

Assessment and Analysis of Property and Land Use Changes in the Cross Border Region Austria – Hungary

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ABSTRACT

In times of the K&K-monarchy (1867-1918) Austria and Hungary had the same political system and also a common land registration system. Since the end of First World War (1918) both countries developed in separated ways caused by different political systems. The change assessment of parcel-based property and land use in a period of 100 years for two villages in the cross border region of both countries is described in the paper. First results of the analysis of the acquired data will be presented.

ZUSAMMENFASSUNG

In den Zeiten der K&K-Monarchie (1867-1918) hatten Österreich und Ungarn dasselbe politische System und auch eine einheitliche Landadministration. Seit dem Ende des ersten Weltkrieges (1918) haben sich die beiden Länder aufgrund von unterschiedlichen politischen Systemen auch unterschiedlich entwickelt. Die Erfassung der Änderung von grundstücksbezogenen Eigentumsrechten und von Landnutzungen in zwei Dörfern in der Grenzregion der beiden Länder über einen Zeitraum von 100 Jahren wird in diesem Beitrag beschrieben. Erste Ergebnisse der Analyse der erfassten Daten werden dargelegt.

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1. INTRODUCTION

In the year 1817 Emperor Francis I of Austria initiated the survey of the Austrian Empire. As being part of the former empire today's Hungarian state area as well as today's Austrian state area were recorded during this time. Today in both countries parcel-based land register data as well as cadastral maps are available to document ownership and use of land during the 19th century.

After the breakdown of the Austro-Hungarian Empire in the year 1918 both countries developed in different political ways. The inhomogeneous regimes in the two regions strongly influenced the ownership of parcels and the cultivation of land. While in Hungary most of the land was socialized, the rate of public and private land almost remained unchanged in Austria. In 1989 the political system in Hungary changed again– once again with impacts on the land.

The objective of the presented joint Austro-Hungarian project was to quantify and analyse land changes in both countries. Changes in property rights of parcels as well as changes of parcel-based land use should be considered in time series within the last 100 years. The investigations should be done in the cross-border region of both countries, whereas the test areas were selected according to the common historic development of administrative, social and linguistic conditions until the end of the First World War.

In a future stage of the project the collected data sets of both countries will be compared. Also the above-formulated hypothesis should be proofed, that the differences of the political systems in the countries also cause different developments of land property and land use.

2. PROJECT AREAS

Due to the relatively small budget of the project the number of investigated parcels was limited to 100. So it was necessary to select the few test areas carefully to obtain representative parcels in both countries. The test sites in Austria and in Hungary had to fulfil the following criteria to achieve significant results - especially for future-planned investigations on comparison of different land developments in both states:

- Characteristics of parcels in the times of monarchy (beginning of investigation period) should be the same or similar in
 - Arrangement
 - Size
 - Relationship of land use

- Ownership distribution
- Area should include dwelling regions (with parts of the historical centres of villages) and agricultural land.
- Both test areas must be part of today's cross boundary region.
- Land Register Data and Cadastral Data of these areas must be available and accessible.

Finally the following test areas were selected (*see figures 2.1 to 2.3*):

- Cadastral district of Magyarfalva (German name: Harkau) in Hungary and
- Cadastral district of Girm in Austria.



Figure 2.1: Maps of study area: Overview map (left) and detailed map (right, © AMAP, BEV)



Figure 2.2: Magyarfalva, Hungary



Figure 2.3: Girm, Austria

Both areas lie in a rural region and they are close to the common boundary of Austria and Hungary. The test sites fulfil the above mentioned selection criteria and have – beyond it - similar and comparable geological, topographical, climatic and socio-demographic conditions.

3. ASSESSMENT AND PREPROCESSING OF LAND CHANGES

In Austria as well as in Hungary data of approximately 100 parcels were recorded. In 1900 one half of registered parcels was used as agricultural land and the other half of parcels was used as dwelling area.

Similar methods for the assessment of parcel data and the pre-processing of the acquired geometric and thematic data sets were used for both test sites.

