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# Organisation and development of GIS centres

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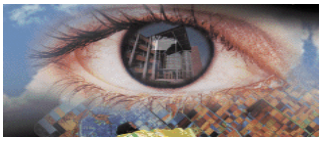
GIS competence Center
Dienst Landelijk Gebied en Dienst Regelingen

Landesvermessungsamt Nordrhein-Westfalen



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# Organisation and development of GIS centres

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## Abstract

In January 2005 the GIS competence centre (GIS CC) became operational within the ministry of Agriculture in the Netherlands. The objective of the GIS CC is to develop to a centre that delivers GIS products, services and advices within in the Ministry and to its partners. According to the theory behind the GIS CC, GIS is an activity that can be brought into a shared service centre concept. This research tries to elaborate on GIS as a shared service centre (SSC) activity. This has been done by exploring the general theory of a SSC and taking into account the specific demands of a GIS shared service centre. Important issues were their role as coordinating body of the spatial data infrastructures and their role in diffusion of GIS knowledge in an organisation.
To gain insight in the status and developments of GIS (shared service) centres a selection of seven national and international case studies has been made and a methodology has been developed to compare the organisation and development of the case studies. The data has been collected by Internet research, interviews and visits of the centres.

All seven case studies have characteristics of a shared service centre. They all deliver services in a specific area – GIS and geo-information - to other units or organisations and SSC organisational models can be applied on GIS centres. The model chosen by an organisation is the result of a complex of external and internal factors e.g. reasons of establishment, vision and organisation flexibility.
All GIS centres have responsibilities to facilitate an easy data exchange by providing a spatial data infrastructure. They all facilitate and coordinate data exchange, inside the organisation and with partners. Providing applications and portals with functionalities to search data are other activities coordinated and facilitated by all centres. Communication of knowledge and stimulating GI use or tasks of some of the case studies.

This leads to the following definition of a GIS centre: A GIS centre can be defined as an accountable unit having a supportive role by providing GIS service and applications to facilitate the work of other units or organisations. A GIS centre also has a coordinating role concerning the spatial data infrastructure and the diffusion GIS knowledge and innovations in an organisation.

Crucial for the development of a GIS centre is the context in which it has been founded and awareness and commitment in the organisations. GIS centres play an important role in the coordination of GIS development and diffusion of knowledge in an organisation. Important obstacles for development of GIS centres are incomplete and not compatible data sets, and institutional barriers. In the activities of GIS centres a trend to a more service oriented approach and knowledge dissemination can be identified. Important new developments for GIS centres will be web based services.
Also the GIS CC can play an important role in the creation of a good organisational and financial framework for GIS and geo-information in the ministry of agriculture. A priority of the GIS CC should be to improve knowledge and awareness of GIS in the Ministry of Agriculture.

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## List of abbreviations

| | | |
|---|---|---|
| AGI | - | Adviesdienst Geo-informatie en ICT |
| AHN | - | Actueel Hoogtebestand Nederland |
| AID | - | Algemene Inspectie Dienst |
| BU | - | Business Unit |
| CGI | - | Centre for Geo-information |
| DG | - | Directoraat Generaal |
| DLG | - | Dienst Landelijk gebied |
| DR | - | Dienst Regelingen |
| GI | - | Geo-Information |
| GINIE | - | Geographic Information Network In Europe |
| GIS | - | Geographic Information System |
| GIS CC | - | GIS competence centre |
| ICC | - | Institut Cartogràfic de Catalunya |
| ICT | - | Information and communication Technology |
| IDEC | - | Infraestructuras de Dades Espaciais de Catalunya |
| INSPIRE | - | Infrastructure for Spatial Information in Europe |
| KLIC | - | Kabels en leidingen informatie centrum |
| LNV | - | Ministerie van Landbouw natuur en voedselkwaliteit |
| LVA | - | Landesvermessungsamt |
| NAP | - | Normaal Amsterdams Peil |
| NRW | - | Nordrhein-Westfalen |
| RWS | - | Rijkswaterstaat |
| SC | - | Support Centre |
| SSC | - | Shared Service Centre |
| SDI | - | Spatial Data Infrastructure |
| VLM | - | Vlaamse Landmaatschappij |
| VenW | - | Ministerie van Verkeer en Waterstaat |
| VWA | - | Voedsel en Waren Autoriteit |
| WFS | - | Web Feature Service |
| WMS | - | Web Mapping Services |
| WUR | - | Wageningen University and Research centre |

# Chapter 1
# Introduction

## 1.1 Context and background

In January 2005 the GIS competence centre (GIS CC) became operational within the ministry of Agriculture, Nature and Food quality, abbreviated in Dutch as LNV. The objective of the GIS CC is to develop to a centre that delivers GIS products, services and advices to LNV and its partners. The GIS CC has been organised as a virtual cooperation between two agencies of LNV, namely DLG, the government service for land and water management and DR, the national service for the Implementation of Regulations (Dienst Landelijk Gebied et al. 2005). However tasks, resources and the organisation structure need to be further defined. To develop the structure of the organisation and to run the implementation in LNV smoothly a strategy needs to be developed by the GIS CC. Next to it also needs to find its position in the national GIS context where it is operating.

The GIS CC has been established because a lack of GIS innovations and developments has been identified within LNV. Substantial differences exist between the departments and services in the use of geo-information (Vullings, et al. 2002). The LNV agencies DLG and DR did make substantially investments in the development of geo-information services and geo-information technologies and therefore developed quality GIS expertise. However other services of LNV like the AID (common inspection service), VWA (The Food and Consumer Product Safety Authority) are lacking behind and do not have their own digital spatial information service (Dienst Landelijk Gebied et al. 2004). They are increasingly using the geo-information facilities of DLG and DR. Within LNV awareness is growing that a better combination of data, knowledge, and innovative technologies, of different departments and services will stimulate innovations and use of geo-information. By establishing the GIS CC LNV is trying to come to a more effective en efficient use of available GIS knowledge and techniques, and to stimulate innovations (Dienst Landelijk Gebied et al. 2004). In the future other services and departments should come for GIS related issues to the GIS CC that will provide them with GIS products and services; the GIS CC should be known as the centre for GIS related questions, products and services.

