The Impact of Access Policies on the Development of Local SDIs: The Special Role of Utilities

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SUMMARY

Within the context of Spatial data infrastructures (SDI) access-to-government-data policies are important for the existence and successful use of the data, and the success of the SDI itself. Many researches have attempted to assess the success of access policies for public sector (geographic) information. Most compare the open access approach of the United States federal government with the cost recovery models in other countries, and conclude that the open access policy is more successful. Consistently, most research recommend nations to convert cost recovery policies into open access policies. The SDI hierarchy of global, regional, national, state, local and corporate SDIs, however, suggests that success of a specific policy option at one SDI level does not necessarily apply to other levels of SDIs. Therefore, although at first sight the accomplished researches provide convincing evidence for the success of the open access model at the national (or regional) level, they appear to have some deficiencies for application to the local levels of SDIs. The frequently cited researches underestimate the role cost recovery policies may have in the availability of spatial framework data at the local levels of SDI. Through an analysis of the large-scale topographic datasets in three jurisdictions in Europe and two states in the United States, this paper provides insights in the technical and non-technical characteristics of these data, and in the role private or semi-public utilities may play at the local SDI levels. The paper will show that cost recovery policies may be more beneficial for SDI development at the local levels than current research has suggested.

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1. INTRODUCTION

Within the context of a Spatial Data Infrastructure (SDI) access-to-government-data policies are important for the existence and successful use of the data, and the success of the SDI itself. Two access doctrines are dominant in the literature: open access policies and cost recovery policies. The open access approach assumes that government agencies, responsible for the collection and creation of government spatial data, are fully funded with public funds to accomplish their public tasks. Data within government are accessible for a price not exceeding the cost of reproduction and distribution, with as few as restrictions in the use as possible. Cost recovery approaches seek profits from the sale of data to support the development and maintenance of the datasets (Lopez 1998). The data collection, maintenance and dissemination are not fully provided for by public funds, and the costs must be recovered through other means. As a result, the price of government data covers the cost of creation and dissemination, and may include a return on investment. The use of the data is restricted and government may even choose to have exclusive arrangements.

Many researches have attempted to compare open access policies with the cost recovery model. Most conclude that the open access policies of the federal United States should be implemented in other countries (see Weiss and Pluijmers 2002, KPMG 2001, Pira 2000, Lopez 1998). Although at first sight the accomplished researches provide convincing evidence for the success of the open access model, they appear to have some deficiencies (see Van Loenen 2003). One of the flaws is the generalization of findings for small-scale data to large-scale data. Research of the experiences of academics in acquiring and using spatial data in the United States suggests that the policies of state and local government agencies in the US are less open than expected (Van Loenen 2002). Also the Pira study notes: “while easier access and lower prices are certainly true of federal data in the USA, it is not automatically true of the considerable volume of public sector information held by states and counties” (Pira 2000, 53). Pira further found that “the prohibition against government copyright applies only to the Federal Government. State and Local Government may copyright their own information products and some have” (Pira 2000, 100). Since state and local government are collecting large-scale data, there might be a direct link between the level of detail of the data, and the most successful access policy, not necessarily being open access. However, accomplished research on government access policy has not, or only briefly, addressed the local levels of SDI. Through an analysis of the large-scale topographic datasets in three jurisdictions in Europe and two states in the United States, this paper provides insights in the technical and non-technical characteristics of these data, and in the role private or semi-public utilities may play at the local SDI levels. Which funding model allows ready access to high-quality data, low cost spatial information that is necessary to advance SDI development? (after Lopez 1998, 97).

2. SPATIAL DATA INFRASTRUCTURE

"A Spatial Data Infrastructure is one that encompasses the policies, organizational remits, data, technologies, standards, delivery mechanisms and financial and human resources necessary to ensure that those working at the appropriate scale are not impeded in meeting their objectives" (GSDI). Rajabifard (et al., 2000) identifies a global, regional, national, state, local, and corporate level of SDI. These levels are directly related to the level of data detail necessary for satisfying the needs of those operating at the corresponding level (see Rajabifard et al., 2000). Spatial data at a large-scale, i.e. 1:500 – 1:5,000 form the local SDI level and will be used for local purposes like town planning and public work activities. Large-scale data needs a higher update frequency to be of use than small-scale data due to the frequency of, at this scale, visible changes. Generally, the larger the scale of the spatial data, the higher the costs per ha of its collection, creation and maintenance.