3.1 Cadastral and Topographic Data

The Hungarian as well as the Austrian project team collected all available cadastral and topographic data in their test area (*see figures 3.1 to 3.3*):

- *Cadastral Maps* in time series up to six different stages of parcel-maps. The first in time shows the parcel structure in the year 1857 and the last one – available in a digital vector format (DKM) - documents the parcels in the year 2000.
- *Cadastral Parcel Data* were collected, beginning from the year 1857 up to the year 2000 to document the size, the ownership (see chapter 3.2) and the land use for each parcel.
- *Aerial photographs in time series* as source of information about land use and structural development of buildings.
- *Digital Terrain Model* for the orthorectification of aerial photographs
- The actual *Land Use Plan (Zoning Plan)* of the area.

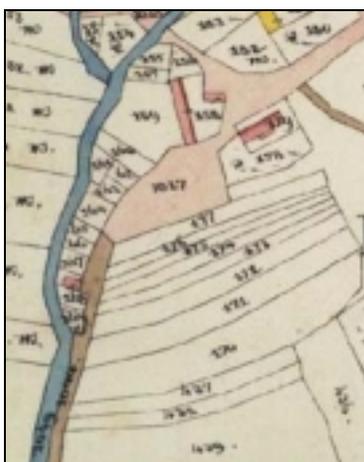


Figure 3.1: Cadastral Map of Girm (1857), © BEV



Figure 3.2: Cadastral Map of Harka



Figure 3.3: Digital Cadastral Map of Girm, (2000) © BEV

Subsequent to the data assessment the data were pre-processed to enable a later analysis. The analogue data were digitised. The maps were georeferenced and the aerial photographs were orthorectified. The geometric data were corrected topologically and the describing parcel information was added to a Geographic Information System (GIS).

First of all the cadastral map of the year 2000 (DKM2000) was read into the GIS-System *ESRI ArcView* and the pure line data were converted to a proper GIS-topology. Now this

adapted map (in the *Gauss-Krüger-Projection-System* in Austria and in the *UTM-Projection-System* in Hungary) was used as basic content for the analogue/digital conversion of the other cadastral maps.

The analogue cadastral maps were scanned and georeferenced to the specific projection system of the DKM2000. Afterwards the rectified digital raster files were processed according to the year of origin, starting with the predecessor map of the DKM. This predecessor map (in Austria the cadastral map of the year 1966) was superimposed on a copy of the DKM2000 and visually compared. If changes in the geometry were detected – the vector data were changed according to the content of predecessor map. The revised vector data set (cadastre of 1965) was stored and used as reference set for processing the next predecessor map (Example see *Figures 3.4 and 3.5*).

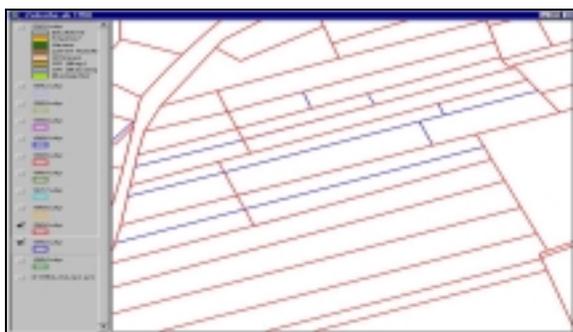


Figure 3.4: Cadastral Map of Girm of 1966 (red lines) including adaptations to the map of 1950 (blue lines)

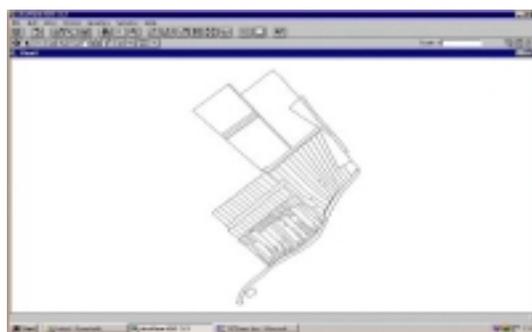


Figure 3.5: Cadastral Map of Harka of 2001

This procedure of digitalisation was repeated for all the other analogue maps, whereby the obtained result of each “digitalisation step” was used as input for digitising the previous cadastral map in the time series. Finally - as result of this procedure - all cadastral maps were available in a digital vector format.

