

Impact of Decentralisation and Community Empowerment to Spatial Information Management

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SUMMARY

In the past major structural changes in organisations that are providing services were caused by technology, by social consciousness (spirit of the age) or by economic pressure, appearing independent from each other. Nowadays these three issues simultaneously have an effect on politics and on economy of a country. To meet these challenges in an effective land administration and land development, new forms of governance were established, such as decentralisation and community empowerment. Both new types of a modern regime as a result of structural changes have an essential impact to spatial information management.

In the paper the terms decentralisation and community empowerment will be defined and described. An essential part of the paper focuses on good practice of procedures of and between organisations to collect, to maintain, and to provide spatial information. Demands on additional subjects in the education of surveyors will shortly be discussed. Finally recommendations and conclusions for a successful data policy will be outlined.

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1. INTRODUCTION

Modern governance requires transparency and the involvement of communities and citizens in the decision making process. Decentralisation and community empowerment are strategies to achieve transparency and participatory democracy and they are a result of economic pressure to governmental institutions (requirement of slim administration). Decentralisation and community empowerment are also needed for community based land management processes in particular and development administration in general. By ushering in a process whereby governmental power can be shared, these also guarantee social cohesion and sense of belongingness. Modern spatial information management tools play the role of enabling technology by facilitating decentralisation, community empowerment, and citizen participation.

Mankind often is not aware about evolution. Modifications on spatial infrastructure, on social settings, and on technological improvements are not realised by people in the case of long-term changes. So one cannot even imagine how social interaction could work without mobile phones, internet, and/or traffic systems. Thus also tools for managing spatial and temporal information are needed, whereas the benefit of spatial information hardly can be estimated without having integrated these tools to social interactions and decision making (Ann.: Twenty years ago also the benefit of mobile communication also could not be predicted!).

2. STRUCTURAL CHANGES

2.1 Spirit of the Age

Today traditional place-based communities are increasingly being complemented by virtual ones: People ‘meet’ and become intellectually and emotionally engaged with others without regard to constraints of distance. The risk that internet accelerates the detachment of individuals from the places within which social networks are formed is balanced with the opportunity to interact with self-defined communities electronically in response to exclusion from local communities. As people transfer more of their time and loyalty from actual to virtual communities, the balance between place-based and non-place based communities is shifting, with potentially wide-ranging implications both for places and communities, and for the influence of place on human identities [Goodchild et al., 1999, Varenus-Project]. Today the time used for communication is still just the same as some decades ago. So with the implementation of new communication technologies the “spirit of the age” changed from “face-to-face” communication to “virtual internet”-communication.

2.2 Technology

Regarding the developments in spatial information management one could realise a shift of focus from “hardware and software” to “data availability” and “data characteristic” within the last years. Or expressed this in another way, there was the change from the question “How to use geographic information systems” to

- “How to receive more and more detailed data?” (data acquisition),
- “How accurate are all available data?” and “Why are different data sets not fitting?” (data quality),
- “Which reference model should be used to merge all the different data sets?” (data integration) and to
- “How multi-institutional cooperation can provide a better service?” (process integration)

As one result of this change a lot of efforts was and is still invested in standardization (ISO-TC211, OGC and within all the GIS-companies, GSDI, EU-INSPIRE), whereas there are still frictions, lacks, and obstacles.

Within the last decade a lot of changes took place in the field of data collection, data processing, and equipment (GPS, Laser Scanning, Satellite Remote Sensing, and Image Processing). The development was mainly technology driven. In 1970 surveying equipment started to get an innovative push by computer technology. The competition on new technologies ended in merging of companies and establishment of partnerships between companies. At the beginning of this process companies of similar profiles merged (like Wild and Kern). Later on also companies of rather different background merged. “Surveying equipment meets software” often was the motto for new partnerships (e.g. Leica, Helava, System9; Zeiss and Intergraph). In the meantime cooperation is seen under a wider perspective and goes beyond the approach to integrate software into some hardware (surveying equipment).

