Spatial Data Infrastructure and the Environment of Urban Areas

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SUMMARY

Spatial information has become indispensable for numerous aspects of urban and rural development, planning and management. The increasing importance of spatial information has been due to recent strides in spatial data capture (especially satellite remote sensing), management (utilizing GIS and database tools) and access (witness the growth in web mapping), as well as the development of analytical techniques such as high resolution mapping of urban environments. A key factor for success will be utilisation of spatial information and technologies to support management of key problems such as disaster management, flooding control, environmental management, health and transportation. The concept of spatial data infrastructures (SDI) has been developed to encompass the efficient and effective collation, management, access and use of spatial data.

The rapid growth of urban areas causes severe social, economical and ecological problems. New tools, techniques and policies are required to baseline and integrate the social, economic and environmental factors associated with large urban areas, to monitor growth and change across the area and to forecast areas of risk. This will lead to more proactive urban planning and environmental management.

The paper summarizes the results of FIG Commission 3 working group WG3.2 'Using Spatial Data Infrastructures to Manage Cities' obtained so far to identify relevant spatial tools that will support development and use of spatial data infrastructure (SDI) by city authorities in the world's largest cities.

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1. INTRODUCTION

Both rural and urban areas are facing social, economical and ecological problems. Occurring problems, however, are different in detail, because the process of urbanization goes along with its own rules.

City administrations of large cities often are confronted with a multitude of key problems, like informal settlements (land tenure, development approvals, building control), traffic management, natural hazards (floods, earthquakes, fires), unclear responsibilities and mandates (within or between administrations), uncoordinated planning, water management (fresh water supply and waste-water disposal), provision of continuous electrical power, visual pollution and garbage disposal, air and water pollution control. To manage such problems adequately, urban governance urgently needs comprehensive, reliable and easy accessible spatial data, in other words, a well-functioning spatial data infrastructure (SDI).

FIG Commission 3 has set up a working group (WG3.2) to identify relevant spatial tools that will support development and use of spatial data infrastructure (SDI) by city authorities in the world's largest cities. The aim of the working group is to

- Support discussion on the role of local and regional SDI in managing mega cities
- Identify institutional, policy and legal frameworks that can be incorporated in SDI to address mega city issues
- Identify specific technical innovations in spatial information management (SIM) that can improve management of mega cities

The working group has adopted a pragmatic approach, based on working with administrations in mega cities (populations greater than 10 million) to identify key problems they face both now and in the future; use an international network of experienced spatial information practitioners to identify potential solutions; and then develop materials that provide a practical guide to international best practice in the use of SDI to better manage our cities. Commission 3 plans to provide a major report on its findings at the FIG Congress in Sydney in 2010.

2. KEY PROBLEMS OF URBAN AREAS

2.1 Survey amongst city administrations

The working group developed a questionnaire about current problems facing mega cities and their current use of SDI. The questionnaire was distributed in early 2008 to contacts in 13 mega cities. A number of city administrations responded to the questionnaire. Also, the

working group facilitated fact-finding visits to interview senior administrators in a further three cities.

In all, initial data was obtained from 7 cities either by their direct response to the questionnaire (Q) or by a personal visit and interviews by working group members (V), see Table 1.

Table 1 Key Problems Facing City Administrations

Problem	***Hong Kong SAR*** **(Q)** ***China***	***Tokyo*** **(Q)** ***Japan***	***Seoul*** **(Q)** ***Korea***	***Istanbul*** **(V)** ***Turkey***	***London*** **(V)** ***United Kingdom***	***New York City*** **(V)** ***USA***	***Lagos*** **(Q)** ***Nigeria***
Informal settlements (land tenure, development approvals, building control)	N	Y	N	Y	N	N	Y/High
Traffic management	Y/Med	Y	Y	Y	Y	N	Y/High
Natural hazards (floods, earthquakes, fires)	N	Y	Y	Y	Y	Y	Y/High
Unclear responsibilities and mandates (within or between administrations)	N	N	N	N	N	N	Y/High
Uncoordinated planning	N	N	-	N	N	N	Y/High
Water management (fresh water supply and waste-water disposal)	Y/Med	Y	N	Y	N	N	Y/High
Provision of continuous electrical power	N	Y	N	N	N	N	Y/High
Visual pollution and garbage disposal	Y/Med	Y	N	N	N	Y	Y/High
Air and water pollution control	Y/Med	Y	Y	N	Y	Y	Y/High
Population growth	-	-	-	Y	Y	-	-

2.2 Interpretation of survey results

Informal settlements are a problem in only some cities. Further research may indicate that it is a problem mainly in countries where development controls and tenure systems are immature and land administration capacity is low. A particular problem reported by one city is development being allowed in water catchment areas used by the city, but not under development control of city planning authorities. Some of the experience with planning and development laws, regulations, procedures and systems used in some of the cities may be useful to others.