The concept of a competence centre has been applied in many other domains then the GIS domain. However the more general term which can be found in management studies is the term shared service centre. Different activities can be brought into a shared service centre, activities like finance and administration, human resources, IT, etc. (Strikwerda 2004). GIS is another activity that according to the theory behind the GIS CC can be brought into a shared service centre concept. However in management books no references could be found to GIS shared service centres. Therefore this research tries to elaborate on GIS as a shared service centre activity. This has been done by exploring the general theory of a SSC combined with the specific demands of a GIS shared service centres. The issues which have been explored in the scope of this research are the development, organisation and main activities of GIS SSCs. Furthermore has been explored what role those centres play in GIS developments and what the main obstacles are for GIS SSCs. Important issues are their role as coordinating body of the spatial data infrastructures (Rajabifard et al. 2002) and their role in diffusion of GIS knowledge in an organisation (Chan et al. 1999a).

To gain insight in the status and developments of GIS (shared service) centres and to test the theories a selection of case studies was made. Among those case studies a survey was held to compare the organisation, the activities and development of different national and international GIS centres. To not be limited to very specific definitions from the beginning in the scope of this research the general term GIS centre has been used.

## 1.2 Problem definition

The concept of a GIS (competence) centre has not been defined yet in literature. This makes it difficult to identify tasks and activities of GIS centres and explore development and organisation of GIS centres. The term GIS centre needed to be defined by combining concepts and organisational models of management studies with the specific tasks and position of a GIS centre. To gain insight in the status and developments of GIS centres and to compare developments of different GIS centres key issues for development needed to be identified.

## 1.3 Objectives

This research defines the concept of a GIS centre by combining the general theory of a SSC with the specific demands of a GIS centre. This has been applied on GIS centres resulting in possible organisational models and indicated main activities. Case studies explored the role of GIS centres in GIS developments and possible obstacles for GIS centres. The results of the research have been used to define the possible tasks and the position of the LNV GIS competence centre. It should support LNV in finding the right tasks, products and services and an appropriate organisational framework.

## 1.4 Research questions

The research tries to answers the following three main research questions:

1. How a GIS centre can be defined and be organised?

2. What are key issues for the development of GIS centres?

3. What should be the tasks and position of the LNV GIS competence centre?

## 1.5 Methodology

The starting point for this research has been the concept and the objectives of the GIS CC. This has been defined on the basis of policy documents and practical work observations. Relevant concepts from management studies and GIS literature have been used to position GIS centres in an organisation and to explore their role in SDIs and diffusion of GIS developments. Case studies have been used to get insight in the position and activities of comparable initiatives and (inter) national developments (see figure 1.1).

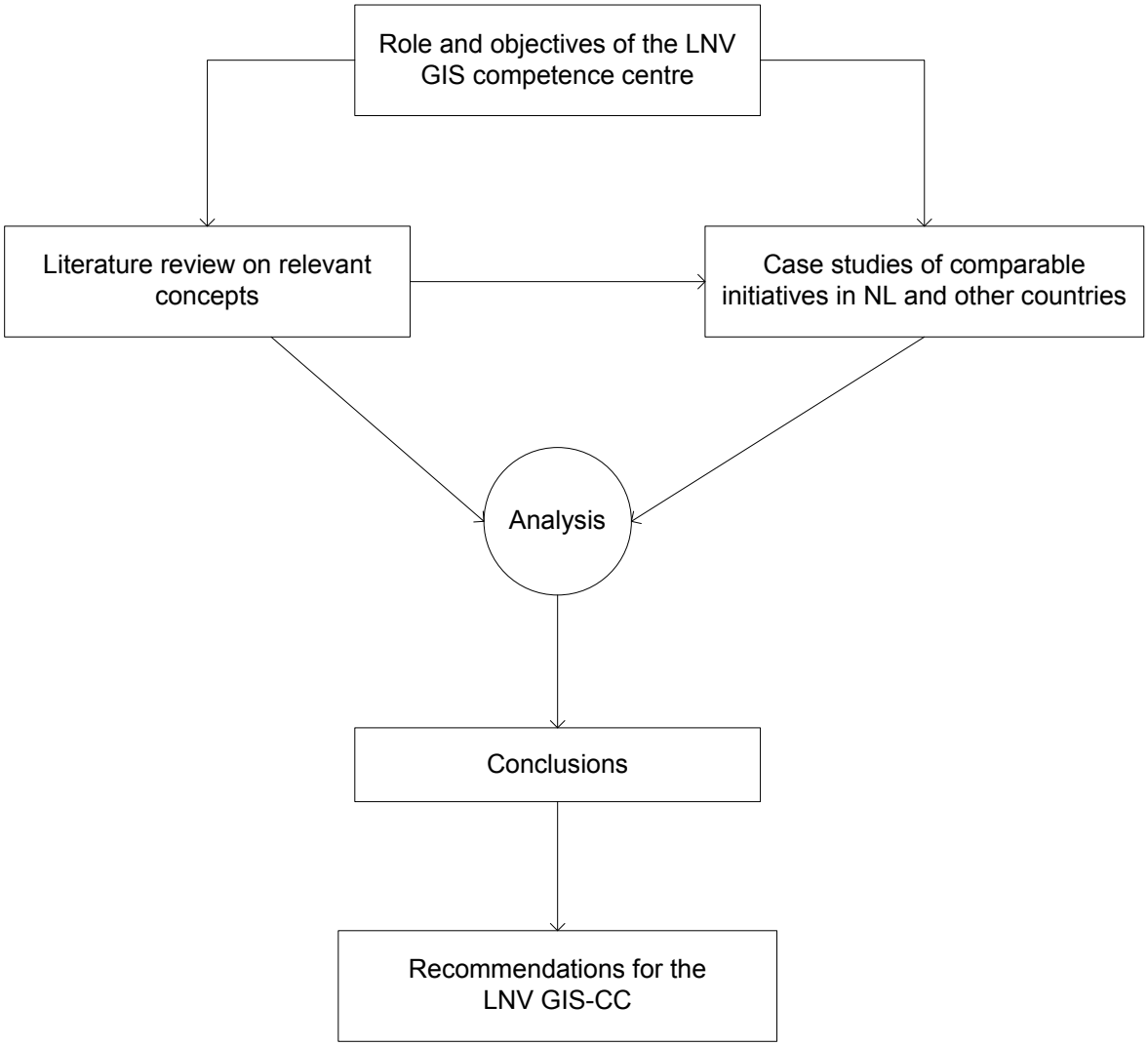


Figure 1.1. Research methodology

*Role and objectives LNV GIS CC:* An analysis of policy documents and participation in the working process e.g. attending meetings and having discussions with staff members clarified the role, activities and objectives of the GIS CC and the ideas behind the GIS CC.