It seems that the business models changed. The change from supply to demand driven developments, products and services requires the involvement of heterogeneous expertise. Therefore a flexible cooperation can bring more benefit than just merging companies, which caused many frictions. The next step of this business approach resulted in combining tools used in that process e.g.: “Total Management Systems for real estate” with GIS (SAP and ESRI). The final goal of these developments could be the customer-orientated integration of processes.

Technology empowered individuals and local communities to create their own IT-solutions with integrated tools for spatial information management. While the amount of digital spatial data collected at the local government level is dramatically increasing, much of the collected data are not entering the public domain. This development might still be rather an opportunity than a threat. Within an integrated well coordinated approach spatial information will flow in an aggregated or filtered form from various sources on local level to decision makers on different levels of governance.

2.3 Economic Pressure

In the past technical development of equipment was the main component for economic improvement in data acquisition and resulted in a faster and more cost-efficient data production. In the next step improvements focused on optimised production processes within individual companies. In the meantime organizational improvements can be observed by streamlining procedures as inter-institutional “Clustering” processes.

The increased financial pressure – caused mainly by reduced budgets - on public institutions as well as on private sector forced cost recovery and a process of rethinking of existing business models. Duplication of work is not affordable any longer. All kind of outsourcing became fashionable e.g. acquisition and maintenance of spatial data. Traditions were given up in favour to cooperation on processes along the chain of added value led to clustering (see e.g. www.giscluster.at). Whatever can be provided by somebody else in a more efficient way is preferable to in-house solutions. That situation calls for partnership and teamwork across disciplinary lines bridging different commercial sectors, which is also an opportunity for local communities:

“Paradoxically the lasting competitive advantages of a global economy are increasingly focusing on local conditions – knowledge, partnerships, motivation: components which hardly can be reached by afar rivals” according to [Porter, 1998].

3. NEW FORMS OF GOVERNANCE

Decentralisation and Community Empowerment are terms with different meanings in the various fields of competence, even in different countries and in different cultures. To prevent uncertainties that may stem from such differences and facilitate proper communication, the authors will clarify their understanding by using the following definitions.

3.1 Decentralisation

Decentralisation is the transfer of responsibility for planning, management and resource raising and allocation from the central (national) government and its agencies to field units of central ministries or agencies, subordinate units or levels of governments, semi autonomous public authorities or corporations, area wide, regional or functional authorities or non governmental, private or voluntary organisations [Cheema et al, 1983].

Decentralisation has several forms [Cheema et al, 1983]:

Devolution: Transfer of responsibility for governing - the strengthening (financially or legally) of sub-national units of governments, whose activities are substantially outside the direct control of central government.

Delegation: Assignment of specific decision-making authorities that can be done by the transfer of managerial responsibility for specific defined functions to public organisations outside the normal bureaucratic structure of central government.

Deconcentration: Spatial relocation of decision-making – the transfer of some administrative responsibility or authority to lower levels within central government ministries or agencies.

3.2 Community Empowerment

Community empowerment is the activity to give official authority or legal power to the community that can be a local group, a citizen's action committee, a citizen's initiative, or a number of individuals with common interests [adapted to Merriam Webster Dictionary, 2003].

Another definition is given in the sourcebook of empowerment and poverty reduction [World Bank, 2002]: Empowerment is the expansion of assets and capabilities of communities to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives.

The involvement of communities in the decision process can be done in several stages. The spectrum of involvement is open from a very passive role to a very active impact of communities in decision-making. And community empowerment spreads from a powerless level up to a powerful one [Community Empowerment Working Group, 2003]:

Communication/Information: The community is informed about what has been decided. In some cases the community also receives information during the process of decision-making.

Consultation: The community is invited to respond to a proposal for action but without any commitment to acting on the responses.

Formal Involvement: The community has a defined role in decision taking on its own behalf but as one interest amongst several.

Deciding Power: The community has the right to decide for its own and also the responsibility for the means to implement its own decision.

4. IMPACTS OF NEW FORMS OF GOVERNANCE TO SPATIAL INFORMATION MANAGEMENT (SIM)

Decentralisation as well as community empowerment can appear in several forms as shown above. But all stages of these features of modern governance are based on four key elements [World Bank, 2002]:

- Access to information
- Inclusion and participation
- Accountability and
- Local organizational capacity.