2.1 Objectives

Most SDI objectives focus in one way or another on the promotion of economic development, the stimulation of better government, and on fostering environmental sustainability (Masser, 1999, 75). "The principal objective for developing SDI for any political/administrative level is to achieve better outcomes for the level through improved economic, social and environmental decision–making. The role of SDI is to provide an environment in which all stakeholders, both users and producers, of spatial information can cooperate with each other in a cost-efficient and cost-effective way to better achieve organisational goals" (Rajabifard, et. al. 2002). The product – and process based SDI model may be used to explain the differences between SDI objectives. "The product-based model represents the main aim of an SDI initiative being to link existing and upcoming databases of the respective political/administrative levels of the community" (Rajabifard et al. 2002). The process-based model presents the main aim of an SDI initiative as "to provide better communication channels for the community for sharing and using data assets, instead of aiming toward the linkage of available databases" (Rajabifard et al. 2002). He continues with "The local and state levels of an SDI hierarchy are producing data and [ ] are thus forming data belonging to higher levels of an SDI hierarchy". Both levels are recommended to take product-based approaches "due to their key roles in data development" (Rajabifard et al. 2002). The objectives of an local SDI are made operational in (1) to provide users at the local level the spatial information they need efficiently, (2) in a way needed by these users, and (3) to allow the efficient use of locally collected and created data for the higher levels of SDI.

2.2 Framework Data at the Local Level

Framework data are data that are commonly used as a base dataset upon which other data can be placed (Phillips et al, 1999), or a sufficient reference for most other geo-located data (Luzet, 2000). What should be considered a spatial framework dataset depends on the needs of a community at a particular time. Onsrud (1998) provides an overview of a wide variety of core layers used among different national and regional initiatives. Among the most frequently mentioned datasets are topography (elevation), cadastral data, geodetic control, and government/ administrative boundaries. Among the typical framework datasets at the local SDI levels are cadastral data and topographic data.

2.3 Users of Large-scale Spatial Data

INSPIRE (2002,12) identifies six groups of users: (1) government and administrations, (2) utility and public services, (3) commercial and professional users, (4) research, (5) NGOs and not-for-profit organizations, and (6) citizens (see also Micus 2003, 39). Each of these groups may need large-scale spatial data. Primary users of large-scale data are local government and utilities. Micus (2003, 50-62) found for the private commercial sector a need for facility management, (in-car) navigation, geo- (micro-) marketing, and location based services. The other groups may have project-based needs for large-scale spatial data.

3. SDI DEMANDS FOR LARGE-SCALE FRAMEWORK DATA

3.1 Requirements for Framework Data: Technical Requirements

The quality of a dataset may also be decisive for its use. Quality of data may be defined as: the level of truthful and objective representation of reality necessary for satisfying user tasks. The costs of spatial data collection and maintenance rely on the requirements of the quality of the data, among other aspects. Quality may be decided for by the integrity, accuracy, completeness (comprehensiveness, currency), correctness (e.g. topological relations or representation of reality), standards and format (compatibility). Other aspects directly linked to the quality of the data are the quality of the software and hardware processing the data.

The objective of a local SDI and user needs for large-scale data (see for example Micus 2003, 8, 24, 42, 45) provided, the SDI demands from large-scale framework datasets ubiquitous coverage of a jurisdiction, the inclusion of all attributes deemed necessary, accurate and current data (at the very most two years old in dynamic areas), and consistency throughout the dataset. Further, “in order to function as a foundation framework datasets should have guaranteed qualities, and central control over these qualities should exist” (Philips et al. 1999).

In order to integrate heterogeneous datasets easily into one ubiquitous dataset or to be interoperable both with higher levels of the SDI and other datasets at the local level, the local datasets need jurisdiction-wide uniform quality, a harmonized data model, open data format, similar currency and update frequency, and clearly demarcated coverage area.

