

LAND ADMINISTRATION AND LAND CONSOLIDATION AS PART OF AUSTRIAN LAND MANAGEMENT

SPRÁVA A KONSOLIDÁCIA POZEMKOV AKO SÚČASŤ PÔDNEHO MANAŽMENTU V RAKÚSKU

Reinfried MANSBERGER, Walter SEHER *

I. Introduction

Land (use) management is the work related to the use of land resources within current policy guidelines taking into consideration the legal framework for a specific land area ⁽¹⁾. The terms include all activities for documentation, validation, cultivation and development of land resources by considering ecological, economic, legal, social and technical aspects. A sustainable use of the resource land is required to meet today's social challenges with demographic change, energy transition and climate change.

A description of the whole land management system in Austria would break the frame of this article. Therefore, the authors will focus on two selected aspects of land management, namely land administration and land consolidation.

The Bathurst Declaration on Land Management for Sustainable Development stresses the importance of land administration in this field. Land administration in the definition of FIG ⁽²⁾ includes laws and regulations necessary for creating property rights, for registering and subsequently transferring them, for resolving disputes, for taxation purposes, and the equitable resumption of these rights. Land

⁽¹⁾ Mattsson, Mansberger (2017)

⁽²⁾ FIG (1999)

administration embraces legal rules for land use related to a certain area ⁽³⁾. As information (site, value, etc.) about such an area is essential, the tools for assessing, documenting and mapping this information are parts of land administration.

In Austria, the concept of land consolidation encompasses all constitutional standardized measures of land reform – from the traditional measures for improving the agricultural structure to more complex measures for realizing projects of public interests, like road construction or flood prevention. In this way, land consolidation contributes to the implementation of strategic plans in rural areas.

The article documents the organisation and tasks of land administration and land consolidation in Austria. The paper describes interactions and collaborations between these two fields of land management and outlines new developments and current challenges.

II. Organisation and Activities

In Austria, two different authorities carry out land administration and land consolidation. Activities and responsibilities are stated in the Austrian Constitution.

⁽³⁾ Mattsson, Mansberger (2017)

Abstract (EN)

Land administration and land consolidation are two pillars of the Austrian land management sharing a long tradition and duties defined by the constitution. Land administration supports measures of land consolidation with cadastre data, land registry data and other geo-technical data. New methods and instruments of geodata assessment provides a more detailed information about land and its changes. The geo-products are contributing to an improved process efficiency of land consolidation authorities. In addition, the role of land consolidation changed from an instrument to improve farming structures to a multifunctional tool of land management.

Abstrakt (SK)

Správa a konsolidácia pozemkov sú dva piliere rakúskeho pôdneho manažmentu, ktoré majú dlhú tradíciu, pričom ich povinnosti sú definované ústavou. Správa pozemkov vytvára podporu pre opatrenia potrebné na konsolidáciu a to najmä prostredníctvom poskytovania údajov z katastra, pôdneho registra a iných geotechnických dát. Nové metódy a nástroje hodnotenia geodát poskytujú podrobnejšie informácie o pôde a jej zmenách. Geo-produkty prispievajú k zlepšeniu efektívnosti procesov vykonávaných konsolidačnými orgánmi. Navyše sa úloha konsolidácie pozemkov zmenila z nástroja na zlepšenie poľnohospodárskych štruktúr na multifunkčný nástroj riadenia pôdy.

Keywords (EN)

land administration, land consolidation, land management

Kľúčové slová (SK)

správa pozemkov, konsolidácia pozemkov, pôdny manažment

* University of Natural Resources and Life Sciences, Vienna, Austria

II.1 Land Administration

Austria has a 200 years' experience to register the site, the use, the value and the rights of and on land, to administrate the land and to provide these data for the public. In 1817, Emperor Franz I. ordered a systematic land survey of the whole monarchy with the purpose to create an objective basis for the levy of the land tax. Within few decades, in total 50 million parcels and their land use were mapped in a country-wide reference system (see Figure 1). The so-called "Franciscan Cadastre" documented also the owners of the land. Since 1871, the year of the implementation of a countrywide land register, the cadastre is linked with this data set and since the in the year 1883 enacted "Evidenzhaltungsgesetz" (Evidence Keeping Act) guarantees the continuous maintenance of cadastral and land right data sets.