These are the basic concepts that should be defined to better understand issues rose in this paper. The following is a discourse on access to a specific type of information, the geoinformation, the technical possibilities in the capture of this information and the possibilities for the distribution of the same with a view to availing the same to decision makers that are located at many and different levels.

4.1 Increased Demand on Information

It is now widely regarded that data are the most important component of the spatial data infrastructure (SDI) of a country. But it can be predicted that the next steps based on SDI will

be the optimization of customer-orientated processes.

A case for accessing geodata in this kind of set up can be illustrated with a typical scenario in land information management. Thus, relevant information about land, for example, can be obtained by the possibility to link different kinds of geodata together. The linkage of data is realised through a system of spatial reference. Said with other words the coordinate (reference) is often used as primary key in a (relational) geodata base linking the different components of a dataset and thereby playing the role of foundation data.

Decision-making for sustainable land use and land development is achieved through the geoinformation link and based on data sources as illustrated in *Figure 1*.

Land tenure data define the rights to a specific piece of land (parcel) and they are recorded in land registers. Usually this kind of data is under the custody of Justice and Law authorities.

The use and the condition of land can be described by physical data. This group consists of topographic data of the land, information about the land cover, the geological situation, the quality of soils, as well as the shape and size of parcels. Often these data sets are collected and maintained by planning or environmental authorities.

The third data group that contributes to geoinformation characterizes the value of land and is assigned to the financial and taxation sector.

Decision-making is not only based on information about land. It also depends on the social environment, on the culture, and on the economic condition of a country, of a region, or of a local area. This information also must be integrated into the geoinformation system to guarantee optimal decisions.

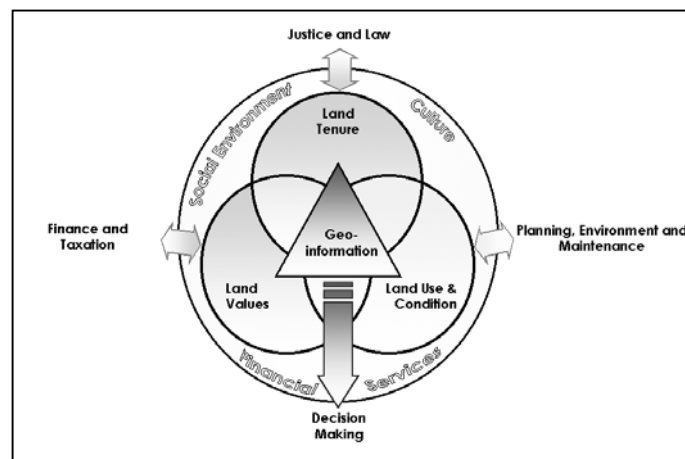


Figure 1: Required Data for Decision Making

Source: adapted from [Dale&McLaughlin, 1999] and [FIG, 2002]

As has been shown in the diagram above, spatial information offers a tool with which these disparate spatial datasets could be brought together and put to use through a common reference.

4.2 Increased Number of Users and Professions Involved

Users of geoinformation are organisations, groups, or individuals and they can be involved in the production maintenance, and/or the processing of data. *Figure 2* gives a more detailed description of potential users. The diagram also specifies the demand on geoinformation in a

three-step grading (low/medium/high) broken down to different levels of administration. Using this illustration, one can clearly see the increasing need for more geoinformation at a local level. However this is not always true and may only be valid in the context of decentralised administration where the communities and local government have more opportunities to make decisions.