3.2 Requirements for Framework Data: Non-technical Requirements

Non-technical characteristics are characteristics that do not directly relate to the technical functionality of the dataset, but to the legal, financial, physical, and intellectual accessibility of the dataset (see Bovens 1999). These aspects are important for the user to be able or to decide to use a specific dataset, or to seek alternatives.

Legal access relates to legislation that provides means to enforce access to data (e.g. freedom of information legislation) or to restrict its use (privacy legislation, intellectual property legislation, contracts and licenses). Legal access provides the bandwidth of the potential uses. For example, privacy legislation is likely to hamper the economic value of a spatial dataset. Lack of privacy protection would allow the provision of datasets that are commercially very attractive (see Ravi 2000, 24), but limit the privacy of individuals.

Financial accessibility concerns the balance between price and potential benefits resulting from using the data. If the expected benefits are outweighing the costs, then it is likely that the dataset will be used. If, however, the costs for acquiring and using the dataset are outweighing the potential benefits then it is likely that the dataset will not be bought and used. Alternatives will then be searched. Although users may require the highest quality for the lowest price several researches found that a maximum price for government information of the marginal cost of dissemination promotes use and economic development (e.g., Pira 2000).

Physical access concerns the ease to find, access and use data. Users require transparency of available data (see Ravi 2000, 13), their qualities (metadata), but also of prices and use restrictions. Moreover, users require consistency in the access policies throughout government (see KPMG 2001, 16, Ravi 2000, 11, Pira 2000, 76). The publication of a dataset in a clearinghouse (see Micus 2003) and adequate standardized documentation (metadata) (see Van Loenen and Onsrud 2004, Longley 1999, 175) are likely to satisfy the transparency requirements. In order to disseminate public information in an effective, and economical manner sufficient and appropriate hard- and software programs, standards to communicate between suppliers and requesters of data are required. Further, data online accessible are likely to promote their use, while data behind bureaucratic doors are not. Especially the existence of a one-stop-shop concept may be beneficial. The user does not have to contact each one of the many organizations (see also Micus 2003, 9) and is likely to be confronted with one policy.

Finally, a dataset may acquire extra value when the use is supported. Optional services may be an available help desk for technical assistance, the notification of updates, an online manual, help for the interpretation of the data, free software, courses on spatial data use, etc.

4. FIVE CASE STUDIES OF LARGE SCALE TOPOGRAPHIC DATA

4.1 Introduction

This research has used a case study approach in order to compare the impact of different access policies on the local levels of SDI. The research compared similar jurisdictions with regard to socio-economic development, system of government, and geography (size of the country/ population density). The Networked Readiness Index 2003-04, the Human Development Report 2003, and the Worldfactbook were used to come to a first draft. Further, the cases were selected based on maximum variance in their access policy for public sector geographic information. Five jurisdictions were selected: the Netherlands, Denmark, North-

Rhine-Westphalia (Germany), Massachusetts (U.S.) and the Metropolitan Region of Minneapolis and St. Paul (U.S.). The research focused on cadastral and large-scale topographic data. Here only the research results for the latter are provided. Since population density of a system is directly linked to the level of spatial detail necessary for the maintenance and development of the system, we assumed that each of the cases had similar needs for topographic data, and consequently expected to find similar quality of data.

A topographic dataset may be defined as: a dataset showing "the configuration of a surface and the relations among its man-made and natural features" (http://www.cogsci.princeton.edu/cgi-bin/webwn?stage=1&word=topography). For example, the following data are considered topography: edge of pavement (street, freeway, bicycle path, etc), road center line, street furniture, trees, buildings, fences, waterways, railways, land use, and special objects: swimming pools, playground. Topographic data in this study may be commonly referred to as planimetric data in U.S. terminology.