*Literature review on relevant concept:* On basis of the identified role and objectives of the GIS CC a literature review has been carried out. The GIS CC was seen as a shared service centre and an organisational model from Strikwerda (2004) was taken to position a GIS centre in an organisation. The specific demands of a GIS centre have been explored by using theories from SDI literature about the role of coordinating bodies in SDIs (Rajabifard, et al. 2002) and the diffusion of GIS in an

organisation (Chan, et al. 1999a). The SDI concept and GIS diffusion theories helped to define the GIS role and the position of a GIS centre. This lead to identification of main tasks of GIS centres and their role in diffusion of GIS developments. The results of the literature review have been described in **chapter 2.**

*Case studies of comparable initiatives:* On the basis of the role and activities of the GIS CC a selection has been made of interesting national and international case studies. A methodology has been developed to make the case studies comparable. Different aspects have been looked at: development and objectives; organisational and financial framework; products and services; obstacles for development; and future expectations. The data has been collected by Internet research, interviews and visits of the centres. The methodology has been further described in **chapter 3.**

*Data analysis:* Each case study has been extensively described in paragraph **4.1.** The collected data has been compared per aspect, similarities and differences have been further explained in paragraph **4.2**. The next step, in paragraph **4.3,** has been to compare the results from the case studies with the concepts obtained from the literature review and if possible to position the centres in the identified concepts.

*Conclusions:* In the conclusions, presented in **chapter 5,** the research questions have been answered and the results have been discussed. The term GIS centre has been defined and main possible activities have been identified. From the case studies key issues and main obstacles for development of GIS centres have been identified. Also recommendation have been given for further defining the position and tasks of the LNV GIS CC, on basis of the results from this research. Finally the results of this research have been placed in the framework of previous SDI research and recommendation for further research are given

# Chapter 2
# Framework and concepts

## 2.1 Shared Service Centre

**Introduction**
Enterprises and (governmental) institutes are continuously aiming at efficiency and quality improvements. A fairly new organisational concept applied is the shared service centre (SSC) concept. Strikwerda (2004) defines a shared service centres as accountable entities in the internal organisation of an enterprise, governmental institute or non-profit organisation, which main task is to deliver services in a specific area (like administration, human resource, IT, purchase, etc.) to the operational units (like business units, divisions, departments) on the basis of service level agreements or pricing policies. Also a number of different enterprises can have together a common shared service centre.
The establishment of SSC is a global development and since the mid-nineties also in Netherlands an increasing number of enterprises and fewer public sector bodies started a SSC.

Different activities can be brought into a SSC and there are different ways of organising them (Strikwerda 2004). Another name for a SSC is a competence centre that also can be used for a unit giving support to operational units. A competence can be defined as a specific range of skills, knowledge, or abilities. A competence can be seen as the cluster of skills, abilities, habits, character traits, and knowledge a person must have in order to perform a specific job well (Rip 2003). However service and competence fit both within the tasks of a shared service centre as mentioned in the above definition of Strikwerda (2004). Therefore in the scope of this research competence centres, like the LNV GIS CC, are seen as a type of shared service centres.

To explore the SSC concept the following section will give a brief description of the general concept and idea of a SSC, possible organisational models, and possible SSC activities.

**Development of shared service centres**
After the Second World War the division model became the most common organisational model. Companies were organised in different divisions or business units (see figure 2.1). Factors of success of this model were a better vertical integration and a better integration of operational activities. Also the supportive tasks could be organised within the division, making a more efficient and effective coordination possible. Another factor of success is the opportunity for more people in the society to arrive at management and leading position and to get the opportunity to develop and use their talents. This model has been very successfully in the past and has contributed to economic and welfare growth in the 20$^{th}$ century. However at the end of the nineties the profitability of organisations came under pressure. This forced firms to reduce the slack in the value chain and lower organisation costs. The decentralism of the division model had led to duplication of staff and supportive services; suboptimal use of goods and capital; lack of common purchase strategy; and difference in procedures and standards.

The developments in ICT gave new opportunities to work more efficient, with ICT as enabling technology coordination costs could be lowered. The recent popularity of shared service centres can be also seen in this context. By using ICT SSCs gave the opportunity to lower the costs of decentralisation by avoiding duplication of staff and supportive services and facilitate standardisation, common purchase strategy and optimal use of goods and capital; leading to synergy advantages because of an easier cooperation between divisions. Concentration of support services in SSCs also

has scale advantages contributing to more professionalism and a better quality of the support, reached by more specific tasks and training. Because of a better control and planning of work a SSC can also contribute to a higher labour productivity. A SSC fits also better with the perspective on labour of the post-modern worker, where contractual obligations and accountability of the individual worker are seen as being important (Strikwerda 2004).

**Organisation**

A SSC can be organized in different ways figure 2.1 shows the different possible models of organisation.