Aerial photographs were orthorectified using the software *INTERGRAPH Base Rectifier* and included to the GIS-System.

The collected thematic parcel data - like parcel number, size of area, land use, mutation records, were linked to the graphical representation of parcels into the GIS-System.

3.2 Land Register Data

The legal units used in the land register are identical with the cadastral units or combinations of them. A unique cadastral number of each land unit serve as link between cadastral map and cadastral records (verbal description) that finally led to the ownership records in the land register.

In this project the investigation of ownership changes were started with the common Austrian-Hungarian land register of 1850. For each cadastral unit (parcel) of the selected test area the corresponding ownership record could be identified in the land register on the basis of the parcel number shown in the cadastral map of 1857.

Because the Austrian municipality Girm had been under four different regimes from 1850 to 1921 - Austrian empire, Hungarian kingdom, Russian occupation and Austrian republic - parts of the historical cadastral records got lost or had been destroyed. Subsequently the survey period of the land register of Girm starts with the re-ambulated register of 1953.

Similar to the actual land register system also the historic register shows any changes related to the legal situation of a parcel over time. This information, i.e. the number of owners and their names, their share, the type of property transfer, like donation, selling, inheritance etc. had been stored for each parcel in a relational database, whereas the cadastral unit number and the date of change registration serve as its primary key (*Table 3.1*).

The assessment of the historic ownership data was done at the archives of the local land register offices in Oberpullendorf (Austria) and Sopron (Hungary) as well as at several regional and national archives. Because since 1986 in Austria all land registers are managed in digital form, the survey for this period had been done with digital records obtained from the BEV.

The resulting database includes more than 10.000 records describing the history of any parcel of the two 100 acres test sites.

PN	YY	AI	AR	RI	LU	TT	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	
116	1940	1	1306	129	G	E	3/5	1/10	1/10	1/10	1/30	1/30	1/30									
116	1954	1	1306	129	G	K	1/2	0	1/10	1/10	1/30	1/30	1/30	1/5								
116	1955	1	1306	129	G	E	1/2	0	1/10	1/10	0	1/30	1/30	1/5	1/30							
116	1956	1	1306	129	G	K	0	0	0	0	0	0	0	0	0	1/2	1/2					
116	1975	1	1306	129	G	EI	0	0	0	0	0	0	0	0	0	0	1/2	1/2				
116	1980	1	1306	129	G	SCH	0	0	0	0	0	0	0	0	0	0	0	1/2	1/2			
116	1986	1	1306	129	G	E	0	0	0	0	0	0	0	0	0	0	0	1/2	0	1/4	1/4	
116	1997	1	1306	129	BF	ZZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Abbreviations:		PN...Parcel Number			AI...Annual Index			RI...Register Index			TT...Transfer Type											
		YY...Year			AR...Area			LU...Land Use			Sx...Share of holder x											

Table 3.1: Example of a database set - Ownership development of parcel n° 116

4. ANALYSIS OF DATA SETS AND RESULTS

Up to now the available data sets are only analysed separately by each project team. So in the following chapters the results will be individually presented for each country.

4.1 Analysis of Austrian Data Sets

In Austria one important data set describing the changes of parcel numbers at a specific date was lost in the past. The missing data could be substituted by means of other historical data sources, but this would have gone beyond the financial scope of the project. So the consequence was to restrict the analysis to the period of full available data sets (1950 up to 2000).

4.1.1 Changes in the Geometry of Parcels

The following four cadastral procedures are legally allowed to mutate the geometry of a parcel:

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- Subdivision of parcel
- Rearrangement of fragmented parcels (Merging of parcels)
- Land Consolidation
- Resurvey of parcel(s).