Traffic management is a common problem. City transport and police agencies were not part of the initial information gathering. Given the commonality of the problem, this may be an area for further study.

Natural hazards and emergency management were high on most cities' lists. Risk profiles from floods, fires, earthquakes and other hazards differ between cities, but capacity to plan, prepare, respond and recover from disasters is a common issue.

It appears that unclear responsibilities and mandates (within or between administrations) is not a major issue for most cities. However, all cities appear to have problems with overlapping responsibilities amongst internal and external agencies, leading to operational dysfunction such as a multitude of agencies holding non-accessible spatial data. It is clear that solutions to problems facing mega cities require concerted response from many internal units and regional and national agencies in areas such as planning, infrastructure, development and land use controls, transportation, environmental management and water management. Mandates might be clear, but rationalisation of functions and more effective levels of cooperation may still be needed.

It seems that in many mega cities, the city administration does not have responsibility for all matters covering the full area of the city. Several cities reported that their city administration did not have control over development, but rather it was the responsibility of local government units (an average appears to be around 30 municipal authorities within the area of the "greater city"). In some cases, other levels of government had land use and development control responsibilities. So, even if city planning is centrally coordinated, often city administrations have little control over the implementation (i.e. land use and building controls) of these plans. In short, some city administrations have control over key city development functions; others do not.

The influence of megacities reaches out well outside their administrative boundaries to the peri-urban and regions beyond. It is essential that the greater region is managed holistically to maximise the economic benefits of the city. This places even greater emphasis on effective governance of the larger region, cooperation in planning and development control and sharing information.

Another area for further study may be the role of infrastructure providers, such as utility services, not being part of the planning and development process. In many cases, these authorities are not part of the city administration, being privatised or at another level of government.

Environmental management, especially pollution control is another problem area reported by several cities. Again, the experience of some cities in managing environmental problems may be useful to others.

The inevitability of further population growth is likely to be a common issue. Some cities reported that their administrations have little control on population growth. It was a regional or national issue and needed to be addressed at that level. However, city administrations need to address the consequences of growth, which will add further stress to existing systems and facilities, even for those cities not experiencing problems at the moment. Just finding enough housing for people will be a common problem. Monitoring population change effectively and being able to respond through planning and infrastructure development will be major challenges.

3. CURRENT USE OF SDI

3.1 Spatial Information Management in the world's largest cities

This section presents the results of an internet investigation, collecting information about current use of SDI in the world's largest metropolitan areas. A short overview of general NSDI development for all countries of the world holding at least one mega city will be provided as will be the use of SDI or comparable initiatives in the associated metropolitan areas. Leaving legislative and organisational SDI aspects aside, the evaluation focuses on the technical aspects of the use of spatial information technology in mega city management. The classification of the results is done on the basis of usability and accessibility of spatial data which was identified by the internet search.

Like in the home countries of the mega cities, the application of spatial information technology in the mega cities of the world is largely diverse. Table 2 shows the availability of digital spatial data in the mega cities under review. The application of spatial information technology in the cities under consideration varies considerably. It starts from the provision of simple WebGIS applications which only show the road network and some less basic data like in *Jakarta* or *Mumbai*, it comprises advanced applications which enable the presentation of social, economic, ecological and urban information related to the city (e.g., *Buenos Aires*, *Los Angeles*, *Paris*) and it ends up with highly elaborated comprehensive distributed information systems which can be found in *Seoul*, *London* and *New York City*.