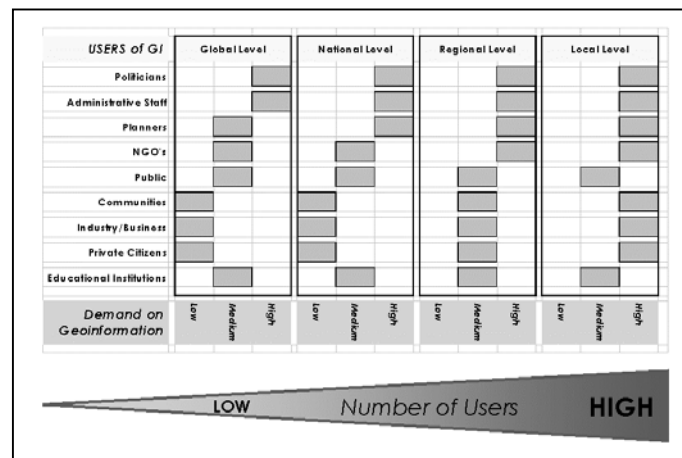


Figure 2: Users of Geoinformation

The number of potential users is inversely proportional to the level of administration: The lower the level of administration the higher is the number of users.

4.3 Flexible SIM-Tools to Support

The access to geoinformation is an essential part in the process of decision-making. Information that is not accessible is as good as information that is unavailable. For information to be of any use, it must be accessible. Up-to-date datasets out of different data sources should be available in real time to all institutions and groups that are involved in the decision-making process.

5. GOOD PRACTICE TO TAKE CHALLENGES

5.1 Geo-Clustering

It is all about maximising the economic, social and environmental benefits from investment already being made in spatially referenced information. The question is about integration of multi-source spatial data and processes into usable information products. The realisation is based on at least three ingredients: data, processes and knowledge. Many efforts had been done to improve the procedures of spatial data acquisition and a lot of progress was reached within the last years. However the real challenges are in the workflow:

- to organise business processes that support the availability of, and accessibility to geoinformation in the right place, at the right time and for the right person;
- to create and maintain data models and databases from which information can be extracted, processed and shared by many stakeholders at any given time.

How can we deliver the right information to the right people at the right time, if the right information must be derived from here-and-now parameters that change daily? The answer

comes from business model innovation. In other words: the result of human activities on different locations is an integral part of information required and should be considered as part of our modelling processes.

5.2 Changing Role of Surveying Profession in Data Processing

Finally the role of the surveyors will not stay untouched by the modern information management including data acquisition methods and distribution technologies for streamlining inter-organizational workflows. Surveyors have to change and extend their professional field from pure data collectors to information managers and experts for land development.

In the past dramatically changes in our geodata business resulted mainly from technological innovations. In the meantime however changes are more and more caused by improved business processes with a sever impact on our surveying business. Some of our customers and even some partners like National Mapping Agencies started innovative reorganization processes, which has some drawbacks:

Reorganization takes time and resources – during that time customer contacts are weakened.

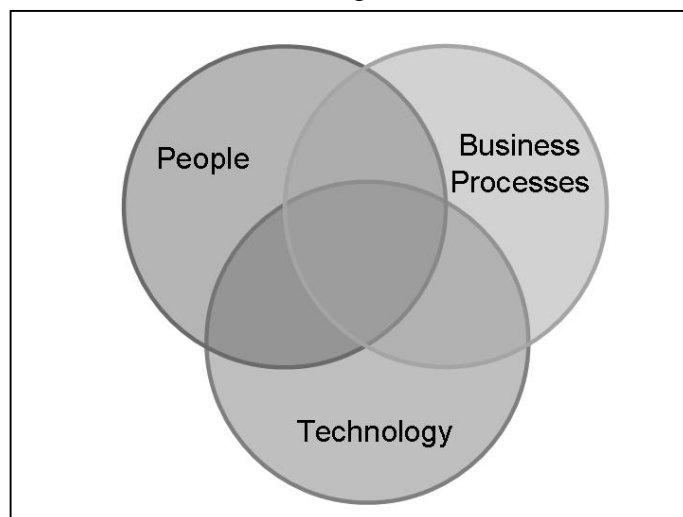


Figure 3: Integration of processes

The renewed organization may again not fit because the business world is under a continuous changing process.

Even running the tradition change script faster does not work. The reaction on increased business pressure with organizational changes is often the wrong way. The most dynamic firms shift business models without organizational changes. Instead of shifting organizational blocks we have to shift mindsets!!!!