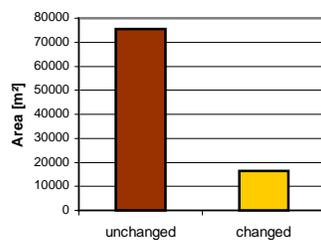
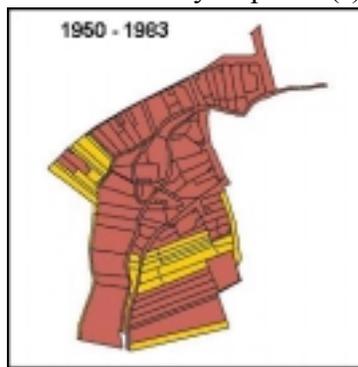


Figure 4.1: Changes of parcel structure 1950 – 1983 (33 years)

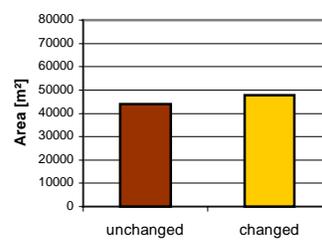
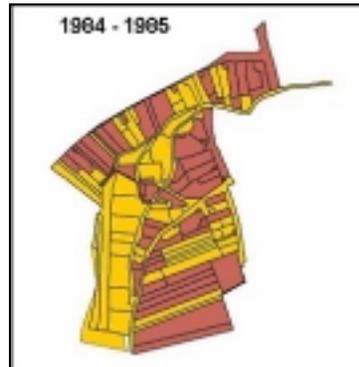


Figure 4.2: Changes of parcel structure 1984 – 1985 (2 years)

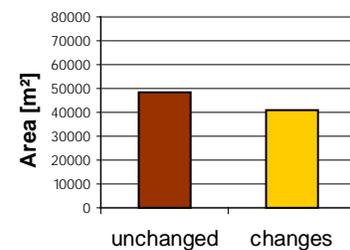


Figure 4.3: Changes of parcel structure 1986 – 2000 (14 years)

In the Austrian test area only few changes in the parcel geometry could be observed in the last 50 years. Only in 1985 a substantial land consolidation caused a peak of size mutations. In general a trend to larger sized parcels was recognisable.

4.1.2 Land Use Changes

The land use of parcels is documented in the Austrian cadastre system for taxation purposes. Dependent on this record the amount of land taxes will be calculated. The Austrian cadastre documents the boundaries of ownership. These boundaries only fitted with land use boundaries at the first establishment of the cadastral map. So the parcel-based registered land use varies a little from the real land cover or real land use. Nowadays in the digital cadastral map (DKM) this problem is solved by the documentation of both types of boundaries.



Figure 4.4: Land use in the test area 1950



Figure 4.5: Land use in the test area 1985

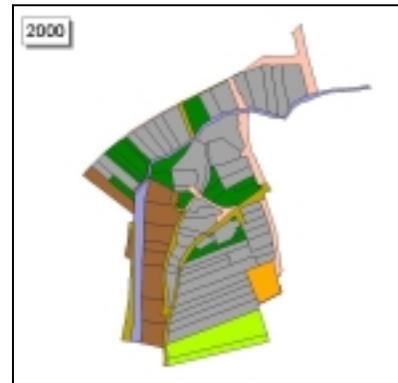


Figure 4.6: Land use in the test area 2000

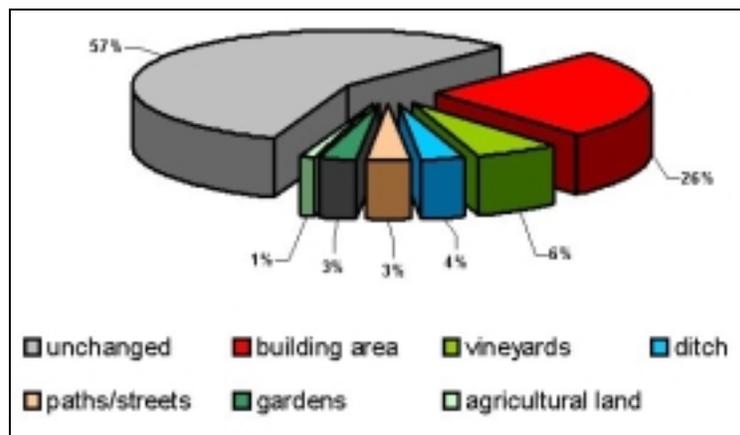


Figure 4.7: Changes of land to specific land use during the period 1950 – 2000 in the whole test area
 Figure 4.7 documents the changes of land use for the whole Austrian test area within the last 50 years. 57 percent of lands are still used in the same way as they have been used in the year 1950. Most of the parcels that changed their land use were dedicated to building areas. Interesting is also the large area (6%) of land that was transformed to vineyards.