4.2 Research Findings for 5 Cases

4.2.1 The Netherlands: Large-scale base map of the Netherlands

The Netherlands covers 41,000 km^2 with a population density of 420 people per km^2. The Netherlands consists of 12 provinces, and almost 500 municipalities. The formal coordination of the SDI has been divided between the coordinating minister and the Ravi, between which a formal agreement existed until 2002. The objective of the SDI has been "to ensure the widest possible access for members of our society to communication media and the rich divers information sources". The Grootschalige Basiskaart Nederland (GBKN) has the large-scale topography of the Netherlands.

The National Joint Venture of the Large Scale Base Map ('Landelijk Samenwerkingsverband GBKN'), together with 25 'self-registering' municipalities are responsible for large-scale topographic mapping. In the LSV board the Cadastre, KPN Telecom, umbrella organisations for municipalities, for utility companies (energy and water supply) and the Union of Water Boards are represented. 10 Regional Joint Ventures and more than 50 municipalities are responsible for the dataset in their territory (Murre, 2002).

The GBKN covers the Netherlands entirely. Detailed is defined as a scale of 1:500 or 1:1.000 in suburban areas and 1:2.000 in rural areas. The core dataset contains hard topography (buildings, constructions, paved roads), soft topography (waterways, most topographic boundaries as hedges, fences, etc.) and semantic information (street names, house numbers, names of waterways, etc.) (Murre 2002). There are municipality datasets with more comprehensive content. The positional accuracy is 5 cm in the south of the Netherlands and the large cities for hard topography, to 20-40cm in the rural areas for soft topography. The currency is one year in the urban areas, and two years in the rural areas. The dataset has a line (spaghetti) structure. The exchange format and data model are based on national open format (NEN1878) and standard (NEN 3610).

Access to the dataset cannot be enforced through a freedom of information act request. Copyright and database rights are claimed. A contract providing for a use right for the GBKN must be signed prior to being able to use the dataset. The contract arranges for notification of the GBKN organization as source of the data. No redistribution is allowed without permission. The use conditions are uniform throughout the Netherlands. Privacy is no issue in the use of the dataset and liability is being waived.

The complete dataset can be bought for €1 – 2 million. Viewing data can be unlimited for €150,000 per year. For smaller areas there are separate fees for rural, urban and infrastructural datasets. The different joint ventures and 'self-registering' municipalities may have different prices.

Data can be ordered online. Data can be selected on the web through a user friendly device (e.g., draw a polygon). Since 2004, online webbased access through a viewer is available. For access to the complete GBKN one has to contact the national contact point. For multiple regions request, one will be directed to one of the 4 most appropriate regional organization responsible for the distribution of multiple regional requests. Other requests are directed to one of the 35 regional organizations. The GBKN is not publish in the Dutch clearinghouse. Core metadata is available. No metadata standard is used and it is only available in Dutch.

Major users are municipalities, utilities, waterboards and cadastre. 'Private users' such as architects, and urban area developers also use the dataset (Murre, 2002). However, due to its price the complete GBKN is not used by the commercial sector and value adding services based on the GBKN are non-existent. The new GBKN webmapping service may promote value adding services.

Currently, the GBKN is not uniform with respect to the structure and content specification, the process of updating, and selling and distribution/dissemination. Especially where regional areas are adjacent there may be overlaps of data, or data may not fully fit. In 2000 and 2001 guidelines were provided to uniform the structure, content specification and the organisational structure for updating the GBKN (Murre 2002).

Further, there is discussion about upgrading the GBKN to an object-oriented dataset. However, the utilities only use the data for viewing and referencing their own data to the topography and do not require object-orientation. The GBKN may become an Authentic Registration, which will make it the preferred source for government for large-scale topography with guaranteed qualities and a single access policy.

4.2.2 North-Rhine-Westphalia: Automatisierten Liegenschaftskarte (ALK)

North-Rhine-Westphalia (NRW) is one of the 16 states of the Federal republic Germany. NRW consists of 34,060 km^2 and a population density of 470 people per km^2. Coordination of the SDI is in the Centre for Geo-information (CeGI), a public private partnership. The overall goal of GDI.NRW is to enable the geoinformation market and to enhance the access to geoinformation (www.cegi.de). Large-scale topography is included in the Automated

Liegenschaftskarte (ALK). The collection of ALK is decentralised in the Cadastres of 54 counties and county free cities. Generally the scale of ALK is 1:1,000.