Table 2: Application of SDI in the world's mega cities

	SDI development status unknown	SDI master plan available	Primary spatial data available	Secondary spatial data available	Spatial data accessibility available
Bangkok					
Beijing					●
Buenos Aires				●	
Cairo	●				
Delhi			●		
Dhaka	●				
Guangzhou				●	
Istanbul					●
Jakarta			●		
Karachi		●			
Lagos		●			
London					●
Los Angeles				●	
Manila				●	
Mexico City	●				
Moscow	●				
Mumbai			●		
New York					●
Osaka	●				
Paris				●	
Rio de Janeiro					●
Sao Paulo					●
Seoul					●
Shanghai					●
Tehran		●			
Tokyo	●				

3.1.1 SDI application in the African region

NSDI in ***Egypt*** is still rudimental. Considering the underdeveloped NSDI of Egypt, it is no surprise, that for the city of ***Cairo*** no information concerning SDI development or comparable initiatives could be found.

Nigeria started the implementation of a National Geospatial Data Infrastructure (NGDI) in 2003 (Federal Ministry of Science and Technology of Nigeria, 2003). In 2007, the government of ***Lagos*** constituted a committee for the provision of a fully digital mapping and enterprise GIS for *Lagos* State. The policy framework adopted by the administration for the development of *Lagos* should be reached by generation and sharing of information with organised private sector, developing skilled and knowledgeable workers.

3.1.2 SDI application in the Asia-Pacific region

In ***Bangladesh*** no official NSDI exists. In accordance with the rudimental national SDI initiatives in *Bangladesh* in ***Dhaka*** neither city SDI nor any WebGIS application or similar was identified.

China has paid great attention to construct the Digital China Geospatial Framework (DCGF). A series of fundamental spatial databases was completed as the kernel of DCGF. A fully digital nationwide spatial data production system is widely established. In 2002, the ***Shanghai*** Municipal Government announced the "Digital City Shanghai" strategy. In this context a distributed WebGIS application for managing landscape resources was developed, which allows the connection of all landscape bureaus of the city where data are kept locally for maintenance and updates. These data are also available online to the central bureau and other local bureaus. In 2004, the city authority of ***Guangzhou***, the capital city of south *China*, initiated the Digital Municipality of Guangzhou (DigiM.GZ) project which aims to represent the Guangzhou metropolitan area as a digitalised virtual municipality by using a wide range of up-to-date GIS and telecommunications technologies. In ***Beijing***, the Beijing Digital Green Management Information System is available, which integrates a database of *Beijing* landscaping areas and a database of social, economic, ecological and urban infrastructure.

The NSDI scheme in ***India*** (established in 2001) aims at using GIS to merge satellite imagery and ancient topographic maps with data on water resources, flooding, rainfall, crop patterns, and civic layouts to produce 3-D digital maps. Another objective of the Indian NSDI is to achieve a national coverage of all forest maps, land use, groundwater and wasteland maps, pollution data, meteorological department's weather-info and department of ocean development's sea maps. In 2005/06 in the Handni Chowk area of the walled city of ***Delhi***, a pilot study on generating a 3D-GIS database was accomplished. The database was created by using a base map at scale 1:2500, high resolution satellite data, ground control points, video of the area, high resolution DEM from LiDAR/ ALTM and by 3D GIS data processing and analysis software. In ***Mumbai*** various GIS applications for small areas with different aims have been made. The Mumbai Metropolitan Region Development Authority (MMRDA) recognised the usefulness of this technology and thus proposes in its Regional Plan (1996-

2011) to build up a Regional Information System. These developments may be stimulated by the Collective Research Initiative Trust (CRIT) that plans to generate an open-access SDI and a set of simple tools and applications for knowledge transfer and participatory urban planning by communities and citizens in *Mumbai*.

The ***Indonesian*** NSDI aims at improvement of coordination mechanism, completion of spatial databases and national metadata developments, activation of national clearinghouse and development of Digital Indonesia. The city of ***Jakarta*** has a simple WebGIS application, which represents the road network of the city and enables different search functions to find streets and points of interest.

In ***Iran***, national organisations, ministry and municipal offices as well as private companies are active in the field of mapping and spatial data production. The ***Tehran*** municipality, Public & International Relations Department committed to the development of a WebGIS with more than 140 layers.