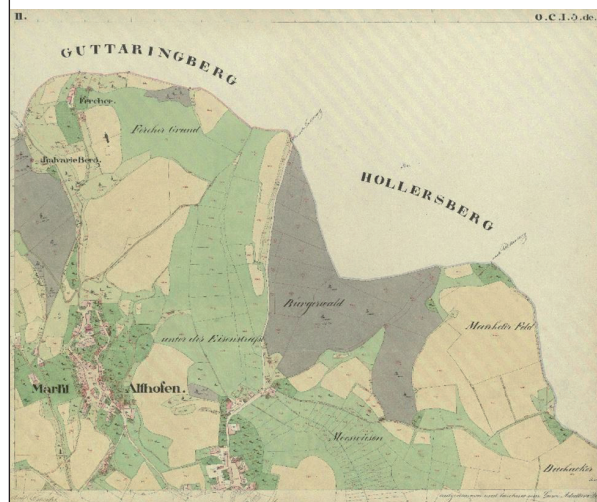
As one of the first countries worldwide, Austria digitalized all records of the administration system. In 1984, the digitalisation of the land register was finished. Since 2004, the cadastral maps are also available in a digital format. Nowadays, the information of 11 million parcels (site, area, land rights, land use) is available and everybody has access to this database, 7 days per week and 24 hours per day.

Cadastral and land register lie in the competence of the state. Besides the Austrian Federal Office of Metrology and Surveying (BEV), licenced surveyors and academic educated surveyors employed at public institutions on state level or provincial level are allowed to outline specific activities in cadastral surveying (e.g. sub-division of parcels). The "Liegenschaftsteilungsgesetz" (Real Estate Act, BGBl. Nr. 3/1930) clearly defines the group of authorized persons or institutions. Documents issued by these authorised persons or institutions will be controlled by the cadastral offices (branch offices of BEV) and updated in the land parcel database, which includes cadastre and land register data.

BEV is also responsible for the maintenance of the countrywide distributed reference (grid) points (in total 220.000) and the production of countrywide maps in various scales. BEV and cadastral offices (Vermessungsämter) are assigned to the Austrian Federal Ministry of Science, Research and Economy. Applications for changing the land rights (e.g. purchase, sale, inheritance, servitudes) are submitted to the land register authorities (Grundbuchsgerichte), which are assigned to the Austrian Federal Ministry of Justice.

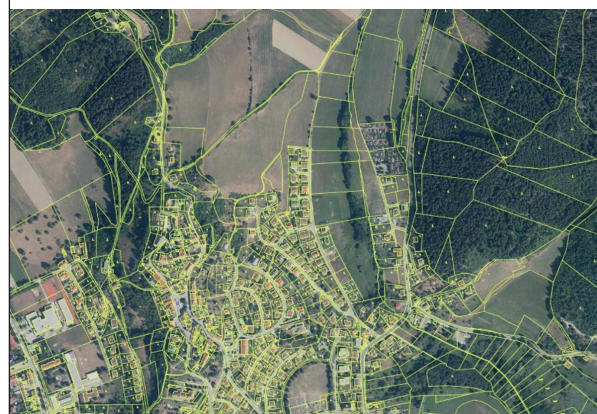
In 1968, a specific surveying law (Vermessungsgesetz, BGBl. Nr. 306/1968) was enacted in Austria. This law introduces - in addition to the existing Real Estate Cadastre - a so-called Boundary Cadastre (Grenzkataster). The Boundary Cadastre guarantees the coordinates of boundary points of a parcel. The transition of parcels from Real Estate Cadastre requires a besides the cadastral surveying a written agreement of all neighboured owners to the proposed boundary line of this parcel. Currently 14% of Austrian parcels are recorded in the Boundary Cadastre with the benefit that the surveying authority reconstructs boundary points in cases of boundary disputes. For parcels of the Real Estate Cadastre, a judge has to take the decision about the position of the disputed boundary - often supported by expertise of the surveying authorities.

Figure 1: Franciscan Cadastre - KG Althofen (detail)



Source: BEV

Figure 2: Digital Cadastral Map superimposed to Orthophoto - KG Althofen (detail)



Source: BEV

The Digital Cadastral Map (see Figure 2) documents countrywide all parcels and is a basic geodata-set for a land information system. The cadastral data are geocoded in a GIS format in the Austrian Grid (MGI-datum, Gauss-Krueger projection) and can be linked with other in Austria available geodata-sets (e.g. zoning map).