ALK has a positional horizontal accuracy of generally 0,2 – 0,3 m. It has a currency of less than 2 years, it is object-oriented, has a seal of authority, aligns with parcel data, and the structure of the standard exchange format EDBS is published. Further, the data collection and creation of ALK is anchored in legislation, guaranteeing to a great extent the existence, availability and quality of the dataset. ALK contains parcel boundaries and numbers, boundaries of districts, survey control points, outlines of houses and buildings, house numbers, street names, results from official soil assessment, type of land use and topographic details like kerbs, cycle tracks, etc. (Hawerk 1995, 19). Together, the datasets of the 54 Cadastres cover NRW entirely. However, at the Land level the harmonized ALK dataset has only 80% digital coverage.

"ALK is accessible to the general public in accordance to the rights of protection of individual interests (privacy). Person-related information can be provided to users with a special interest, e.g., in buying a parcel. Not person related data is accessible to all without any restrictions" (Hawerk, 1995, 18). Currently, the cadastral law is being renewed. One of the goals is to open access to the cadastral map without any privacy restrictions. All Cadastres claim copyright in their data. Users of public geographic data are granted a "limited use right". Copying and processing ALK for internal use are permitted, re-distribution of ALK only with permission of the concerned organization.

The standard ALK would cost for more than 200 ha €1 per ha. ALK data with full coverage of NRW would cost approximately €3,400,000. In certain parts of NRW local government cooperates through 'Rahmenvertrage' with utilities. The utilities finance the creation and maintenance of ALK, and can use the data freely (Micus 2003, 42).

Since 2003, the NRW clearinghouse (www.geocatalog.de) exists. However, only ALK data from 4 Katasters was found here (01 December 2004). Data can not be downloaded, and administrative procedures need to be fulfilled to acquire the data. The independent 54 cities/counties need to be contacted to obtain data concerning the data of one specific jurisdiction. The Geodatenzentrum, which is placed within the Landesvermessungsamt will be formally embedded in the new legislation and will take care of cross-county data requests. Metadata documentation varies heavily throughout NRW and in many instances no metadata is documented.

Use of the ALK is primarily in the public sector and utilities. Not one user could afford to buy the ALK for entire NRW due to the high price.

In 2005, Micus' findings of 2001 are still valid: the incomplete availability, currency of data, the lack of transparency, and the high price and restrictive use rights have for most customers a frightening effect (Micus 2001, 13). In addition, decentralized responsibility of the ALK has resulted in incompatible datasets due to non-uniform quality, differences in currency, overlaps between datasets, and different exchange formats (see also Riecken 2001). Further, the insufficient level of standardisation of geodata (see Brox et al. 2002) is a sufficient obstacle for the extensive and easy use of data. Finally, potential users lack sufficient knowledge about the scope, quality, currency and availability of core and user-specific geodata. If such metadata were available, duplicate surveys could be avoided and the use of the data intensified (Riecken 2001). These issues are addressed in GEOBASIS.NRW and the solution is expected to be incorporated in the German-wide uniform ALKIS system. The challenge over overcoming the institutional barriers is further acknowledged at all levels and significant progress has been made to include the international concepts of an SDI into the GDI.NRW.

4.2.3 Denmark: Technical Korte (TK)

Denmark consists of 43,094 km^2 with an average population density of 123 persons per km^2. The public "Service Board for Geodata" is responsible for the coordination. The general goal of the vision is the free flow of information through all levels of government (Brande 2003).

