E-Land Administration 2015 – Vision or Reality?

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Key words: *e*-land administration, *e*-government, GDI, workflow

SUMMARY

A lot of developments on the technical and the administrational sector follow some global trends. E-government and SDI-projects have been initiated and launched in most developed countries and reached different stages of implementation. These projects influence the Land administration sector because it is an essential part of these projects. Especially SDI-projects will only be successful when all players in the game follow the same rules. International Standards become an increasing importance. FIG Commission 7 supports activities for a cadastral domain model which can be a basic element of these standardised software tools.
The technical development on the sectors internet, telecommunication and e-commerce allow completely new ways and opportunities of the administration and distribution of data. E-application and *e*-conveyancing of documents will open new ways of co-operation between the public and the private sector in the area of Land Administration.

A lot of countries especially in Europe are in the middle of a renewal process of their information technology operating their land administration systems. The new object-oriented data base management systems together with their processing and presentation components will allow business re-engineering processes. Modern mobile technology together with satellite navigation systems will allow an optimised workflow from the office to the field and back.
The surveying field practice will change dramatically by transformation of existing boundary coordinates into modern reference systems like ETRS89 in Europe. Fixed control-points are not necessary any more.

These developments will influence the existing structures in cadastral offices. Higher cost-efficiency and better customer oriented services will be possible when we start working towards these objectives now. Will our profession be able to design and carry out the technical and organisational environment to meet the future requirements or will we be the losers in this game.
This paper tries to describe a vision of a modern cadastral office and its work processes in the information society of the year 2015 when Cadastre 2014 is past already.

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1. INTRODUCTION

About 80% of all information is estimated to be spatially referenced. Within all public and private decisions a spatial component is involved. Spatial data are produced on various levels with different contents and different standards. For the geodata market in Germany a volume of more than 250 mio EUR is estimated with an annual growth rate of 10-30%. The increasing number of data and functionality is a key problem for the efficiency of geodata management.

This is the reason for politically and economically driven decisions in order to establish international and national spatial data infrastructures (SDI). On the European level the INSPIRE initiative is a major factor to establish a European Spatial Data Infrastructure (ESDI). The Federal government in Germany together with the surveying authorities in the 16 states are working in the INSPIRE initiative as well as on national level to establish a national spatial data infrastructure (Geodateninfrastruktur-Deutschland GDI-DE).

At least on national level cadastral data and the topographical data sets from ATKIS® (Authoritative Topographic-Cartographic Information System) of the surveying authorities in the 16 states are identified as a basic element in GDI-DE. The German cadastral authorities are now establishing the new ALKIS®-system. This new standard will help meeting some of the major past obstacles, nation wide provision of standardised cadastral data.

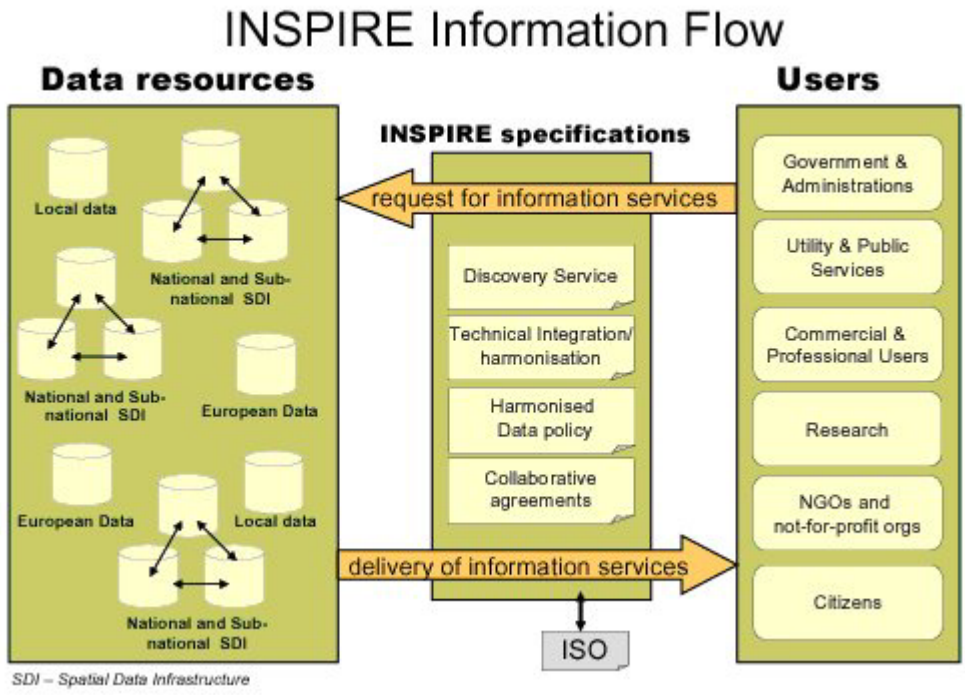
The technical development on the internet, communication and the *e*-commerce sector is opening completely new ways and opportunities of data acquisition, administration and distribution. *E*-application and *e*-conveyancing of official data will open new ways of co-operation between the public and private sector in Land Administration. This requires as well a new legal and organisational framework. The technical solutions are more or less already available. They allow to establish a new designed workflow in the cadastral authorities, but it still is a big task to maintain the data in such a way that the benefits of a complete digital workflow can be earned.