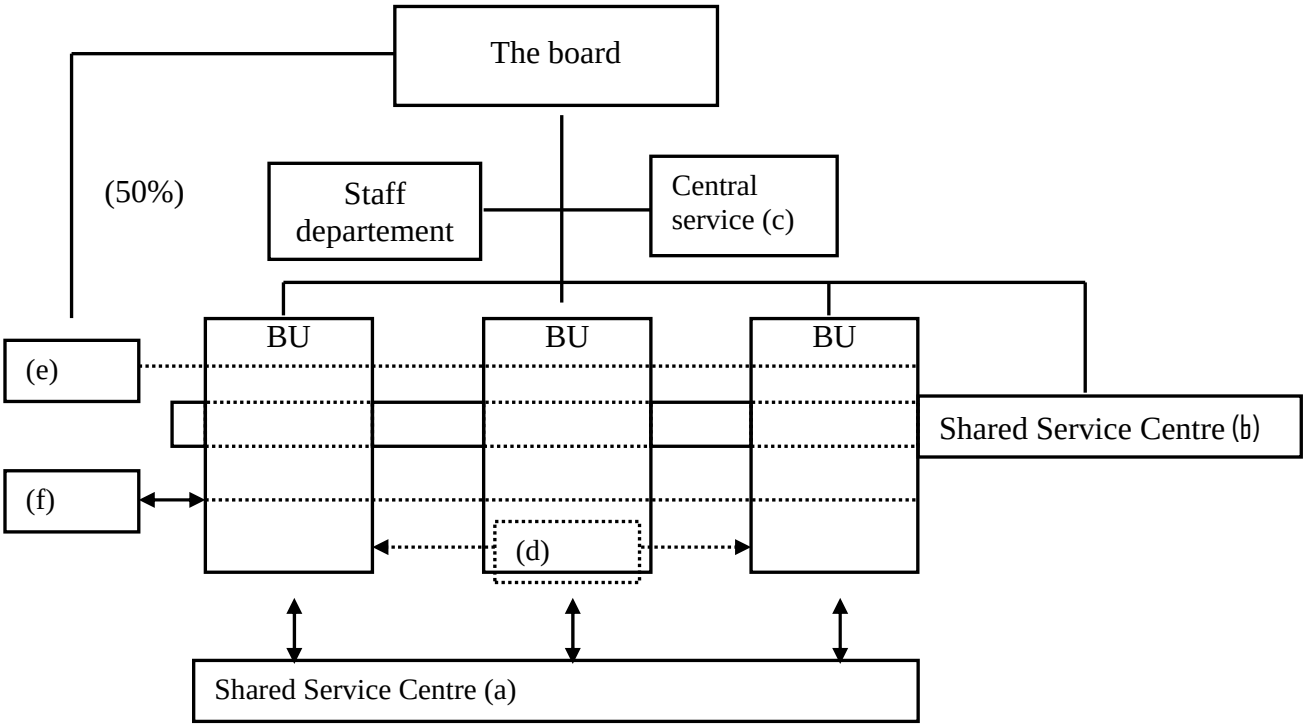


Figure 2.1. Possible models for the organisation of a shared service centre (Adopted from strikwerda 2004).

Model a: the SSC as internal joint venture of business units with no direct interference of the board. The SSC is managed by different business units.

Model b: the SSC as an infrastructure managed by the board next to the operational units. The SSC is seen as an infrastructure for all business units.

Model c: the SSC integrated in the central staff unit. The SSC manager is reporting directly to the corresponding function staff department. In the case of IT common practise is organizing the activity as operation where IT policy remains in the staff, without the IT operation unit reporting to the staff. Another sub variant is that the central staff department, or part of it, is seen as SSC by itself.

Model d: the SSC as a separate section within a department or business unit. This is done if the majority of work is coming from one department or if the reputation in the specific field is good enough for other departments to rely on it.

Model e: the SSC is organised as separate enterprise. The SSC is no longer officially part of the enterprise self, but a joint venture is set up together with an external party which holds part of the ownership of the SSC.

Model f: the service firm: independent supplier that is working on contract basis.

The model chosen by an organisation is the result of complex external and internal factors. No standard can be made to see which model is the best for which situation. Depending on for example, the reasons of establishment, the vision on developments, technological nature of SSC, organisation flexibility, time perspective of changes and resistance against changes a choice will be made.

**Activities**

Different activities can be brought into a shared service centre and before establishing a SSC needs to be decided what exactly will be the domain of the SSC and for what business units or third parties it will operate. Strikwerda (2004) identified two criteria for the selection of the SSC activity:

- First the activity needs to be a general and applicable for different processes, which can be standardized without loose of economic value.
- Secondly the activity or output from a process needs to be accountable in a format of a contract or performance.

There are many activities that potentially fit those criteria each company will have its own consideration. Examples of activities that companies have organised by using the SSC concept are: finance and administration; management control; human resources; sells and marketing; logistic; and IT.

Dealing with geographic data can potentially be an activity that can be brought into a shared service centre. GIS is then the enabling technology, which can support different working processes in different departments or business units. The GIS SSC can for example provide geo-data, facilitate analysis, and develop and maintain general application used by different departments. However in management books no references could be found to GIS SSCs. This can be due to the fact that GIS is a relatively new field and has only been recently became part of working processes in an organisation. Therefore the concept of a GIS SSC has not been identified yet and is still much under development. It needs to be further defined what exactly will be the domain of the GIS SSC and how the activities of the GIS SSC can be made accountable.

## 2.2 Spatial Data Infrastructure

**Introduction**
In order to facilitate data exchange and GIS co-operation inside an organisation and between different organisations a so called spatial data infrastructures (SDIs) is necessary. An SDI consists of different components and can be found at different hierarchal levels. A GIS (shared service) centre needs such an infrastructure for activities like providing and analysing geo-information and developing and maintaining applications.

**SDI definition**
The intention of a Spatial Data Infrastructure (SDI) to create an environment in which all stakeholders can co-operate with each other and interact with technology, to better achieve their objectives at different political/administrative levels. SDIs have become very important in determining the way in which spatial data is used throughout an organisation, a nation, different regions and the world. In principle, they allow the sharing of data, which is extremely useful, as it enables users to save resources, time and effort when trying to acquire new datasets by avoiding duplication of expenses associated with generation and maintenance of data and their integration with other datasets (Rajabifard, et al. 2002). Groot, et al. (2000) define a (geo)spatial data infrastructure as, encompassing the networked geospatial databases and data handling facilities, the complex of institutional, organisational, technological, human, and economic resources which interact with one another and underpin design, implementation, and maintenance of mechanism facilitating the sharing, access to, and responsible use of geospatial data at an affordable cost for a specific application domain or enterprise.