Municipalities, often together with the utility companies, finance large-scale topographic mapping. Utility companies own about 15 % of the datasets. Digital large-scale datasets are available in scales from 1:1,000 (towns and built-up areas) to 1:25,000 (rural areas). The creation is not required by law or in other ways regulated. Technical map series exists of TK1, 2, and 3. TK3 is the most detailed one used in urban areas. TK3, 2 and 1 have a positional horizontal accuracy of <10, 25 and 80 cm respectively. TK1 includes buildings, house numbers, street names, place names, forest areas, urban areas, fences, land use descriptions, (small) lakes, and street centre lines (www.kortcenter.dk). TK2 and TK3 have full roads and waterways, and more detailed buildings. All datasets have the address theme included. TK3 includes a link through cadastral identifiers to the cadastral map. Update frequency varies between 1 and 5 years. The technical maps adhere to the Dansk Selskab for Fotogrammetri og Landmåling et Forslag (DSFL) standard. Together, the datasets cover Denmark completely. However, they do not form a homogenous nationwide product. The quality varies from area to area, not all of the datasets are conformant to the latest version of the DSFL standard, and some of the datasets are "spaghetti" maps.

The large-scale topography is not subject to the freedom of information act or any other access legislation. Copyright is claimed by the municipalities and utility companies, and use is restricted to one's own purposes but redistribution is prohibited. Privacy legislation does not limit the use of the datasets.

Using the cost of 85 DKK (€11) per ha (incl. VAT) for urban areas (total of 250,376 ha) and 5 DKK (€0,65) per ha (incl. VAT) for rural areas (total of 2,023,818 ha) (www.kortcenter.dk), the price of the technical data of Denmark would be over 40 million DKK (€5,200,000). The price of 12,5% of the updating cost would result in an annual 5 million DKK (€ 650,000) for updates.

Denmark has a wide variety of online selling points including the metadata service Geodata-info.dk. However, a single point of access for the complete technical korte is lacking. The utility NGMN is the intermediary for suppliers in Jutland for re-use by the private sector, and others. Other municipalities also sell data by themselves. In North Zealand, for example, one has to contact each of the 43 large-scale data suppliers individually. Metadata documentation is often very incomplete, and not published. A user needs to make a specific request in order to obtain a copy or access the dataset. Users need to identify themselves and explain their intended use prior to being allowed to access the dataset.

Typical users are professional users in technical or administrative public sector. Other important users of the TKs are the utiltities. Users are barely found in the social/ health sector or private financial sector (Brande 2002). Secondary users are architects, engineers, contractors, and chartered surveyors (Brande 2002). Restrictions of many kinds (formats, data structure, skills, organizational etc.) have impeded the use of spatial data on a broader scale. Few products that are based on technical data were found, aside from the products created by the owner(s). This may be because of the, at a national level, heterogeneity of the data, its price and restrictive use conditions.

In Denmark, coordination at the local SDI level is lacking. This has resulted in duplicate data collection and often incompatible large-scale topographic datasets.

4.2.4 Massachusetts (U.S.)

Massachusetts is one of the 50 states of the United States. It has three levels of administration: the Commonwealth, 14 counties and 351 local communities (cities and towns). Massachusetts consists of an area of 20,300 km2 and has a population density of 320 per km^2.

Legislation has established MassGIS as the official state agency assigned to the collection, storage and dissemination of geographic data. Among it tasks are "(a) fostering cooperation among local, state, regional and federal government agencies, academic institutions and the private sector in order to improve the quality, access, cost-effectiveness and utility of geographical and environmental information as a strategic resource for the state; and (b) coordinating data sharing and executing data sharing agreements among all levels of government and private users".

The collection of large scale topography is not the legislated tasks of a public sector entity. The private and (semi-) public utilities, however, have made substantial investments in large-scale topography. In a few instances local communities collaborated with a utility and in a very few instances they have had their own planimetric project. There is, however, no consistent uniform planimetric dataset for Massachusetts available. Content (limited-comprehensive), exchange format, positional accuracy (50cm – 3m), currency (from 1995 – 2003), and availability (not – against use restrictions) varies from dataset to dataset. The utility companies that are in large-scale topographic mapping have a service area that only covers Massachusetts in part.

State, municipal, and county government have to comply with the provisions of the Massachusetts Public Records Law. Access to government information must be provided on request. Although it is not prohibited local governments and state agencies do generally not copyright data. Utilities, however, are under no obligation to give their data to anyone. Access to their data cannot be enforced through a request through the public records act. Utilities control the use of their data through copyright and additional use restrictions. Generally, data is provided under the condition of non-disclosure. Privacy law does not apply to large-scale topographic data.