Besides cadastral data and topographic maps, the BEV provides also other geodata-sets, which are used by the land consolidation authorities: Aerial photographs and orthophotos, the Digital Terrain model (DTM), and the Digital Landscape Model (DLM). Since 1950, aerial photographs are taken countrywide with an interval of five to seven years. Nowadays the interval decreased to three years - enabled by cooperation between BEV, the Austrian Ministry of Agriculture, Forestry, Environment and Water, and the regional provinces⁽⁴⁾. Data describing the quality of soils are assessed by the Austrian Ministry of Finance and for each of (agricultural) parcels recorded as "Ertragsmesszahl" (standardized

⁽⁴⁾ Banko et al. (2013)

yield-capacity value) in the cadastre⁽⁵⁾. In addition, the regional provinces collect various data about land (e.g. zoning maps, Airborne Laser-Scan data, information about natural protection areas), which are provided to land consolidation authorities.

II.2 Land Consolidation

Land consolidation in Austria is part of the so-called “measures of land reform”. In Austria, the term land reform relates to the rearrangement of property and land use on agricultural and forest land. The measures of land reform in Austria date back to the middle of the 19th century. The transition from a feudal to a private, market-based property system in the course of the “Grundentlastung” in 1848 as well as the agricultural inheritance law in operation and the common system of triple field husbandry resulted in several shortcomings in agricultural land use structure, such as land fragmentation, small and unfavourably shaped parcels, land parcels with no connection to rural roads and legal defects concerning land use. These shortcomings and the problems related got even worse in the course of mechanisation in agriculture after the Second World War. They impede agricultural cultivation and result in an increased workload and in higher energy consumption⁽⁶⁾.

Land reform measures are part of the Austrian Constitutional Law. Their task is to rearrange and legally regulate agricultural property, land use and cultivation structures and to adapt them to up-to-date social, economic and ecological requirements. The objective of land reform in Austria is to eliminate shortcomings in agricultural land use structures by means of land consolidation, construction of rural roads or separation of overlapping land uses.

Framework legislation concerning land reform in Austria is subject to the federal state whereas the provinces are in charge of executive legislation and implementation of land reform measures. In detail, the following measures are part of land reform:

- land consolidation,
- voluntary land exchange,
- division of common land,
- regulation of land use (rights) on common land,
- regulation and removal of agricultural easements on forest land (grazing and timber rights),
- construction of agricultural roads,
- protection of alpine pastures, and
- the operation of agricultural land funds.

There are legal procedures for all these measures. Implementation of land reform measures is subject to land reform authorities in the provinces (except Vienna). The authorities usually comprise a technical and a legal department. The focus of land reform in Austria is different. In the flat and hilly regions of Austria land consolidation and voluntary land exchange are the most important measures whereas in the alpine areas rural road construction, management of agricultural commons and handling agricultural easements

on forest land are prevailing. Landowners are entitled to appeal against decisions taken by the land reform authorities. Province based administrative courts and subsequently the Federal Administrative Court decide about those appeals.

In the following sections the focus of this paper is on land consolidation because it is the most important measure of land reform both related to the number and the extent of land reform schemes. Land consolidation is an instrument of land management to enlarge, redesign, rearrange and improve agricultural and forest land. According to the federal Framework Land Consolidation Act, the objective of land consolidation in Austria is “to improve and rearrange the conditions of agricultural cultivation on behalf of an efficient and environmentally friendly agriculture by consolidation and development of agricultural and forest land”. In doing so, the rearrangement of land has to be in line with up-to-date economic and ecological requirements. In order to realise these goals on the one hand disadvantages in farming structure like land fragmentation or unfavourable plot sizes shall be eliminated. On the other hand, the task of land consolidation is to improve farming structures negatively affected by public projects like traffic infrastructure or flood protection schemes. In order to start a land consolidation scheme the existence of those shortcomings and disadvantages has to be proved by the land reform authority. The most important procedural steps of a land consolidation scheme are as follows:

- initiation of the land consolidation scheme by order of the land reform authority,
- establishment of the land consolidation association (representing body of the land owners involved),
- designation of the land consolidation area: negotiating and surveying the borders of the land consolidation scheme,
- property evaluation,
- soil evaluation,
- evaluation of landscape elements in the land consolidation area,
- designing the plan of so-called common structures of land consolidation involving rural road network, canals and ditches, protective measures against soil erosion (e.g. field windbreaks) or other landscape elements,
- delivery of land allocation proposals by the land owners involved,
- design of redistribution and allocation project,
- provisional cultivation of the newly allocated land by the farmers involved,
- implementation of construction measures,
- design and approval of land consolidation plan,
- transfer of new property structure into the so-called boundary cadastre and the land register,
- closure of the land consolidation scheme.