**Models for SDI development**
Based on the strategies, aims, objectives, and status of individual SDI initiatives on different levels, Rajabifard, et al. (2002) identified two models for contemporary SDI development: product-based and process-based developments as illustrated in figure 2.2.

The product-based model, outlined in Figure 2A, represents the main aim of an SDI initiative being to link existing and upcoming databases of the respective political/administrative levels of the community. The core components of this SDI model are policy, access networks, technical standards, people (including partnerships) and data (Rajabifard, et al. 2002). The best example of an access network is the clearinghouse, which facilitates the access to the network and provides complementary services and improves the exchange and sharing of spatial data between suppliers and users (Crompvoets, et al. 2004). An analysis of Rajabifard, et al. (2002) of the current SDI initiatives suggested a predominance of product-based SDI development.

Figure 2B represents the process-based model, the second approach possible for SDI development. This model presents the main aim of an SDI initiative as defining a framework to facilitate the management of information assets. In other words, the objectives behind the design of an SDI, by any coordinating agency, are to provide better communication channels for the community for sharing and using data assets, instead of aiming toward the linkage of available databases. The process-based model emphasises the communication channel of knowledge infrastructure and capacity building for the creation of an infrastructure in which to facilitate all parties of the spatial data community in the cooperation and exchange of their datasets (Rajabifard, et al. 2002). Spatial data and services can be made available through a geo-portal. Defined by Maguire, et al. (2005) as gateways that organize content and services such as directories, search tools, community information, support resources, data and applications.

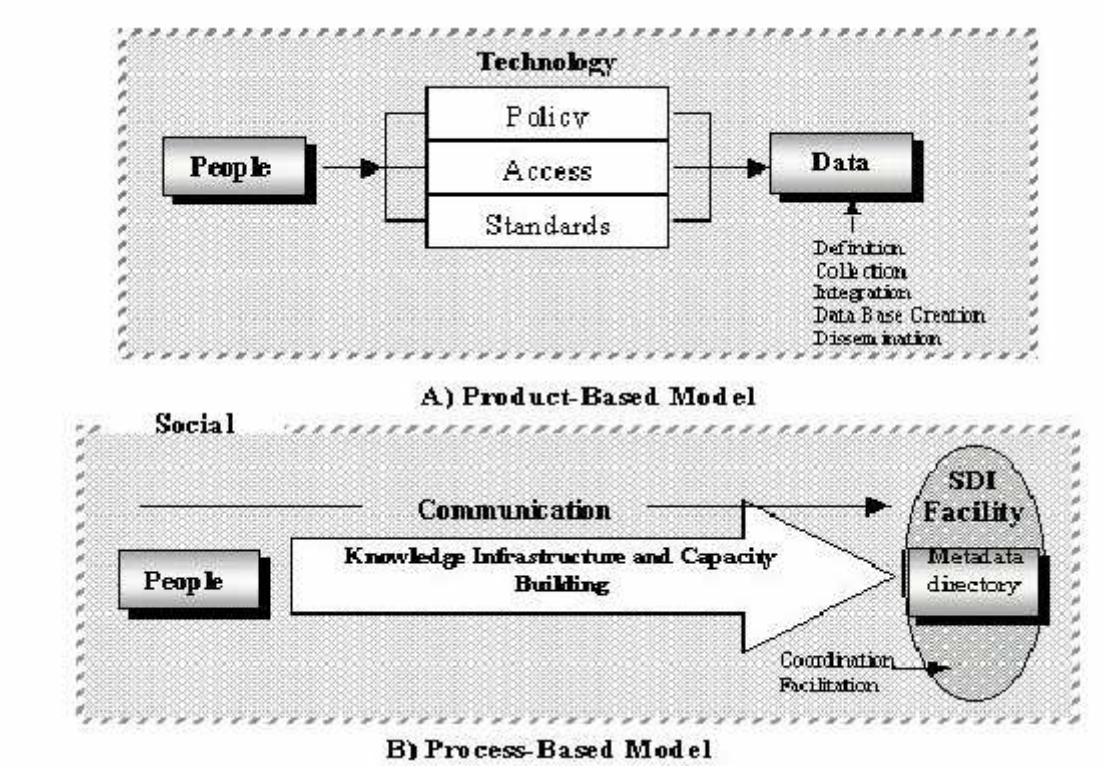


Figure 2.2. Product and process based models for SDI development (Rajabifard et al. ,2002)

According to these models, an SDI initiative is considered to be a product-based model if the main aim of the initiative is to link existing and future databases of the respective political/administrative levels of the community. However, if the main aim of an SDI initiative is to define a framework to facilitate the management of spatial information assets, the initiative is considered to be a process-based model.

**SDI hierarchy**

The SDI concept can be found on different hierarchal levels (Chan, et al. 1999) (Rajabifard, et al. 2001). SDI hierarchy is made up of inter-connected SDIs at corporate, local, state or provincial, national, regional and global levels (figure 2.4). A corporate GIS is the base level of the hierarchy (Chan, et al. 1999). Each SDI at the local level or above is primarily formed by the integration of spatial datasets originally developed for use in corporations operating at that level and below.