In ***Japan,*** the NSDI is implemented by the Geographical Survey Institute (GSI) and different ministries, who began their work on the Spatial Data Framework in 1995 and completed it in 2003. The future work of the Japanese NSDI concentrates on a new infrastructure concept, which is promoted as "Digital Japan" and which shall lead to a virtual and real-time representation of the land. Concerning the two Japanese mega cities ***Osaka*** and ***Tokyo,*** the internet investigation could not extract any specific SDI-initiatives, although the survey response from *Tokyo* indicated that base mapping and agency-specific spatial applications do exist. Both cities developed long-term master plans, where principal goals for city planning are formulated but no SDI strategy could be identified.

In ***Pakistan*** no official NSDI was established. In its "Megacities Preparation Project" from 2005 ***Karachi's*** government schedules the development of digital maps of the city by using GIS technologies.

First official activities for establishing an NSDI in ***Philippines*** were initiated in 2001. As a member of a developing country Metro ***Manila*** has not yet a comprehensive SDI available. A Disaster Management Information System called "Metro Manila Map Viewer" was developed in 2004.

The first phase of an NSDI Master Plan for ***South Korea*** was completed in 2000. Basic GIS infrastructure has been established by producing various kinds of digital maps. The second phase of the NSDI, which started in 2001, concentrated on spreading GIS application for maintaining the digital maps and developing national standards. The city of ***Seoul*** has at its disposal a widespread SDI on the technical base of several distributed GIS applications like Urban Planning Information System, Road Information System, Soil Information System, and other municipal affairs Information Systems. A Spatial Data Warehouse is available which provides for sharing and accessing the different spatial data of the GIS systems via a GIS Portal system.

Development of the ***Thailand*** NSDI fits very well with the Thai Government's scheme for a comprehensive utilisation of Information Technologies to support administration and public services. The key mechanism is the development of e-Government in which GIS is a key component and plays an important role in providing for dynamic information to support better governance of the country. For the city of ***Bangkok*** there is a webpage in Thai language that seems to grant access to a comprehensive collection of spatial data in different GIS applications.

3.1.3 SDI application in the European region

In ***France*** there is no explicit overall governmental initiative to develop an NSDI even though a geoportal was launched in 2006 and a multitude of NSDI-like initiatives are undertaken. In ***Paris*** a WebGIS application gives access to the most important spatial data about the city. It is possible to access a series of thematic maps through a multiplicity of data layers

Russia's NSDI concept schedules a three stage process, which should be finalised by 2015 with the implementation of the national NSDI. For the city of ***Moscow*** no specific SDI solution information could be found during the internet investigation.

There are several persisting problems in the field of SDI in ***Turkey***: lack of coordination between institutions; no standardisation, neither with regard to the spatial reference system, nor to data quality or data exchange; data duplication; the majority of large scale data not available in digital format; interoperability does not (yet) exist; lack of expert personnel and budget; and a lot of difficulties to share data. ***Istanbul's*** Water and Sewerage Administration (ISKI) developed the Infrastructure Information System (ISKABIS) to control and manage extensive water and wastewater facilities for the Istanbul Metropolitan Area with more than 30 applications implemented The city administration of *Istanbul* provides for a WebGIS, which represents the road network for the metropolitan area of *Istanbul* containing a precise division into lots and house numbers, orthophotos of different years and a range of thematic information, as well.

There is now a formal Location Strategy for the ***United Kingdom*** with a single organisation with responsibility for its establishment and coordination. The country as a whole has a well developed GI sector, with extensive datasets available from both public and private sector sources. The government of the city of ***London*** provides for the City Online Maps Project Accessing Spatial Systems (COMPASS), which aims at improving access to information about the city of London through a unique access point. One remarkable SDI application in *London* is the Newham Neighbourhood Information Management System (NIMS), where users gain access to data on economic, social and environmental conditions of the borough.

3.1.4 SDI application in the Pan-American region

In 2004 the National Geographic Information System of the Republic of ***Argentina*** (PROSIGA) started as an Internet distributed GIS, in which seven specific SDI working groups are present: Institutional framework, Policy and Agreements, Fundamental and Basic

Data, Metadata and Catalogues, Diffusion and Communication, Training, Search Engine for Geographic Names and IT for SDIs. The department of Geographic Information Systems of the city administration of ***Buenos Aires*** developed a widespread WebGIS application built up on open source components and integrating a multiplicity of spatial data of the city. The GIS covers a range of applications like health, education, tourism, sports, culture, leisure, green spaces, social services, transportation etc. and enables access to information up to parcel units.