According to the legal situation, the core task of land consolidation in Austria is the improvement of farming structures by reducing cultivation efforts having regard to environmental restrictions. Beyond that, non-agricultural land-related problems could be solved repeatedly by land consolidation. In Austria the related tasks are referred to as

⁽⁵⁾ Abart et al. (2017)

⁽⁶⁾ Seher (2002)

multifunctionality of land consolidation. They include land rearrangement for roads, railroad tracks, flood protection schemes, river restoration, nature conservation areas, habitat networks, recreation facilities and municipal areas as well as land readjustment for housing and commercial areas. A specific land consolidation procedure for non-agricultural purposes, comparable to the “Unternehmensflurbereinigung” in Germany, is not provided by Austrian land reform legislation. Thus, the improvement of farming structures has to be proved for every new land consolidation scheme even if the main goal of the scheme is in fact the implementation of non-agricultural public projects.

III. Interactions between Land Administration and Land Consolidation

Land consolidation authorities as organisations for Rural Development continuously interact with land administration institutions. During a land consolidation project, they take over the cadastral surveying in the whole project area. According to §1 (4) “Liegenschaftsteilungsgesetz” (Real Estate Act, BGBl. Nr. 3/1930), the land consolidation office is allowed to produce maps for cadastral sub-divisions. After the recognition of the validity of the consolidation plan, the sub-division documents are handed over to the land register offices (“Grundbuchsgerichte”) and to the cadastral offices (“Vermessungsämter”).

An optimal and successful reorganisation of rural areas requires proper planning materials and the involvement of from the consolidation process affected persons⁽⁷⁾. Besides the geodata, provided from land administration and regional provinces, the land consolidation offices assess small-structured geodata of the project area, e.g. detailed information about the quality of soils. New knowledge also will be gained by analysing and merging existing data-sets.

The use and the potential of geodata as well as the application of information and communication technology (ICT) at Austrian land consolidation authorities were investigated⁽⁸⁾. There was consent that land register and cadastral data are the most important sources for land consolidation processes. In addition, information about the soil quality, natural protection (landscape elements), spatial planning (zoning plan) are seen as essential input. It was a surprise, that socio-economic data and historical data-sets (e.g. old cadastral maps or aerial photographs) are not really required for outlining the land consolidation processes. The land consolidation offices consider their soil valuation as crucial activity, as this measure enables improved knowledge of the project area and this measure create confidence between the involved persons and the authority.

In Austria, land administration offices and land consolidation offices have a very good cooperation. Data exchange between the institutions is without any problems – whereat the level of satisfaction is higher from a technical than from

a legal or financial perspective⁽⁹⁾.

The professional education and training of land consolidation experts mainly is done at the University of Natural Resources and Life Science in Vienna (BOKU). Academic staff of land consolidation offices are mainly absolvents of study courses “Civil Engineering and Water Management”, “Forestry”, “Agriculture” and “Landscape Planning and Landscape Architecture”. Land surveying, remote sensing, GIS and photogrammetry is part of most of these study programs at BOKU. Additional, geodesists and lawyers are employed.

IV. New Developments and Products of Land Administration

The production of detailed, homogeneous, complete, traceable, up-to-date and easy-accessible information about land is perpetual challenge for all Austrian land administration institutions. They are required to update continuously their technologies and methods for the assessment, storage, processing and delivery of geodata. Traditionally, technology innovations in the field have always led to improved and – in response to the changing demands of land management – to new products. As outlined before, Austria always played a pioneering role in the assessment and provision of country-wide geodata. The following chapters give an overview about current developments.

IV.1 High Resolution Images and Airborne Laser Scanner Data

As mentioned above, currently orthophotos are produced in a three-year cycle based on digital aerial images with a ground sample distance of 15 cm and with four channels (blue, green, red, and near infrared). All these basic geodata are available for land consolidation projects. Within the last years, the use of the materials increased. The high quality of photographs, the possibility of 3D-views, the improved interpretation of vegetation by using the near infrared channel and the high level of automatic image processing software (orientation, generation of DTMs and orthophotos) resulted in improved (geometric and thematic) geodata for planning and decision-making. Images also can be used for visualisation purposes, which facilitate the participative processes in land consolidation projects. The use of photogrammetry is also stimulated by decreasing costs of hard- and software.