Some decades ago the strong position of surveyors with almost a monopoly in geometric data acquisition was mainly based on technology and people - technological innovation combined with highly skilled experts. In the meantime technology became cheaper and easier in their use. This led to a wider user community: thematic experts acquire geodata themselves. This trend was increased by another change: Geodata became more detailed in their “thematic resolution”. The required knowledge for geodata assessment shifted from geometric issues to thematic issues with the consequence that thematic experts are more involved in data

acquisition than surveying experts.

But nevertheless surveyors are needed more than ever. The merge of global geodata requires well-based knowledge about coordinate systems and map projections. In the future four additional main activities have to be realized by professional surveyors in the field of “Spatial Data Management”:

- Coordinator of the workflow for geodata sets
- Information Manager (including documentation: metadata)
- Quality Manager (QM) for geodata
- Expert for integrating business data, thematic data and geodata across different professions for generating “geoinformation for decision making”.

Or with other words: the surveyors – working in the field of data processing - have to mutate from “Geodata Collectors” to “Managers in Geodata Clusters”. The training of these skills, the communication of these skills and the understanding of demands and language of other professions will be essential ingredients for the success as a surveyor. Surveyors, who contribute to the consulting business, experience already today the wide range of skills and inter-professional cooperation needed.

The interval for launching new products will decrease and business models have to be adapted to the faster and more automated sampling of geodata. The trend to lower costs for surveying and data capturing will continue.

Due to the broad thematic orientation and huge amount of geodata needed for a wide spread field of users the organisation of data acquisition requires new strategies. Co-operations and partnerships of companies and/or institutions on a local or regional level (Public/Private Partnerships) in so-called “Geodata Clusters” could be the key development. “Geodata Clusters” will need a core group for the managing of geodata: Surveyors with their education and knowledge in geodata management have to take this position: Providing service for the customers and bridging contributions from different professions. Surveying profession has to open up its communication to other professions.

5.3 Use of Modern Technology

The use of new technologies as mentioned in point 2.2 leads on the one hand to an increasing effectiveness of data acquisition and on the other hand to an improvement of data quality. The details in relation to technical advances in the development of equipment and systems for geodata capture and management can be seen in [Mansberger & Muggenhuber, 2002]:

Increased Data Acquisition Rates: Innovations, like motorisation and automatic reflector (target) recognition of total stations, 3D-laser scanning or real time GPS, abbreviated the time for individual point measurements. Additionally new technologies result in the change of surveying methods: For the surveying of a façade the invention of reflectorless distance measurements enables the time saving method of ‘radiation’ (one station) instead of ‘intersection’ (two stations).

‘Higher Resolution’ of Objects: Since 1998 the ground resolution of satellite images decreased from ten meters (SPOT) to below one meter (IKONOS, QUICKBIRD).

Time and Weather Invariant Acquisition Methods: Modern remote sensing satellites are capable to take images for almost every place on planet earth within a repeat cycle of some days. High-resolution sensors are only equipped with detectors registering the

visible spectrum or the near infrared spectrum and are not meant to take images during the night or images of cloudy regions. The use of radar sensors can easily help to overcome this shortcoming.

Reductions of Staff for Data Acquisition: Especially in industrialized countries manpower and with it the whole data acquisition is very expensive. So research activities of production companies are also focused to improve surveying equipment for a reduction of staff costs. GPS and one-person total stations are results for these efforts.

Automatic Algorithms for Measuring Objects: The need of huge sets of geodata only can be satisfied by automatic procedures for data acquisition. Object detection rises to one main research activities in the surveying industry. First results to recognise and classify objects out of digital images had been achieved in photogrammetry and remote sensing during the last years.

Figure 4 shows four possible ways to distribute data:

Data distribution by analogue maps is the oldest and most conventional way. The maps are produced by specialists of several disciplines and are provided to the decision-makers. The actuality of maps is dependent on the production time and the delivery time, as customers and users of maps are independent of any technical equipment. This method is still widespread all over the world. The limited possibility of multiplying and the analogue format are the obstacles of this geodata delivery medium.