The Brazilian cartographic community, in particular Federal Government agencies, made great efforts to constitute an NSDI in ***Brazil***. Map servers offer diverse information and provide for geodata of the whole country. The department for planning of the city of ***Sao Paulo*** makes an internet portal available, which enables access to a multiplicity of statistical data, thematic maps and allows for the visualisation of infrastructural data in a WebGIS client. For ***Rio de Janeiro*** the department of city planning offers digital maps and databases of the municipality of Rio in a Geoportal and allows for download of statistical tables, maps and spatial data.

The ***Mexican*** NSDI implementation has been led by the National Institute of Geography, Statistics and Informatics (INEGI) since 1997. INEGI developed an internet presence (GeoPortal), where users can view and download a series of spatial data, including appropriate metadata. For the Mexican mega city ***Mexico City*** the internet investigation did not extract any specific SDI-like-initiative.

The ***United States*** clearinghouse was established in 1994 with the US Federal Geographic Data Committee (FGDC) responsibility of NSDI implementation. The NSDI major development focus is at the *United States* federal level, although efforts have been made to support coordination at State level as well. Spatial data are provided in a nationwide geoportal offering a multiplicity of functions to access, publish and share spatial data in a widespread number of categories. An Interactive City Map of ***New York City*** provides information on transportation, education, public safety, resident service and city life. The office of Emergency Management operates a GIS, which maps and accesses data — from flood zones and local infrastructure to population density and blocked roads — before, during, and after an emergency case. Beyond that the City government runs a spatially-enabled public website called ACCESS NYC, which has the capability to identify and to display over 30 City, State, and Federal human service benefit programs to explore appropriate services for the individual users needs. The ***Los Angeles*** city administration publishes a collection of interactive maps containing information on traffic, parcels, flooding, city services, leisure, among other information.

3.2 Current Use of Spatial Data within interviewed city administrations

It was interesting to note that those senior administrators interviewed by the working group candidly admitted the importance of spatial data and analysis in helping them do their job. As users of spatial information, they personally believed that access to timely and accurate spatial data and tools was a key requirement in managing functions such as city planning.

Correspondents reported widespread use of spatial data in a range of city functions, including:

- Land registration and tenure administration;
- Cadastral survey, mapping and data management;
- Policy development, planning and citizen engagement;
- Land use and development control;
- Transportation planning and road or highway management;
- Public works, infrastructure development and maintenance;
- Environmental protection;
- Coastal, ports and marine management
- Law enforcement and security;
- Public health management;
- Visualisation of urban environment, demographic trends and social conditions for use by elected officials and citizens.

In fact, collection and usage is so widespread that data integration, access and use was hampered by the diversity of data holdings and systems managed by individual units. Getting data for planning processes, for example, can be difficult, costly and slow. Fundamental data management standards were not being used.

Access to data held by other levels of government was also problematic. Collating data across internal units and external agencies was an impediment to providing timely information to citizens.

All cities reported that they had at least some elements of an SDI. Most cities reported that they had only small "central" GIS units, under-resourced and generally incapable of providing a comprehensive citywide SDI. Missing capabilities included no common metadata, spatial data policies and standards, formal data sharing arrangements between units or agencies or shared data access mechanism.

Most do not have a formal "GIS strategy" across the whole administration. However, most countries covered by this project have national (and in some cases regional) SDI strategies. Unfortunately, at this stage it is not clear to the working group what connection there is between national and local strategies or how national strategies will meet the needs of cities.

Some cities have developed an intranet that could be used to access spatial data held across multiple units.

The results of the survey and internet search show that several cities have invested in providing access to spatial data as part of public websites, reporting information about aspects of city administration such as land tenure, use, planning, environmental and disaster management information. These could be used as exemplars by other cities.

4. CURRENT NEEDS

4.1 Key tools needed to address problems

Some key tools needed to address megacity problems were identified by the study. These included:

- Strengthening planning laws to cover not just the planning process, but the monitoring and implementation of the laws and to ensure that the planning process is guided by economic and environment development strategy.
- Planning and development control over water catchments and other sensitive areas affecting the city.
- Improved governance to provide good communication between all city units and strong partnerships between the city administration and agencies at other levels of government, especially in infrastructure development and maintenance.
- Coordinated planning and implementation involving transportation, utilities and other infrastructure providers.
- Working with the private sector to ensure financial and property markets have the capacity to meet current and future needs for jobs and housing.
- A strong focus on disaster management, including coordinated planning, preparation, response and recovery operations.
- In the developing world, a stronger focus was needed on good governance, institutional development and capacity building.
- Encourage the use of crowdsourcing to capture spatial information to complement the official sources.
- Ensure that aid agencies delivering projects within the cities provide spatial data based on international standards.