Drones (UAV – Unmanned Aerial Vehicles) can be used for small project areas or parts of it. Drones enable a high flexibility in time. High accuracies can be achieved with photo flight arrangements with a high forward lap (up to 90 percent) and a high strip lap (up to 60 percent) – also by using conventional cameras.

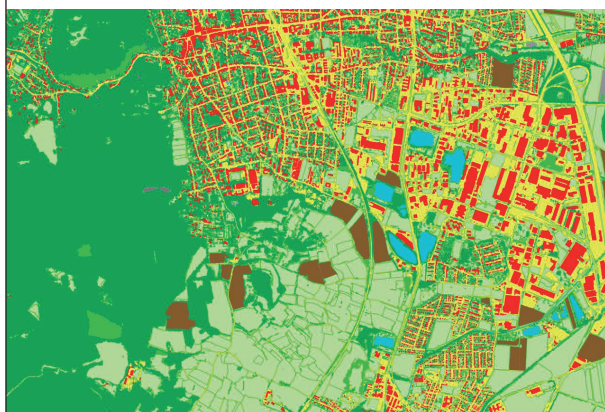
Detailed information about terrain altitudes and object heights can be derived from Airborne Laser Scanner data. Digital Terrain Models as well as Digital Surface Models with an accuracy of some cm are products of this technology. The

⁽⁷⁾ Seher (2004)

⁽⁸⁾ Mansberger et al. (2011)

⁽⁹⁾ *Ibid.*

Figure 3: Land Cover Map Vienna (detail)



Legend: red: built-up, yellow: flat sealed surfaces, bright green: herbaceous permanent, middle green: bushes, dark green: trees, blue: water, brown: herbaceous periodically, grey: permanent soil or rock

Source: LISA-GeoVille

differences between DSM and DTMs are so-called normalised Digital Surface Models, which give information about heights of vegetation and other objects on the terrain.

High-resolution satellite image complete the broad spectrum of remote sensing data for land consolidation projects. Sentinel 2 satellites deliver all five days images of almost the whole globe with a spatial resolution of 10 m and in four spectral channels. The short revisit time (5 days) enables better results for land cover classification as well as change detection.

IV.2 Land Cover and Land Use Maps

Austria has a long tradition in the systematic acquisition of land cover and land use. The first product was the Franciscan Cadastre. Since that time land cover and land use information is part of the Austrian cadastre. On a more generalized level, CORINE (Coordination of Information on the Environment) land cover is countrywide available since 1990. But both products have weak points. The cadastre information is not continuously updated and the spatial resolution of the CORINE data set with a minimal mapping unit of 25 ha is for many applications insufficient.

To overcome the lack of detailed and countrywide land cover and land use maps, the LISA (Land Information System Austria) project was launched in 2009 (financed by ASAP/ Austrian Space Applications Programme of the Austrian Research Promotion Agency/ FFG). The objective of LISA was to investigate the feasibility of a systematic, countrywide, high resolution (minimal mapping unit 50 m²) and to a large extend automatic assessment of the status and the development (change detection) of land cover and land use. In a private-public-partnership (PPP) an Austrian-wide data model for land cover and land use was developed and the feasibility of producing high quality land cover and land use maps was proofed by mapping 1.500 km² ⁽¹⁰⁾. BOKU (Institute of Surveying, Remote Sensing, and Land Information)

⁽¹⁰⁾ Stemberger et al. (2012)

was member of the LISA consortium.

The production of LISA maps was based on Austrian-wide available basic geodata (orthophotos, satellite images, airborne laser scan data, digital cadastral map) and other available geodata (e.g. zoning maps, building and apartment register, integrated administration and control system / IACS). Figure 3 documents a land cover map from the test area "Vienna".

Until today, the countrywide rollout of LISA is not implemented. In the last year, BEV started to produce high-resolution land cover map based on LISA experiences.

The cooperation of the LISA-consortium resulted in another land cover project (CadasterENV/ financed by the European Space Agency). In this case an Austrian-wide roll-out could be achieved: GeoVille, an Austrian company, produced a pixel-based land cover map with a ground resolution of 10 x 10 m² based on time series of Sentinel 2 satellite images. Additional countrywide available input data were used for the post-processing (Graph Integration Platform – road network, SRTM Digital Terrain Model and Water Cover Register). Currently the validation of the product is outlined by BOKU.

IV.3 Land Valuation

The current valuation of land in Austria is based on the unit value method. This assessment method estimates a tax measure, the "unit value", for specific economic units of the assets or for individual items. The "unit value" is used as the basis for the calculation of land tax and for other taxes and charges, such as land value charge, social insurance contribution for agricultural or forestry businesses, determination of the flat rate income tax for farmers, and other fees and administrative charges⁽¹¹⁾.