The renewal process of information technology in land administration systems is going on in Europe. Most countries are on the way to more standardised data base management systems. This development is on the right track. The surveying field practice is changing as well according to the implementation of the European Terrestrial Reference System ETRS89 in cadastre. The new European satellite navigation program GALILEO will allow better accessibility to navigation data and an even wider use of real-time-kinematic-survey systems than now.
The establishment of digital archives for the survey and other cadastral records will be another component to meet future requirements.

2. DEVELOPMENTS IN EUROPE

2.1 Inspire

INSPIRE is a legal framework being developed by the European Commission services with officials and experts in Member States and accession countries from the national, regional and local levels. It is to be implemented throughout the European Union (EU) from 2006/7 onwards with different types of geographical information gradually harmonised and integrated, resulting in a European Spatial Data Infrastructure. A key objective of INSPIRE is to make spatial data available for Community policy-making and implementation in a wide range of sectors, starting with environmental policy and later extended to other sectors such as agriculture, transport etc. (from the web page of INSPIRE http://inspire.jrc.it).



The INSPIRE Geo-Portal is Europe's Internet access point for Spatial Data and Services. It is available in the moment as an experimental prototype version under http://eu-geoportal.jrc.it/. Geographic information and cadastral data in particular can serve as a strong fundament for legal, administrative and technological structures for the entire public administration (Schennach 2003). Looking at the situation in Europe cadastral data do not play a significant role in INSPIRE. Reason may be found in the current situation in cadastre in Europe and the different legal systems in land administration that can be found. As long as there is no higher standard as now in cadastral mapping in Europe there will be no chance for cadastral data to play a significant European role.

In all GI related issues it is the cadastral data which give a guarantee for confidence, accuracy, actuality and which meet high requirements on quality. One of the main advantages that can be obtained by using cadastral data as basic information for *e*-government solutions

are mostly full coverage and permanent maintenance of the data. Cadastral data are indicators for a wide range of related information in particular and may be used for creating value-added data for *e*-government services.

2.2 Standardisation

Using common international standards is a key element in the development and establishment of SDI-projects whether on international, national, regional or even local level. Geodata servers designed to deliver data from different sources to different customers will only run smoothly under a high level of standardisation.
Since some years the International Standardisation Organisation ISO is working on standards for data base description languages. The standards are almost completed and are used for example in Germany for the description of the AFIS®-ALKIS®-ATKIS® model. The description of this model is completed. It covers the information about control points (AFIS®), cadastre (ALKIS®) and topographical data (ATKIS®).

The OpenGIS Consortium OGC is an international institution where the leading GIS and data base companies work together with governmental people, universities etc. to elaborate common features for digital mapping systems. OGC is working close together with ISO on the fields of their activities.
The result of this standardisation process will be interoperability by standardised interfaces between different GI-systems and online-access to different data bases via internet by using OpenGIS Web Services.

FIG Commission 7 works on the field of a definition of a modular standard for the cadastral domain (Lemmen 2003). The idea is to create a standard for a core cadastral data base using standardised description languages. These core data base may be used in countries all over the world as a basic tool for their digital cadastral database (DCDB). The sense behind this development is by using these models making communication of cadastral data or data access cross border for example in the EU much easier than now. Land transactions in Europe could be processed in nearly the same way with a standardised system even when the legal system is different.

