Implementation of Coordinate Based Cadastre (CBC) in Israel: Experience and Perspectives

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INTRODUCTION

Israeli Cadastre Characteristics

- Land registration method - Registration of Titles - based on the Torrens principles
- The State - responsible for cadastral surveying and mapping of land parcel boundaries
- Currently, Israeli cadastre is based on hand made maps, physical ground marking and geodetic measurements made in various geodetic control networks

INTRODUCTION

Israeli Cadastre Characteristics

The Israeli cadastre is characterized by:

- Low accuracy of cadastral works performed in the past due to systematic errors of geodetic control networks
- Great difficulty in integrating adjoining blocks into a spatial cadastral continuity
- Difficulty in search and identification of authentic ground marking of parcel corner points due to development activity and construction

Possible solution → …

TRANSITION TO CBC

Main Objectives

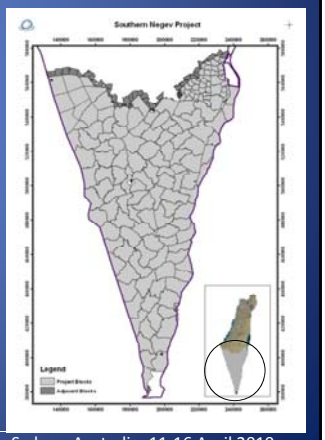
- Transformation of existing parcellation into analytical continuity
  - → *characterized by strong topological compatibility between adjacent cadastral blocks*
- Determining optimal parcel corner point coordinates
  - → *candidates to be declared as legal values for parcel boundary restoration*

SOUTHERN NEGEV PROJECT

General Description

2008 – SOI (the Survey of Israel) initiated the project of CBC implementation in the Southern part of the Negev Desert

- Non built-up areas in the State possession
- Cover almost 50% of the country area
- About 200 cadastral blocks (1% of total amount), containing 2600 parcels
- Lack of detailed cadastral information except block maps at the scale of 1:20,000
- Lack of ground marking of parcel boundary points



SOUTHERN NEGEV PROJECT

Project Highlights

1) Identification and Measurement of Authentic Points on the Ground –

Two kinds of authentic points:

- geodetic control points used as parcel corner points marked on the ground
- points situated on margins or axis of road parcels (check required - whether the route of the road had not been changed)

Goal:

→ to serve as basic points for data adjustment

SOUTHERN NEGEV PROJECT

Project Highlights

2) Geodetic Measurements –

Use of satellite technology (RTK, PP): fast, technological, precise

*3) Connection to - i) adjacent areas (*having detailed cadastral information)

ii) international boundaries

*(*having known (fixed) values)

Goal:

→ *to serve as the outer frame of the project region*

SOUTHERN NEGEV PROJECT

Project Highlights

4) Improvement of National GIS Data –

by means of comparison with the original paper block maps having legal validity

GIS data:

- created originally by digitizing the cadastral block map
- suffer from mismatches compared to the paper maps

Goal:

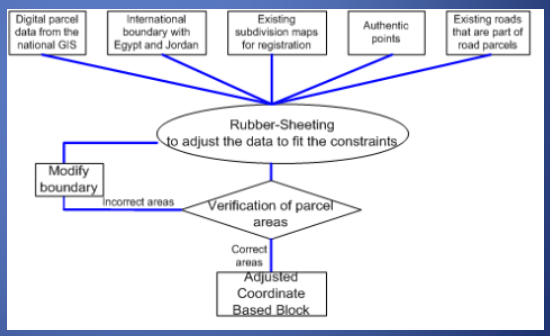
→ *to use improved digital data, matching paper maps, as an initial dataset for further adjustment*

SOUTHERN NEGEV PROJECT

Project Highlights

5) Data Adjustment

Application of Rubber Sheeting to initial GIS dataset



Goal:

