A. (2007) On the positional enhancement of digital cadastral maps. *Survey Review*, Vol 39 (306), pp. 268-281.
5. Klebanov M., Forrai J. (2010), Implementation of Coordinate Based Cadastre in Israel: Experience and Perspectives, FIG Congress, Sydney, Australia, 11-16 April 2010.
6. Steinberg G. (2001), implementation of legal digital cadastre in israel, FIG Working Week 2001, Seoul, Korea 6–11 May 2001 at: https://www.fig.net/resources/proceedings/fig_proceedings/korea/full-papers/session10/steinberg.htm
7. Srebro H. (2009), A Status Report of the Activity of the Survey of Israel, at: http://www.fig.net/resources/monthly_articles/2009/srebro_march_2009.asp
8. The New Israeli Survey Regulation Vadim FISHBEIN, Yaron FELUS, Shimon BARAZANI, Ronen REGEV (Israel) FIG Article of the Month - May 2017

BIOGRAPHICAL NOTES

Eng. Shimon Barazani graduated from the Technion Haifa, Israel with a BSc. in Geodesy (1995), and Civil engineering (1994). He is a Licensed Surveyor in Israel Since 1997.

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