The unit values are determined by the tax office in accordance with the provisions of the Valuation Act in the form of an administrative decision for domestic real estate. Presently, in Austria there are approximately 2.32 million tax files on real properties and approximately 573.000 tax files on agricultural properties. These numbers show that a continued process for establishing real property values in the same way as hitherto would cause enormous administrative costs. This is the main reason why this procedure was not followed since 1973 ⁽¹²⁾.

Due to the discrepancy between the market value and the unit value of a real property, the Austrian Constitutional Court has deemed the different treatment of real property and other types of property (personal property) as unconstitutional. This judgement – amongst other things – led to the repeal of the inheritance and gift taxation as well as to a partial repeal of several laws, such as the initial tax rules for foundations, the Law on Court Fees and the Law on Real Property Acquisition⁽¹³⁾. OECD has recommended Austria to base property taxation on market values instead of "unit values" and to adjust such values regularly⁽¹⁴⁾.

Land administration is challenged to implement as soon

⁽¹¹⁾ Mansberger et al. (2015)

⁽¹²⁾ Leiss (2012)

⁽¹³⁾ Mansberger et al. (2015)

⁽¹⁴⁾ OECD (2010)

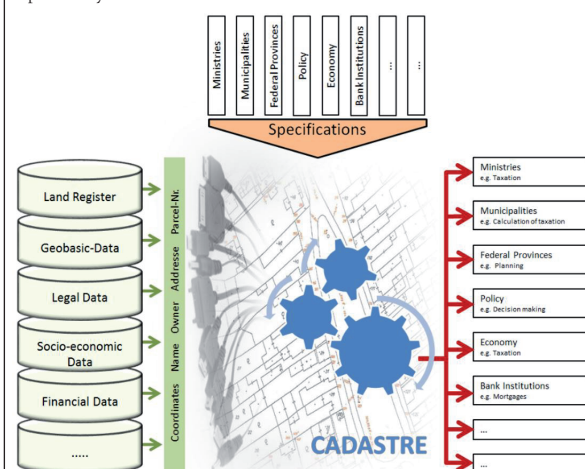
as possible a new mass appraisal system to value close-to-market values for all Austrian real estates. All the more, as the state, the economy and private institutions need information about the market value for decision-making.

Austria has numerous geodata, which are countrywide available and which are relevant for the valuation of real estates⁽¹⁵⁾. These data describe objects (real estates) physically, legally and ecologically. In addition, they give evidence about the infrastructural, demographic and economic situation of these objects. The Austrian land administration system (cadastre and land book) could play a central role for an Austrian-wide mass appraisal system of real properties. The different reference systems recorded in the cadastre, e.g. coordinates, parcel numbers, site names, addresses, enable the combination of various databases⁽¹⁶⁾. Models for calculating the “value” of a real estate can be provided purpose-orientated from the users and have to fulfil the requirements formulated by them (see Figure 4).

V. Land Consolidation between Institutionalized Support for Agriculture and Multifunctional Land Rearrangement

There is an ongoing discussion about the necessity of land consolidation as an administrative task. Land consolidation authorities were and are considerably affected by staff reduction and cutbacks in public spending. Moreover, structural changes in the farming sector lead to a decreasing number of potential beneficiaries of land consolidation schemes. In 2012 the total area where land consolidation and voluntary land exchange schemes were ever implemented amounted for 40% of the agricultural area of Austria at that time⁽¹⁷⁾. Taking into account that a considerable amount of farmland is located in the alpine area, where land consolidation is hardly required because of land fragmentation lacking, the future agricultural demand for land consolidation is on the one hand restricted to farmland in the lowlands and the hilly regions, which has not been consolidated so far due to comparably unfavourable soil qualities as well as topographic and climate conditions, and to alpine valley areas on the other hand. Will land consolidation as a public task still be required in the near future? Are its tasks, as stated in a report of a governmental reform commission, restricted to an “institutionalized support for agriculture” with no necessity to be subject to public legislation and implementation anymore⁽¹⁸⁾. This report is only focusing on the legal basis of land consolidation, which in fact restricts the leeway for a multifunctional orientation of land consolidation⁽¹⁹⁾. A more thorough discussion of the challenges of land consolidation in Austria,

Figure 4: Cadastre as the interface of a countrywide mass appraisal system



Source: Mansberger et al. (2015)

however, should go beyond the agricultural perspective and has to take into account the various land use interests concerning agricultural areas and the related demands for land use coordination.