4.1.3 Changes of Ownerships

To obtain a comprehensive picture on property changes for the region of Girm, the analysis had been undertaken using two different information sources:

- Time series analysis of the development of single parcels
- Statistical analysis of all parcels for selected data.

All calculations are based on the land register data, stored in the database described above. The number of owners per parcel varies between 1 and 17 shareholders. It is of interest that the size of the parcel of the 17 owners is less than 140 m². And this is not a single case. The reason is reflected in the type (mode) of ownership transfer of these parcels - they all had been resituated to returned ethnic minorities after the Second World War.

The analysis of the distribution of shares shows a significant regression in sole owners (Fig. 4.8). About 40% of the legal units are hold today by two owners, and another 35% by 4 or more shareholders.

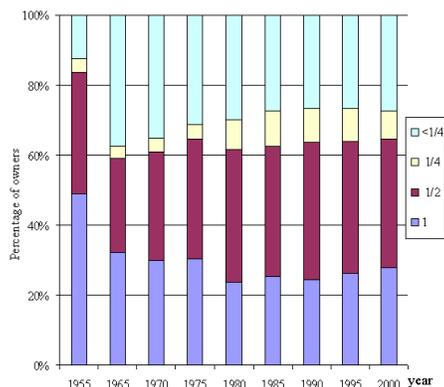


Figure 4.8: Distribution of shares

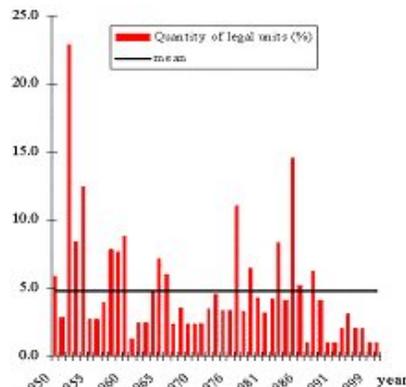


Figure 4.9: Percentage of legal units affected by property changes

4.2 Analysis of Hungarian Data Sets

4.2.1 Historical Background

The First Land Reform is attached to I. Nagyatádi Szabó's name (former minister of agriculture), who had taken part fulfilment of the land reform after the land law in 1921 (No. XXXVI). The reform affected only a little part of the large estate (4 percent of the cultivable area), mainly arable and most hard cultivable areas far away from settlements. The size of the repartition areas was 1,15 million kh (0,66 million hectares): 432.000 hectares areas were used for agricultural farming and the rest was given to approximately 200.000 people as building land. In consequence of the benefits grew the number of the smallholder. Their parcels size was under 5 kh (2,9 hectares). The number of the smallholding estates was grown till 1935: about 4,5 million people were living as farmers.

The Second Land Reform in year 1945 after the law (number VI.): "Liquidation of the large estates and land-benefit to the ploughman". The reform touched all villages of the land. The 34,8 % of the cultivable areas was shared by 650 000 persons. The settlement was done by people's organisation (land-demanding committees). The technical aspects of settlement were realised by regional land offices and land surveying. After the sharing of the large estates the work of the Committees ended and land surveying and registration of land started.

A further agenda was the distribution of building sites. The procedure of the distribution of building sites was regulated. The provision for the distribution of the building sites was a numerical method.

The relationship of land use changed in the years 1959-1962: The Hungarian agricultural farming was collectivised following the soviet sample: 80% of the agricultural land was co-operative farming, 14% of the agricultural land was in the state farming and 6% of the

agricultural land was in the hand of private farmers. The period between 1965-1985 was characterised by dynamic development and economical growing.

The Third Land Reform was the biggest in Hungary to realise the compensation laws from 1991 and 1992.

In the frame of compensation acts the number of entitled persons to benefit are approxiamtely 2 millions. It includes the part ownership of 1.400.000 persons of co-operatives and of 500.000 employers of state farming.