Financial access to large-scale topographic data is heterogeneous. For copies of government data a reasonable fee to recover the costs of complying with a public records request may be assessed. Local government generally provides access to their data for a price covering the cost of the provision of the data, i.e. $50-$100 per CD. However, for many large-scale topographic data the public records act is not available. One utility has provided its data to local government for a symbolic 1 dollar, others charge per ha 40% of the collection cost. A dataset in this instance would cost $20,000 for the typical sized town (<170 km^2).

The central point for access to geographic data in Massachusetts is the MassGIS' website (http://www.state.ma.us/mgis/maps.htm/). Data from the utilities are not published here. Many Massachusetts cities and towns have online GIS datasets available. These data are, however, not downloadable. The exception is data available from the Boston Atlas (http://www.mapjunction.com/places/Boston_BRA/). Metadata documentation varies throughout government agencies in Massachusetts from excellent to not documented. Metadata in the utilities' data is poor.

Local government and utilities use the planimetric data. The research did not find private sector value added products based on planimetric data. For planimetric data government relies heavily on the datasets collected by the (private) utilities. Some towns use data collected in 1991, or 1995 as their core planimetric dataset, just because they were unable to collect these data themselves. Several local communities have checked their old data with the more recent and freely downloadable 2001 color 1:5,000 imagery from MassGIS.

Although local government and utilities have similar needs for base mapping, their cooperation has been limited. Also cooperation between local governments for the collection of planimetrics has not been found. Due to limited resources MassGIS' focus has been on the needs of state agencies, and not so much on satisfying local government needs. The research found evidence that for several areas more than one planimetric dataset exists, indicating duplicate efforts.

4.2.5 Metropolitan region of Minneapolis and St. Paul (MetroGIS)

Minnesota is one of the 50 states of the United States. Within Minnesota Metropolitan Council has jurisdiction over the Metropolitan area, which covers an total area of 7,600 km^2 with a population density of 355 per km^2. The area consists of 191 cities and townships, 59 school districts, 7 counties, and 39 watershed districts. The coordination of the Metropolitan

SDI is in MetroGIS. MetroGIS relies on an informal voluntary structure for participants. The mission of MetroGIS is to provide an ongoing, stakeholder-governed, metro-wide mechanism through which participants easily and equitably share geographically referenced data that are accurate, current, secure, of common benefit and readily usable. Planimetric data are not among MetroGIS priorities. There is no legal obligation for anyone including government to collect, process and manage planimetric data. Consequently a wide variety of structures can be found that have created planimetric datasets. The originator of the planimetrics varies from public (partnerships), to public private partnerships (county-utility), to private.

In several Metropolitan counties planimetric data is unavailable. Only three counties have full planimetric coverage. In other counties the planimetrics may be available for individual towns or cities. Scale of the existing county datasets is generally 1:2,400 (urban) – 1:12,000 (rural). The content of the counties' planimetric dataset is comprehensive. Positional accuracy varies from 15 cm in one dataset to 65 – 3m in another. Average update frequency is approximately 3 years. Dataset is line oriented with for some objects polygons. There is no alignment with the parcel dataset.

Data classified as public data must be provided upon request. Large-scale topographic data, however, are classified as public data with a commercial value, and are copyrighted, and a license is necessary for their use. None of these data can be redistributed to a third-party. Privacy legislation does not limit the use of large-scale spatial data. Liability is being waived. Counties provide access to their data on a cost recovery basis. The prices of Dakota county may be exemplary. Planimetric data of urban areas costs $550/sq. mile (= €1,60 /ha) and of rural areas €$20/sq. mile (= €0,06/ ha). The complete dataset would cost $29,000 (€22,000), and subscription to annual updates approximately $7,000 (€5,300) per year. Other counties are free to have different fees.