2.3 GALILEO

GALILEO is the new satellite navigation system launched last year by the European Union and the European Space Agency. Since the existing US GPS satellites and the Russian GLONASS are military systems GALILEO is the first civil navigation system. GALILEO is based on a constellation of 30 satellites. The operational satellites will be put into orbit between 2006 and 2008.

More available satellites for surveying purposes will make the field work much easier and more cost effective. The network of permanent reference stations can be designed with less density which allows providing services on a more cost-effective level.

3. DEVELOPMENTS IN GERMANY

3.1 National Spatial Data Infrastructure GDI-DE and the Land Administration Sector

The Federal Government in Germany together with the surveying authorities in the 16 states are working on a national spatial data infrastructure (Geodateninfrastruktur-Deutschland GDI-DE) to meet the requirements of the users and to tackle the major problems which can be mainly found in data structures not following international standards, insufficient and inhomogeneous documentation, inconsistent licensing and pricing policy of public data providers.

To improve coordination in the field of GI, the Federal Government established in 1998 the Interministerieller Ausschuss für Geoinformationswesen (IMAGI - Interministerial Committee for Geo-information). All levels and all stakeholders collaborate in the construction of GDI-DE. GeoMIS.Bund is the newest metadata system integrating all the efforts at the federal level. This metadata system will be part of the GeoPortal.Bund which will be the main entrance for the GDI-DE and which can become part of the European SDI. With regard to the INSPIRE-geoportal the GeoPortal.Bund will be able to act as a node of it.
The SDI in Germany is well developed due to the political interest and legal framework that has been established. Collaboration between the public and private sector is a very important factor.

3.2 E-Government in Land Administration

Further political support came at the start of 2001 when the German Parliament passed a resolution to rapidly implement the German SDI and promote the interdepartmental use of GI in the public sector. It also established the coordination of GI activities by the federal government, with support by the 16 states and set about developing collaborations with the private sector and academia.
Another important step forward making the e-government initiative “Bund online 2005” operational, was the establishment of a Geodata Centre (founded already in 1996) within the Federal Agency for Cartography and Geodesy (BKG). Here still topographical data are available.

Due to the organisation of the Land Administration sector it will be a big task to make cadastral data available seamless throughout the entire country. The organisation of this sector by the German Constitution is not designed to support this customer demands. So it will remain a not realistic approach for the near future. But it should be one of the major tasks for the Surveying Authorities on all levels to agree on common standards, a common distribution channel and a common pricing policy.

4. DEVELOPMENTS IN THE LAND ADMINISTRATION SECTOR

The FIG Symposium on IT renewal strategy in European countries showed that most countries in Western Europe are facing the problems of changing their IT environment more or less at the same time in these years. All have the task that the renewal process has to take

place while 'the shops are open' which means that the migration process is not allowed to influence the normal business negatively. Besides the more technologically driven aspects the more customer driven is relevant: in most countries the strategic policy focuses more specifically on the provision of data and information not only to the public but more to the private sector. Keywords are

– Access to the information based on internet technology
– e-land administration as a part of a wider e-government and e-commerce service

New developments in data base management design follow international standards. *E*-government and GDI have to operate using standards otherwise the different components will not work together as they should do.
The first cadastral data base completely designed under ISO standards is the German Official Cadastral Information System ALKIS®.

4.1 ALKIS®

ALKIS® was presented already several times in FIG (e.g. Seifert 2002). This new approach was launched in order to harmonize the structures of the existing digital cadastral maps and the topographic database ATKIS® on the one hand and to integrate the cadastral map and the digital cadastral register into one single model which was usually separated for historical and technical reasons.

This conceptual data model is completely object based and describes geographic and non-geographic features as well as their relations (associations). In order to describe this model in a standardized way it has been based on the ISO draft standards in the field of geographic information.
Most states in Germany are on track establishing this new system during the next years. The GIS industry is now carrying out the software solutions. The front ends will use browser technology for the access to the system. This is one of the important factors to make cadastre fit for e-government and GDI.

4.2 SAPOS® and ETRS89 in German Cadastre

SAPOS® is the public service for real time and post-processing differential GPS (DGPS) applications. 250 permanent GPS reference stations have been established throughout the entire Republic with separating distances of 40 to 70 km. SAPOS® offers different services on different levels of accuracy. For cadastral purposes the High Precision Real Time Positioning Service HEPS is most relevant. HEPS allows RTK applications with an accuracy from 1 to 5 cm which is sufficient for cadastral surveys.