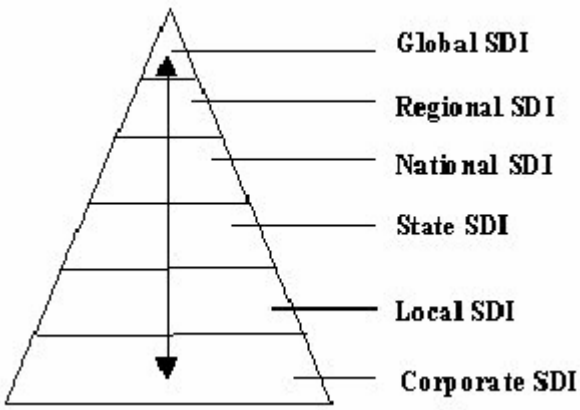


Figure 2.3. SDI hierarchy at different levels of jurisdiction (Rajabifard et al. , 2001)

Many countries, states and regions throughout the world have spent considerable resources over the past few years debating optimal Spatial Data Infrastructures (SDI). The aim of national SDIs is to manage and use the spatial data assets more efficiently assist in decision-making (Crompvoets, et al. 2004). Considerable differences in SDI development between countries and regions in the world can be identified. Different coordination and organisational models are used to organize the national, regional and local SDI initiatives (Masser 2005). In countries like Belgium, Germany and Spain the federal states have more coordinating responsibilities for the development of the SDIs. In other countries like the US and the Netherlands SDI initiatives are more national driven. Difference between SDI initiatives can also be made between countries with a formal mandate and without formal mandate (Masser 2005). Coordinating bodies or national/regional GIS centres might also play a role in SDI developments. However no literature could be found exploring the role of GIS centres or coordinating bodies.

## 2.3 GIS centre

**Introduction**

In paragraph 2.1 the concept of a SSC has been explored to define possible activities and organisational models of GIS centres. In paragraph 2.2 the term SDI has been defined and different models for SDI development have been explored. In this paragraph the role of a GIS centre as coordination body will be further elaborated. Furthermore the role of a GIS centre in GIS diffusion in an organisation will be explored. Finally main tasks of a GIS centre will be identified by combining the SSC concept with SDI theories.

**GIS centres as coordinating bodies**

As part of an SDI defined in the previous paragraph also a geospatial data service centre can be identified, which has been defined by Groot et al. (2000) as a facility or organisation, which is the intermediary between the data user and the suppliers for the applications in the enterprise or domain. Possible activities of geospatial data service centre are: link existing databases; create access networks via clearinghouses or geo-portals; provide technical standards, and create partnerships with other GIS centres or data providers; activities that fit with the product based model as identified in paragraph 2.2.

However GIS centres in the scope of this research are not only data centres, but also centres that give internal GIS support and deliver services to different departments. A GIS centre coordinates not only the sharing and using of data, but also communicates specific knowledge trough the organisation by delivering services and applications. Externally the GIS centre is an important link with other organisations or GIS centres. It is acquiring geographic data and GI services for different departments in the organisation and is coordinating GIS activities of the own organisation with other organisations. The development of such GIS centres fits in the model of process based SDIs, with the GIS centre as the facilitating and coordinating body for communication of GIS knowledge and the main body for capacity building (Rajabifard, et al. 2002).

**GIS diffusion and innovations in an organisation**

Communication of GIS knowledge and stimulating GIS use in an organisation trough an organisation is also referred to as GIS diffusion. The GIS community has adopted the diffusion paradigm. Chan et al. (1999a) have studied the implementation and development of GIS in an organisation and, based on Rogers (1995) they define diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system.

A GIS centre can play an important role in organising the GIS diffusion process. It can create the right infrastructure for communicating and promoting GIS innovations and knowledge through the communication channels of the organisation.

Different patterns for GIS development in an organisation have been identified (Chan, et al. 1999). In the systematic pattern, the development of the GIS modules of the corporate GIS is structured and well planned. There is concerted support from managers at all administrative levels, who have a broad vision to develop a GIS that serves the whole organisation. A GIS centre can support the creation of a systematic pattern for the development of GIS in an organisation and create sustainable support from the (senior) management and mobilise resources for the development of GIS in an organisation.

Furthermore the GIS centre can also be innovative by itself. The concentration of GIS knowledge, technology and data create good possibilities to develop new innovative services and applications for the organisation.

**Position and tasks of a GIS centre**

In figure 2.4 four possible main tasks of a GIS centre have been identified and have been put in an organisational context.

- A GIS centre is coordinating the sharing and use of data and software between different divisions or organisations. Internally it is coordinating the data sharing between different divisions and is e.g. taking care of software licences. If the organisation needs external data or software the GIS centre is obtaining it from external suppliers. One way of distributing data is by making use of a geo-portal accessible for users of data or software.
- A GIS centre also can provide GIS services and specific application to support the work of different divisions or organisations. These can e.g. be web-based services via its geo-portal, specific GIS software or tools, or contribute to projects in the organisation.
- A GIS centre can play an important role in standardisation of data, software and processes trough the organisation by developing common standards for data and software and standardise process. This should facilitate easier cooperation between different divisions and lead the efficiency and quality improvements.
- Finally it can play a key role in communication and promotion of GIS knowledge and innovations in an organisation. A GIS centre can raise awareness in different divisions and give support and training in implementing GIS. It also can scout new GIS developments and be innovative by itself and communicate those new developments in the organisation.

A GIS centre is obtaining geo-information, software and services from suppliers which ten are made available for the users of the GIS centre. An organisational SDI will facilitate the internal data exchange and the provision services in the organisation. For its external contacts the GIS centre will depend on higher level SDIs of networks of organisations, e.g. on national or regional level.

Internally – and possibly externally- services such as directories, search tools, community information, support resources, data and applications can be made available through a geo-portal (Maguire et al. 2005).Furthermore the GIS centre is facilitating a good environment for co-operation and interaction by coordinating and communicating standardisation of data and software in the organisation.