It should be noted that the needs of cities in the developed and developing world are significantly different.

4.2 Most immediate SDI needs

Correspondents identified some immediate requirements to support creation or further growth of SDI in their cities. They have differing priorities and some have already solved these problems. Those reported include:

- Completion of base mapping covering the city;
- Completion of conversion of base data into digital form;
- Common definitive street address file and integrated cadastral (legal, fiscal and spatial) database;
- Solving internal institutional arrangements to provide access to existing data held by individual units, preferably some type of policy or edict setting up a formalised structure;

- Greater cooperation and cost sharing in new data collection, especially with other levels of government;
- Obtaining stronger sponsorship for SDI development from senior city officials and obtaining commensurate resources to do the job;
- A broader understanding within city administration units about the benefits of integrating and using spatial information to do their job better;
- Access to expertise in areas such as spatial data management and ICT to build capacity for web-based repositories and access mechanisms, data integration and spatial data products; (sometimes this is just a matter of better access to existing people spread across units and sometimes need for external help);
- Development of an agreed spatial data strategy, including data access agreements, prioritisation of new data collection, sharing of resources, use of common data standards and systems interoperability;
- A spatially-enabled one-stop citizen interface.

5. CONCLUSIONS

The aim of FIG Commission 3 working group WG3.2 is to support development and use of spatial data infrastructure (SDI) by city authorities in the world's largest cities. SDI developments in existing mega cities were reviewed, current problems and issues and use of SDI was identified. The results may be used for future consideration, i.e., to yield a toolkit for use of best practices in SDI in managing mega cities, including frameworks for policy, institutions, legal and technical.

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BIOGRAPHICAL NOTES

Paul Kelly has extensive experience in the development of spatial information policy and operational management at both national and state government levels. Paul has headed the national office of ANZLIC – the Spatial Information Council for Australia and New Zealand from 2001 to 2004 where he worked with key users of spatial information in natural resource management, emergency management, counter-terrorism and local government. During an eclectic career, he has also been the Chief Information Officer of a New South Wales (NSW) natural resource agency and Deputy Surveyor-General of NSW. He has degrees in surveying, geography, history and political science. He is currently the Director of Spatial Strategies Pty Ltd, which offers advice on land administration reform and the strategic use of spatial information in government agencies and business enterprises. He has recently completed the Land Administration Strategy for Vietnam and worked on the Spatial Information Strategy for both the Australian and NSW State Governments. He is the chair of FIG Commission 3 Working Group 3.2 – Spatial Data Infrastructure for 2007-2010.

Robin McLaren is an independent management consultant who excels at developing location enabling strategies and turning business requirements into effective information system solutions that deliver significant benefits. Since forming Know Edge Ltd in 1986, he has gained extensive experience in developing enterprise location enabling strategies, programme and business change management, and providing independent advice to support Information Systems procurement. He thrives in complex situations and has been involved in key UK projects that have significantly shaped the GI sector in recent years, such as the National Land Information Service, National Addressing initiatives and the UK Location Strategy. Robin is an internationally recognised expert in Land Reform / Land Information Management Systems. He has worked extensively with aid agencies implementing National Land Registration and Cadastral Systems world-wide to strengthen land tenure in support of economic reforms; most notably as technical advisor to the Hungarian government to support their land reform programme during the 1990s.

Hartmut Mueller got his diploma and doctoral degree in geodesy at Karlsruhe University. After 8 years of research he turned into the marketing and software development departments of worldwide working enterprises for 6 years. Since 1991 he has been working as a professor at Mainz University of Applied sciences. Since 1998 he has been a member of the board of i3mainz, Institute for Spatial Information and Surveying Technology. In the DVW – German Association of Geodesy, Geoinformation and Land Management he is the chair of working group 2 -Geoinformation and Geodata Management. He is the co-chair of FIG Commission 3 Working Group 3.2 – Spatial Data Infrastructure for 2007-2010.

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