The numbers of benefit	41,3 million AK (Gold Crown)	3,0 million hectares
Part-owners	38,6 million AK	2,1 million hectares
<u>Employers</u>	<u>10,5 million AK</u>	<u>0,7 million hectares</u>
Sum:	90,4 million AK	5,8 million hectares

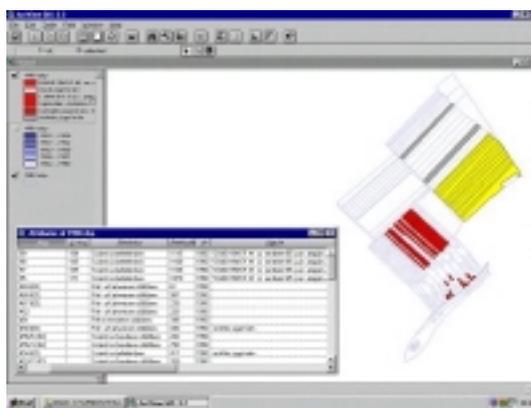


Figure 4.10: Changes in land ownership in 1950

The spatial and temporal data are processed and visualized by ArcView 3.2. The data are structured year by year.

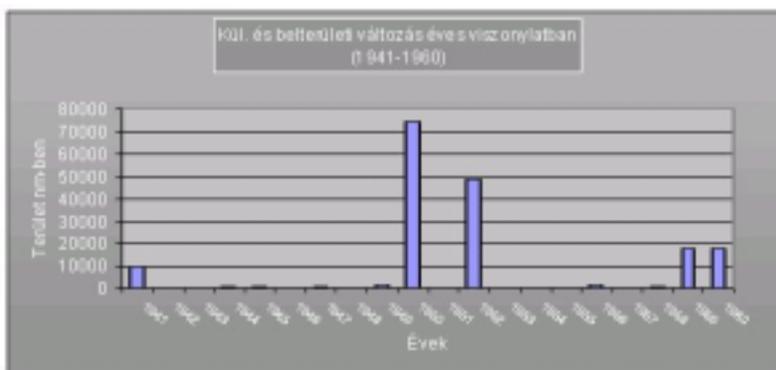


Figure 4.11: Areal changes (vertical axis: sqm, horizontal axis: time (1941-60))

5. OUTLOOK AND FINAL REMARKS

Within the project a huge database was built up, which will be used for further investigations. Parcel data will be correlated with socio-economic data and political milestones to assess possible relationships between these different kinds of data sets.

In a second stage the Hungarian and the Austrian results will be compared and different land developments will be outlined. In this way the impacts of different political developments to land can be analysed.

The project team gained a lot of experience in the assessment of historical cadastral and land register data. Problems caused by different language in the recorded documents and caused by different measure unit systems (the old and sometimes identical termed systems varied in the definition of the distance unit) could be solved. Methods for the analysis of data sets were worked out and tools for the visualisation of results were established.

Finally the project intensified the contact between neighbours. The Austro-Hungarian cooperation in the presented research work led to a better understanding of the different land administration systems and a better understanding of the different cultures in both countries.

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Erwin Heine currently works as an Assistant Professor at the Institute of Surveying, Remote Sensing and Land Information at the University of Agricultural Sciences in Vienna (BOKU Wien). In 1992 he obtained his Master's degree in surveying at the Technical University in Graz. From 1996 until 1998 he was appointed as a senior researcher at the Department of Geodesy at Giessen University, Germany. His PhD degree he obtained at the Technical University of Graz in 1997. He is involved in international surveying and mapping projects in the Asian region and he is experienced in the survey of ancient settlement structures. His research work is focusing on Land Use Planning, Land Information, GPS, and Cadastral Systems.

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Bela Markus is a land surveyor, M.Sc., Ph.D., professor of Geoinformatics, director of the College of Geoinformatics, UWH. He has 30 years teaching experience in surveying, 15 years in teaching GIS and 7 years in development and organization of open, distance learning professional courses for land administration. Prof. Markus has over sixty published papers on various aspects of using GIS, actively involved in many national and international academic programmes, chairman of the Hungarian UNIGIS Course Board, chairman of Educational Affairs of the Scientific Committee in Geodesy at the Hungarian Academy of Sciences, chairman of Working Group on Geoinformatics of Association of Hungarian Surveyors and Cartographers and the national representative of FIG Commission 2.

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