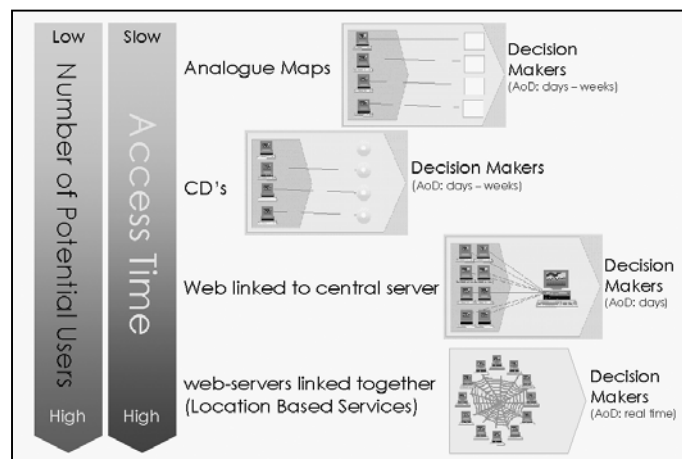


Figure 4: Ways of Data Distribution

Data distribution using storage media (CD/DVD) allows a transfer of data in a digital format. The storage media are often produced by specific experts and the end users have to bring the data from several service units to a common proper format. The data delivered on the media are in general up-to-date, only the delivery time must be taken into account. The limited number of produced storage media also downsizes the quantity of potential users.

Data distribution by access to a central web server allows the access to data for a high number of users in real-time. Any limitation on the size of potential users is determined by skills and the technical equipment available in a country.

Data distribution by web access to linked web servers includes all the benefits and lacks of the afore-mentioned method. Both ways of distribution provide geoinformation that is collected and maintained at several service units and stored on individual computers or servers. For the customers and end-users both methods differ in the actuality of the

information: The web server linked solution allows for all users direct access to all of the servers and so the actuality of geodata is dependent on the updating rate of the individual service units. The actuality of data in the central server solution additionally is dependent on the maintenance rate of the central server.

All distribution methods are still in use. Of course there is a trend from analogue distributed data (maps) to digital data formats and from analogue transfer methods (postal way) to electronic data transfer methods. But especially web-based data distribution methods require a well-developed countrywide communication network with a high penetration of individual Internet access. Web-based distribution methods also demand clearly defined access permission for user groups to avoid misuse of data.

In connection with this, it should be noted that, perhaps with the exception of the first method, all of these might not be presently feasible in the context decentralization and community empowerment in poor countries. This could mean that decision will be made without adequate and quality geoinformation unless ways and means are found to overcome the problem. Important steps towards solving this problem are the analyses of specific cases where felt needs are to be addressed and the direct involvement of stakeholders (communities and local government entities) who may wish and should specify their needs and capabilities.

5.4 Education and Capacity Building

New tools and methods like e-Learning, Virtual education, Long Distance learning and Guided-self learning came on the market within the last years to support knowledge transfer and to enable virtual lecture rooms. Will they change the whole educational systems? Can they substitute traditional lecturing or replace the teachers? Questions that cannot be answered yet, as the access to electronic media is the limiting factor for this new technology at the moment: 50% of the population of North America was able to surf in the Internet whereas only approximately five percent used the Internet all over the world. But there is no doubt that e-Learning brings about new opportunities for knowledge transfer – also in terms of life long learning.

6. CONCLUSIONS AND RECOMMENDATIONS

There is a strong need on geographical information for public and private decision-making.

Decision-making in land management is highly related to spatial information. Especially the basics of geoinformation (land ownership, land rights and land use) should be maintained countrywide to enable and guarantee an unobstructed function of common and personal welfare.

Geoinformation is part of the infrastructure in a country. The acquisition and maintenance of geoinformation itself never will become a cost-covering activity in a country. But the availability of geoinformation has positive impacts to public as well as to private business and welfare and as a consequence to the national economy of a country. The countrywide supply with infrastructure must be is a primary objective at all levels of administration.

Implementation of spatial data infrastructure requires cooperation between the private and the public sector and amongst all professions involved in land management. Land registers and land cadastres as a basis of spatial data infrastructure are mostly the

responsibility of public authorities. But decision-making processes demand additional thematic information about land that are collected and maintained by various public or private institutions or by professionals trained in a particular trade. Partnership and cooperation between and among all groups is necessary for successful geoinformation management.