Earning the entire benefits of RTK survey methods is only possible when the coordinates of the cadastral boundaries are based on an appropriate reference system. In Europe this is ETRS89. The responsible body in Germany (Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany, AdV) therefore decided in 1991 to introduce this reference system for the sectors national survey and real estate

cadastre. In 1995 it confirmed this decision and established the Universal Transversal Mercator projection (UTM) as projection system.

Some states are now in the process of establishing ETRS89 in cadastre. During this process tensions inside old coordinate systems can be identified and compensated (Hawerk 2002). By establishing this system it is not necessary anymore to maintain the existing control points. This strategy allows best cost benefit relations for the establishment of the SAPOS® service.

4.3 Workflow

Together with the establishment of digital cadastral maps and registers a lot of cadastral authorities began to digitize their archives including analogue field books, survey results and other documents related to the parcels by scanning the documents and updating the necessary retrieval systems with the information where to find the digital documents related to a specific parcel.
Digital archives together with ETRS89 and boundary coordinates free of tensions in addition to well defined cadastral processes and data interfaces will allow a workflow without media breaks from the office into the field and back into the office.
The survey results can be produced according to the ALKIS® regulations as ALKIS® objects. These results will be checked in a defined qualification process and will be used automatically to update the original data base. The survey records will be stored in the digital archive carrying the digital signature of the person who is responsible for this update.

These standardised processes will allow new forms of cooperation between the private licensed surveyors and the public authorities who are responsible for the cadastral data base.
The survey methods will be changed into hybrid methods by using RTK equipment together with total stations controlled by GIS software which uses the survey equipment only as a sensor for measuring positions. The connection between the different devices will be wireless by using blue tooth technology or something adequate. The technology already exists.
This workflow will change the traditional work processes dramatically. It is estimated that compared with the traditional methods a cost reduction of approximately 25% will be possible.

5. WHAT TO DO DURING THE NEXT YEARS?

It will be one of the major future tasks for the cadastral services to meet future requirements properly. The technological problems are more or less solved. More important tasks for the next years will be to find new organisational structures not only in the public sector but as well in the working process together with the private sector in order to create an electronically processed cadastral service for the private and public customers.

It can be expected that profitable state services will be increasingly called into question by the private sector. For this reason, it has become clear that in the future models have to be developed that make a partnership-like coexistence of public and private institutions possible.
During the next few years a lot of effort has to be put into the migration process from the digital cadastral maps and registers to the new ALKIS® standard. It is the big chance for the

German cadastre to introduce a common standard not only in software and interfaces but as well in the core data sets.

Digital archiving systems were introduced in some cadastral authorities. The entire benefits can be only earned completely when all relevant documents can be accessed digital. The archives shall be opened for professionals via internet technology, so that transfer of data between the cadastral offices and the private surveyors can be improved. The legal maxim for the introduction of digital signatures exists. Only a few technical features have to be solved in the near future.

The complete introduction of ETRS89 in cadastre in combination with boundary coordinates free of tensions resulting from an old control point network are one of the big tasks in future cadastre in Germany. The introduction of ETRS89 should go hand in hand with the creation of coordinates in areas where the results of cadastral surveys are not yet transformed. The necessary procedures can be increased by using software based on intelligent transformation tools. The "real coordinates" shall be used in the mapping systems as well so that no longer coordinates in maps are used originated from digitising old not very accurate analogue maps. These activities will enable the establishment of a smooth workflow from the office to the field and back and are an important factor for a better customer service for both the private and the public sector.

6. CONCLUSION

Cadastral data are fundamental data for legal, administrative and technological structures for the entire public administration if the authorities responsible for cadastre in Germany are able to meet future requirements. But these data will only be of this importance in an e-government environment when they follow the defined standards and are available throughout the entire country. The acceptance will improve as well when the different pricing systems will be harmonised.

It is not easy to describe future developments (look at the weather forecast for the next three days), especially when technological development (experts say an internet year lasts 3 month) meets the public and especially the legal sector. This paper tried to describe necessary improvements of data and services in German cadastre during the next years. It is not an easy task due to the constitutional circumstances in Germany but we are optimistic to reach these goals.

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BIOGRAPHICAL NOTES

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