→ *to combine all available information and pre-defined constraints*

SOUTHERN NEGEV PROJECT

Difficulties of Realization

- Problems of cellular covering in RTK use *(in remote areas of desert)*
- Partial lack of authentic geodetic control points on the ground *(decrease of adjustment accuracy)*
- Route changes of original roads defined as parcels *(could not be used as authentic object in adjustment)*
- Considerable parcel boundary discrepancies *(in comparison with the original block maps having legal validity)*
- Excessive differences between measured and registered parcel areas *(15% of parcel total amount)*

SOUTHERN NEGEV PROJECT

Result Submission and Check

End of 2009 - project result submission to SOI

Checking Process

- field measurements (geodetic control network and road parcels) – by combined team of field surveyors and geodetic computation experts of SOI
- cadastral data – by SOI cadastral experts
- all digital data – by means of routine computerized technique and additional applications

Data Assimilation

Obtained data regarding new position of parcel boundaries will replace existing data of cadastral layer in national GIS

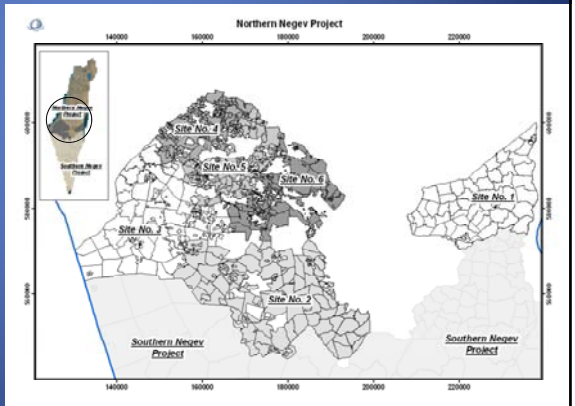
NORTHERN NEGEV PROJECT

General Characteristic

2009 – SOI initiated the project of CBC implementation in the Northern part of the Negev Desert (execution – 2010)

- to continue process of CBC implementation in Israel
- to test previously used techniques in the region with more complex cadastral background

The area was divided into 6 sites – to operate project in a modular way



NORTHERN NEGEV PROJECT

Site Planning

Planning background –

- orthophoto layer – to locate non built-up and built-up areas
- cadastral layers – to examine cadastral background

Two kinds of areas chosen for project –

- non built-up areas even though they have small parcels as a result of subdivision - *absence of physical objects makes the job of parcel boundary reconstruction easier*
- built-up areas that still do not have cadastral subdivision – (new) *physical objects do not affect the location of (existing) parcel boundaries*

NORTHERN NEGEV PROJECT

Technical Specifications

Three categories of involved cadastral blocks –

- Blocks with solid cadastral background
  - blocks having various kinds of cadastral information regarding parcel boundaries
  - requires processing of all available information
- Blocks lacking solid cadastral background
  - blocks having block maps as the only source of cadastral background
  - requires digitization of block maps
- Blocks with "mixed" cadastral background
  - requires “mixed” technique

NORTHERN NEGEV PROJECT

Project Tender

According to SOI decision –

CBC implementation would be performed by private sector - by means of public tenders

Requirements to contractor –

- proper professional skills
- experience in use of satellite technology
- appropriate equipment
- appropriate personnel in charge

Goal:

→ to serve as threshold conditions and as a basic level of qualitative criteria to choose contractor

RESULTS AND FUTURE WORK

Obtained Results

Southern Negev Project -

- SOI obtained digital data characterized by optimal position of cadastral boundaries and by matching to various cadastral constraints and pre-defined conditions
- Data accuracy was mainly influenced by the quality of background cadastral materials
- A priori estimate of point position accuracy has been proven as realistic during project performance (0.5 mm on the map)

Northern Negev Project -

- Presently in progress

RESULTS AND FUTURE WORK

Future Work

- Continuation of CBC implementation activities – initiated projects and parcel boundary restoration in routine cadastral works
- Establishment of a special cadastral unit in the SOI, permanently operating and supervising CBC implementation on nationwide level
- Involvement of private sector as SOI partner in supervision activity and result checking and evaluation

Thank you
for your attention