V.1 Land Consolidation – a Service for Farming or for Sustainable Land Use Management?

Maintaining nationwide agricultural cultivation is a prominent objective of agricultural policy in Austria. Especially in areas with non-favourable agricultural cultivation conditions farming structure (in terms of plot size and configuration, land fragmentation or quality of rural road network) is a decisive criterion whether agricultural land stays in cultivation and cultural landscapes can be maintained. There is still demand for land consolidation in those regions. Nevertheless, the number of land consolidation schemes started as well as the area covered by land consolidation are decreasing⁽²⁰⁾. One reason for that is the lack of staff in the land consolidation authorities. Secondly, it is increasingly difficult for farmers interested in land consolidation to find the necessary majority of land owners to initiate a land consolidation scheme. Structural change in agriculture results in a reduction of farmers with the number of land owners in rural municipalities staying more or less the same. Land owners who lease land to farmers usually are not very interested in contributing to the costs of land consolidation schemes (a certain share of costs for land consolidation has to be covered by all the land owners involved whereas the benefits of land consolidation are with the farmers alone). In many cases especially small non-farming land owners are afraid of authorities interfering into property rights and of being overreached by the farmers. Covering the land consolidation costs by the leaseholders is one possible solution. Another option is to emphasize the advantages of land consolidation for land owners in terms of legally fixed parcel borders and

⁽¹⁵⁾ Muggenhuber et al. (2013)

⁽¹⁶⁾ Wessely et al. (2013)

⁽¹⁷⁾ BMLFUW (2013)

⁽¹⁸⁾ Aufgabenreformkommission (2001)

⁽¹⁹⁾ Amsler, Fuchs (2012)

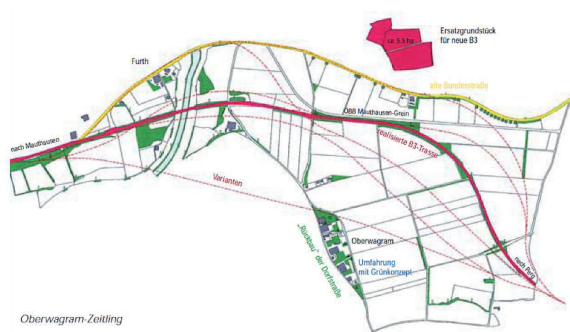
⁽²⁰⁾ BMLFUW (2013)

Figure 5: Implementation of water retention measures in a land consolidation scheme



Source: IRUB

Figure 6: Multifunctional Land Consolidation Scheme to Realise a New Road



Source: Land Consolidation Authority of Upper Austria (2005)

thus secure property rights as all the parcels integrated in a land consolidation scheme are transferred into the boundary cadastre (see section 2.1).

Legal security concerning parcel borders, however, is also important for farmers. The control system for area-based agricultural subsidies is organized in a way that secure parcel borders are beneficial for the farmers in terms of an exact recording of areas eligible for subsidies. Thus, the boundary cadastre is an incentive for initiating land consolidation schemes, also in areas where land consolidation was already carried out. In the course of student projects, it could be observed that farmers involved in land consolidation schemes are more interested to get parcels already consolidated by informal changes surveyed and thus transferred into the boundary cadastre than to realise ecological goals of land consolidation such as preserving valuable landscape elements. Land consolidation restricted to surveying the new parcel borders is not only a contradiction to the multiple objectives of land consolidation regulated by the Austrian Land Consolidation Act but as an exclusive service for farmers it also corresponds with the institutionalized farming support for which the necessity of a public task is being questioned.

Land consolidation schemes have to be regarded in the

context of the further development of agricultural landscapes in particular and of cultural landscapes in general which means that they have to pay attention to public interests as well. There are many challenges in this respect, such as the cultivation of areas important for biodiversity and landscape images, dealing with the cultivation of renewables, reduction of soil erosion, providing water retention and implementing measures that increase the resilience of farming towards expected climate change impacts. Land consolidation provides related options for land rearrangement, solution of land use conflicts and consultancy for a sustainable cultivation of farmland. This way of land consolidation has high potential to evolve towards an instrument of sustainable land use management.