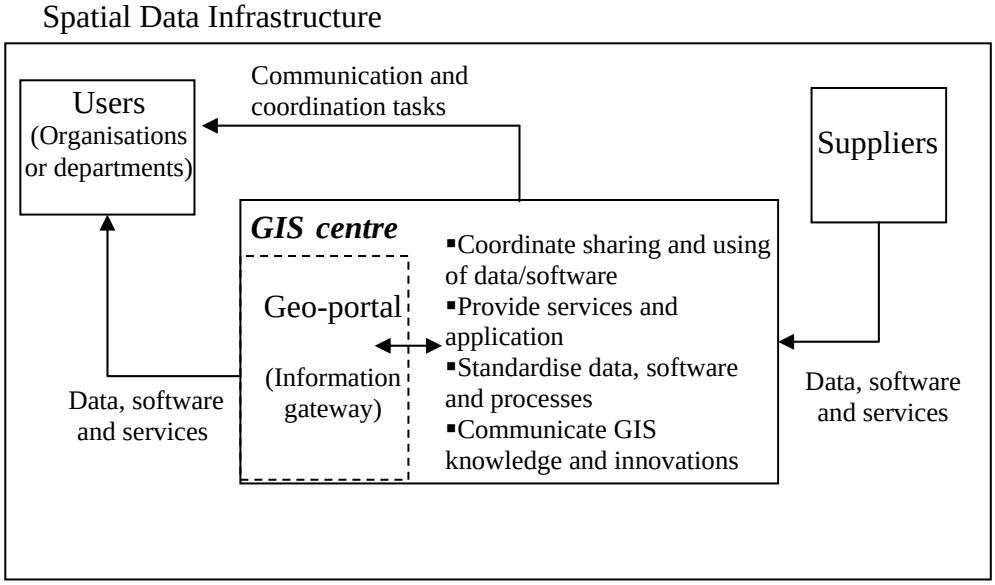


Figure 2.4: Position and tasks of a GIS centre

# Chapter 3
# Methodology

## 3.1 Survey methodology

To test the theories from literature a selection of seven case studies was made (see paragraph 3.2). The case studies should give a good insight in the current status of GIS centres and developments going on. However from literature there was not a method available to compare the organisation and development of GIS centres. Therefore was decided to design an own survey and use as basis for the survey the role and activities of the GIS CC, together with concepts for literature.
The survey covers different themes and was designed to have a framework for comparison between the case studies. The data was collected by having interviews with key persons of the GIS centres (see Appendix I). The themes, and for each theme predefined issues and possibilities, gave the framework to make different GIS centres comparable. The following themes and issues were covered by the survey (see also Appendix II).

Development and objectives: this gives a first general indication of the type of GIS centre and its main priorities. Issues covered in this part are the reasons for founding the centre and its development since then; the importance of different activities e.g. production (data and analysis), advice/consultancy, research and development, GI policy; the focus of the centre, e.g. centre inside a bigger organisation or a centre depending on external orders; and the main users of the centre. Based on those issues a general picture of the development and objectives of the GIS centres has been given.

Organisational and financial framework: this gives the organisational and financial framework the GIS centre is operating and its position in GI coordination. GIS centres can be organized in an official (legal) framework or work on project basis for a fixed time period or can be organized in other ways. Also the financial framework differs: centres can e.g. have a yearly budget based on the activities they need to carry or on the other hand need to (partly) get their own finance by working in project basis. The role the GIS centres play in GI coordination can also differ. Centres can have an official mandate and play an important role in the national coordination of geo-information standardisation and facilitating exchange, others don't. Based on those issues the position and structure of the different centres has been compared.

Products and services: There is a wide variety in products and services offered by GIS centres. In the scope of this research a difference has been made between data tasks, services and the portal site of the centre.

The basis of each selected case study is the data (geo-information) itself. However each centre can have different data tasks. For this research the following possible *data tasks* of a GIS centre have been identified: data collection from other centres; obtaining own data by measurements; documentation and cataloguing of data; data maintenance - keeping it up to date and complete-; distribute data to clients; distribute pre-processed data products e.g. maps

Next to data collection, distribution and maintenance the selected case studies also offer *specific services* to clients. Those services are provided on specific requests of clients that need support of the GIS centre. Three different types of services have been identified: GIS centres can operate as a kind of *consultant* on specific demands and make analysis and give advice on GIS related issues. They can also work on specific *GIS applications* and tools and implement and maintain them. Another important service a GIS centre can provide is GIS *education and training* in GIS.

Next to the services on request most of the GIS centres also run a website with a portal. All the case studies have a website which gives information about the GIS centre. Most of them also have a portal site offering different services. The following services have been identified: searching for (meta)data; map visualisation possibilities of the data; downloading of data; online analysis of the data; e-business activities. GIS centres can have different combinations of these web-based services.

Obstacles for GIS centres: The GIS centres are under constant development and are meeting several obstacles that need to be overcome. Information sharing, exchange and use of GIS are suffering different kind of problems. Craglia et al. (2004) has identified a number of frequently occurring obstacles by comparing different European SDI's. The GIS centres are confronted with a number of those SDI problems. For the specific context of the GIS centres five possible obstacles have been identified.

- Gaps in spatial data (missing or incomplete) and lacking of documentation (incomplete description).
- Incompatible spatial data sets (combination between data sets not possible)
- Barriers to sharing an re-use: cultural, institutional, financial and legal barriers prevent or delay the use of existing spatial data.
- Lack of coordination and leadership; level of coordination is weak and insufficient.
- Insufficient GIS knowledge and not enough consideration given to crucial need for capacity building (education, training) and targeted research.

Those five obstacles have been the basis for further discussion on the main obstacles that impede an optimal functioning of each centre and the way dealt with those obstacles. Additional was tried to identify more obstacles for each GIS centre.

Expectations for the future: Different criteria have been identified to indicate how GIS centre will develop in the future. Indicators have been partly taken from Crompvoets (2004). GIS centres have been asked what they expected will happen to their budget, manpower, and number of data sets and how this is related to developments in the past.
To get insight in expected future developments interviewed persons have been asked about different issues: new GIS products and services the centre will introduce the coming years; development of the GIS centres itself e.g. more or less resources available; its future position in the GIS field, will it e.g. become part of a bigger national centre or will it grow on its own. This enabled the interviewed persons to give their vision on the future of their centre and a general vision on developments in the GIS sector.