Decentralisation and Community Empowerment require countrywide and detailed geodata. New developments of hard- and software meet these requirements: New Technologies opens unlimited opportunities to acquire more and detailed data in a shorter time. Within the last years powerful tools for the storing and processing of geodata appeared on the market. Due to the high costs of modern data acquisition and data processing equipment the new systems are not accessible to local governments and communities in poor countries. Policies and strategies are necessary to make new technology also accessible to poor people. Research work on technical innovations must be continued and has to focus on the development of cheap and easily usable technology.

Decentralisation and Community Empowerment require data access for an increasing number of users. Modern information technology enables real time access to geoinformation for an approximately unlimited number of users. The penetration of modern communication technology in less industrialized countries is very low and prohibits a frictionless access to geoinformation. Using wireless communication system can accelerate the progress of implementing a countrywide communication networks.

Decentralisation and Community Empowerment require experts of geoinformation at a local level. The use of available geoinformation resources requires at a local level knowledge about data acquisition, data processing, and the visualisation of data. The degree of geoinformation expertise is varying and depending on the responsibility of a specific person or user group. Decision-makers need different education and training programs in information technology as people involved in the implementation or maintenance of IT systems or specialists for data capture. Policy has to focus its activities on capacity building in the broad field of geoinformation technology.

Decentralisation and Community Empowerment require a specific geodata policy. As shown above various private or public users in different levels of administration require spatial information for decision-making. Very often these people need the same geodata. The number of units involved with geodata management is increasing with the degree of decentralisation. To avoid redundancies and inconsistencies in the collection of geodata, in the storage of data, in the maintenance of data, in the processing and improvement of geodata, and/or in the distribution of geoinformation, policy has to provide the legal and the administrative framework as well as the business environment to clarify the responsibilities various actors involved in geodata management. The regulations have to include detailed specifications in terms of the tasks for the units, in terms of the topics of data, and the defined working areas. Geodata policy also has to coordinate strategies and procedures for the internal and the external access of data.

Decentralisation and Community Empowerment require data exchange between different levels of public and private institutions. Only the use of clearly defined standards and norms can facilitate the sharing and exchange of geoinformation without any problems amongst various user groups. But the increasing number of collected and available geodata also requires a detailed description of the data, the so-called metadata. The use of metadata can facilitate access to and improved use of geodata. Metadata in the

context of SDI can also prevent duplications that may arise from limited knowledge of available data residing at different locations in a country.

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BIOGRAPHICAL NOTES

Gerhard Muggenhuber has some 20 years of professional experience in management of cadastre and Geo-Information in Austria as well as abroad. Therefore he has an excellent knowledge in the management of geoinformation. In his present function as Vice-head of international affairs of BEV – Federal Office of Metrology and Surveying - he contributed to international initiatives in Eastern- and Central Europe like the World Bank “Initiative on Real Property Rights”. Gerhard Muggenhuber is elected Chairman of FIG-Com.3 (*Spatial Information Management*) and representative of the commissions in the FIG Council. From 1996-2001 he was member of bureau of the Working Party on Land Administration, an advisory body on land registration matters to the UN-ECE in Geneva.

Reinfried Mansberger currently works as an Assistant Professor at the Institute of Surveying, Remote Sensing and Land Information at the University of Agricultural Sciences in Vienna (BOKU Wien). In 1982 he obtained his Master's degree in surveying at the Technical University in Vienna. From 1983 until 1987 he was appointed as a research and teaching assistant at the Institute of Applied Geodesy and Photogrammetry at the Technical University in Graz. His PhD degree he obtained at the University of Agricultural Sciences in Vienna (BOKU Wien). He is council member of the Austrian Society for Surveying and Geoinformation and he is actively involved in FIG as Commission 3 vice Chair on Administration and Information. He is an elected member of the European Faculty of Land Use and Development. His research work is focusing on Land Use Planning, Land Information, Environmental GIS Applications, and Cadastral Systems.

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