V.2 Multifunctional Land Rearrangement by means of Land Consolidation

Public interests concerning farmed landscapes manifest themselves also by direct land use demands ruling out the continuation of agricultural cultivation on the area concerned. Dealing with these increasingly diverse land use demands in rural areas is, as already mentioned in section 2.2., established practice in Austrian land consolidation. Using the example of flood protection the advantages of land rearrangement by means of land consolidation and the related challenges are illustrated.

Both the EU Flood Directive (Directive 2007/60/EG) and the response of politics and administration to the extreme flood events of the last decade mark a transition from flood protection to an integrated approach of flood risk management. The latter comprises a package of different strategies and measures to reduce flood risk, which can be divided into prevention, coping and rehabilitation⁽²¹⁾. Concerning prevention besides restrictions for zoning building land in hazard areas reclamation and restoration of flood plains become more important. The call for more space for rivers is also prominently outlined in the EU Flood Directive, which emphasizes the importance of flood plain restoration. In Austria most of the flood plains are used by agriculture and forestry. Their availability for measures of flood risk management depends on agreements with the land owners concerned because there are no regulations concerning land acquisition in the Austrian Water Act.

Land acquisition for flood plains considering both public interests and land owners' expectations can be realised by means of land consolidation. The substantial strength of this procedure lies within the mobility of land. Further advantages of realising flood plain acquisition in land consolidation schemes are as follows⁽²²⁾:

- land losses are socialised and thus are rather accepted by land owners concerned,
- continuous flood plains are more likely to be realised,
- acceleration of projects by concentration of competences in land consolidation schemes,

⁽²¹⁾ BMLFUW (2006)

⁽²²⁾ Seher, Beutl (2004)

- synergies in cadastral surveying and land registration and
- awareness raising for an extensive cultivation of flood plains.

Multifunctional land consolidation, however, is strongly dependent on the availability of land required by planning authorities. Restrictions for this type of land consolidation can be expected due to increasing agricultural land use demands as a result of higher prices for agricultural products and the production of renewables. As a very likely scenario of spatial development in Austria until 2030, the Austrian Spatial Planning Conference predicts a shortage of undeveloped land because of rising demands for natural resources⁽²³⁾. This shortage can lead to a situation that acquisition of agricultural land is only affordable for particular land uses, like housing or commercial development.

The limited availability of farmland for non-farming purposes is particularly important if there is no possibility of compulsory purchase given. In order to effectively implement land acquisition for public interests (not only related to flood risk management) legal adaptations will be required which strengthen the position of the public sector in acquiring land. Land consolidation legislation should be adapted in a way that land consolidation schemes can be initiated to realise public measures as well with strategic planning (e.g. transportation planning, spatial planning or water-related planning) being the necessary basis. It is highly recommended that land consolidation authorities enforce communication about their possibilities to resolve non-agricultural land-related conflicts because multifunctional land rearrangement is highly suitable to justify land consolidation as a public task and to improve its political importance.

VI. Summary and Outlook

Land administration and land rearrangement are two important elements of land management. Both systems are affected by changing processes and both institutions have to meet a wide range of requirements. Instruments of land administration (with their modern information and communication technologies, with their improved accuracies and more detailed object descriptions, with their easy access to geodata) support land consolidation applications. Land consolidation authorities are using Geographic Information Systems, which improve the efficiency of the processes⁽²⁴⁾.

Within the last decades, a paradigm shift becomes evident in land rearrangement schemes. As demonstrated above on the example of land consolidation, the measures are not only focused to agricultural interests. Nowadays the projects are more multi-functionally orientated with the result of increased land mobility, of an improved land use management by considering involved stakeholders, and an enhanced competence to find solutions for trade-offs. Caused by the structural change in agriculture and the challenges to compensate private and public interests on land in rural areas,

the potential of land consolidation as an instrument of land use management and sustainable land development has to be strengthened in the future.

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⁽²³⁾ ÖROK (2009)

⁽²⁴⁾ Mansberger et. al (2011)

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Contact address/ Kontaktná adresa

Ass. Prof. Dipl.– Ing. Dr. Reinfried Mansberger

Department of Landscape,
Spatial and Infrastructure Sciences,
University of Natural Resources and Life Sciences
Vienna (BOKU),
Peter Jordan Straße 82, A-1190 Vienna,
email: reinfried.mansberger@boku.ac.at

Ass. Prof. Dipl.– Ing. Dr. Walter Seher

Department of Landscape,
Spatial and Infrastructure Sciences,
University of Natural Resources and Life Sciences
Vienna (BOKU),
Peter Jordan Straße 82, A-1190 Vienna,
email: walter.seher@boku.ac.at