DataFinder is the MetroGIS clearinghouse (www.datafinder.org). Datafinder provides access to planimetric datasets of three out of seven counties. The data from the cities, towns, or utilities are not available through Datafinder. Each of the counties needs to be contacted separately. However, in several counties planimetric data is not existing or available. Individual cities and towns may then be contacted. The user group in Ramsey County has a website where the data can be seen and queried (see http://maps.metro-inet.us/). Government agencies shall keep records containing government data in such an arrangement and condition as to make them easily accessible for convenient use. The metadata varies from dataset to dataset. The metadata uses the state standard MGMG as far as metadata is available.

The use of the planimetric data is primarily in government organisations and utilities. Some utilities bought the dataset and are maintaining it themselves, others have a partnership with county government.

Although several counties went into public private or public public partnerships, coordination at the MetroGIS level is lacking for planimetric layer. For planimetric data, there is a perception of data duplication.

4.3 Summary of Case-study Findings

The information provided above is summarized in table 1. In all cases the utilities have a role in the large-scale topographic data collection. The access policy for these data is in all instances restrictive. Adherence to the section 3.1 provided technical SDI requirements is in most instances limited, and (type of) use is comparable between the researched jurisdictions.

Case / Criteria	NL	NRW	DK	Mass	Metro
Access policy for public sector geographic information	Restrictive	Very restrictive	Restrictive	Open	Restrictive
Data collection	Local and provincial government, utilities, cadaster, and water boards	Cadasters (with utilities)	Local government with utilities	Utilities (with local government)	Local government (with utilities)
Access policy for large scale topographic data	Restrictive	Very restrictive	Restrictive	Restrictive	Restrictive
Technical and non technical SDI requirement fullfilment	+/-	+/- -	+/- -	-	-
Use	Limited to primary stakeholders	Limited to primary stakeholders	Limited to primary stakeholders	Limited to primary stakeholders	Limited to primary stakeholders
Value added products	None-few	None-few	None-few	None-few	None-few

Table 1: Summary of case study findings

5. CONCLUSION

The extent of awareness of the value of spatial data for society may be decisive for the choice of the most appropriate funding model for government spatial data provision. However, at the local levels the costs for spatial data collection are such that in many instances government can only satisfy its spatial needs through cooperation with other parties. The five case studies show that there may be a special role for the private sector in meeting SDI objectives. Especially utilities may play a critical role in the collection, creation and maintenance of large-scale topographic data. They are not only a major user of quality large-scale topographic datasets, in four of the five researched cases utilities are also important for the collection of large-scale topography. Through public private partnerships, or without the help of government they supported the SDI through collecting, creating and maintaining the digital large-scale topographic data. In a PPP there was a win-win situation to share the high cost of collection and maintenance, while all members could use the data. In all case-studies the utilities are, however, privatized or semi-public entities. Partly due to competition with other utilities, utilities do not provide the created topographic data to others, unless use restrictions are agreed upon and a price has been paid. Not necessarily they would like to generate high volumes of sales but certainly do not want others to free ride on their investments. In this way cost recovery policies may lead to the availability of large-scale data whereas they otherwise may not have been available at all.

The case study research has further resulted in new knowledge concerning access policies applied to large-scale topographic data. Although US information policy at the Federal level may be summarized as "a strong freedom of information law, no government copyright, fees limited to recouping the cost of dissemination, and no restrictions on reuse" (Weiss and Backlund 1996), this research confirms that it does not necessarily apply to large scale topographic data existing in the U.S.. Due to the involvement of private utilities, none of the researched datasets adhered to the open access principles. However, price and use restrictions are considered in all instances causes for the limited use of the datasets.

In the researched cases large-scale topographic data does not satisfy the technical and non-technical SDI/ user requirements. Consequently the structural use of all researched datasets is limited to the primary users of the data, often also the collector of the data. Further, it is surprising that topographic data is not existing or not available for several parts of the two U.S. cases.

An example for a, from an SDI perspective, beneficial access policy for large-scale topographic datasets collected through public-private partnerships may be in the U.S. Federal Technology Transfer Act (FTTA) which allows the public sector to withhold datasets produced together with private companies for five years from the public domain. The feasibility for application of such a policy at the local level needs further investigation.

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BIOGRAPHICAL NOTES

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