Input for survey themes and predefined issues and possibilities issues came from observations in the GIS CC, policy documents of the GIS CC (Dienst Landelijk Gebied et al. 2004; Dienst Landelijk et al. 2005; GIS-Competence-Centre 2005) and a first look via Internet on activities of other GIS centres. The theme organisational framework has been based on the organisation of the GIS CC and theories of the organisation of a Shared Service Centre (Strikwerda 2005). General input for the survey came from interviews with Jaap Berends, a GIS consultant and Adri van de Brink, chairman of the Dutch national clearinghouse (NCGI).

## 3.2 Case studies and data collection

**Selection of case studies**

The starting point for the selection of the case studies has been the position of the GIS CC. The objective was to find comparable initiatives that have similar roles and activities as the GIS CC.
On basis of policy documents, practical work and observations in the GIS CC the position and priorities of the GIS CC have been identified (Dienst Landelijk Gebied et al. 2004; Dienst Landelijk Gebied et al. 2005; GIS Competence Centre 2005). Four main tasks have been identified (see figure 3.1.)

On basis of those policy documents a distinction between (standard) products and (specific) services became clear. Examples of standard products are: the management and distribution of spatial-information layers; provide standard GI analysis; facilitate the use of GI applications. Examples of services are: advices on applied use of GIS; spatial analysis and geo-visualisation; functional management of specific spatial information layers. The services will be only provided on specific external are internal demands often in a project context where the GIS CC only does a part of the work.
Next to the products and services the tasks and role of the GIS CC goes further. One of the priorities of the GIS CC is to coordinate and facilitate the use of GIS in the whole LNV ministry. The centre needs to make a key contribution to the LNV vision on content and use of geo-information, and the necessary framework and preconditions (GIS Competence Centre 2005). Part of it the work is also to develop and manage LNV wide the geo-information architecture and signal unwanted developments.
The GIS CC needs also to take care of external administrative representation of LNV in the GIS field. This means that the GIS CC is responsible for contacts with data providers and other stakeholders in the GIS field. An example is to develop a common data purchase strategy with other ministries.
The GIS CC should also be an innovative centre that is thinking and working on the development and application of new innovative products. It should facilitate developments and keep the knowledge of spatial information applications up to date. It should stimulate and promote the use of applied GIS within the ministry of LNV and make it an integrated part of the working process.

| | |
|---|---|
| Provide geo-information Products | Provide services and Consultancy |
| Facilitate and Coordinate GIS use | Innovation and development of GIS products |

Figure 3.1. Main tasks of the GIS CC

Next to tasks identified from the policy documents more general additional criteria were added. The GIS CC is operating in the public sector therefore the focus of the study was on service oriented centres (partly) based in the public sector.
A choice was made to include national as well as international case studies. The expectation was that this would give the most interesting results. National centres give a good insight in the national context where the GIS CC is operating. International centres should give an insight in international developments and give a different perspective on how a GIS centre can be organised.

The number of case studies was limited because of the chosen methodology to obtain information about the centres. The choice was made to have a more in depth analysis by having interviews representatives of the centres and to visit the centres.

A quick scan was necessary to identify potential interesting case studies, because there were no studies available that defined and described different types of GIS centres. For this quick scan experts were consulted and a literature study was carried out.
For the national cases the ideas came from experts of the GIS CC and the university and additional studies of Internet and policy documents. A first analysis on basis of figure 1.1 identified the four potential most interesting national case studies:

- the GIS competence centre itself;
- Advies dienst geo-informatie en ICT (AGI), a governmental GIS centre in another Ministry;
- kabels en leidingen informatie centrum (KLIC); the Dutch national information centre for cables and pipes;
- Centre for geo-information (CGI), a centre for fundamental and applied research providing data and geo-services to different users;

Other national centres like kadaster and RAVI were considered, but were finally not chosen. They both don't fit very well in the definition of a shared service centre and do not carry out all four identified tasks. Kadaster has not a GI coordinating/facilitating task and the centre was considered as less innovative. RAVI is a platform for discussion and was not considered as a centre delivering GI data products and services.
For the international case studies the ideas came from experts from the university and the GIS CC and additional studies of the INSPIRE state of play reports and the study of the GINIE project (GINIE 2003). Those studies indicated in which countries most interesting developments were going on and where GIS centres played an important role in those developments. The three case studies selected are: GIS Vlaanderen (Belgium); Landesvermessungsamt Nordrhein-Westfalen (Germany); and IDEC (Spain). They carry out all four tasks identified in figure 3.1 and are seen as good practices and central nodes for the use of GIS and (national) coordination of Geo-information.

**Data collection**
After the survey had been developed and the case studies selected data collection could start. In the first phase as much as possible information was collected using Internet pages of the centres, and obtaining policy documents and other information e.g. articles and papers, available about the centre. A first description of each GIS centre was made using the survey as framework for description. Not all the necessary information could be obtained. Additional information and verification of collected information was necessary.

Therefore in the second phase interviews were prepared. For each case study at least one person of the GIS centre needed to be interviewed. It was important to interview a key person of the centre who had an overview over the whole organisation and activities of the GIS centre. Good representatives of the centre needed to be found and appointments with them needed to be made. The survey needed to be the guideline for the interviews, but for each case study different questions needed to be prepared because of the different context of each GIS centre and the differences in collected data from the first phase. The interview techniques were trained inside the GIS CC by interviewing different persons there.

The third phase was to visit the other GIS centres and to have an interview with a key person. The interviews took approximately one hour and all themes abstracted from the survey were discussed. To get useful information for comparison on some issues possible answers were indicated e.g. possible data tasks, services and obstacles. Subsequently the interviews have been worked out in a report and sent back to the interviewed person enabling to give comments or to make additional remarks. These comments were processed and put in the report of the interview.

# Chapter 4

# Results

## 4.1 Introduction

The first step in the data analysis was to give a good description of each GIS centre separately. The report about collected information and the interview report were used to give a good picture of each GIS centre. In paragraph 4.2 all seven case studies have been described extensively per theme. The objectives, position, activities, main obstacles and future plans of each centre have been identified.

The second step was to make a comparison between the GIS centres. Every survey theme has been analysed separately in paragraph 4.3 by using tables and describing similarities and differences between centres. This should give a better insight in the different types of centres existing and also make it possible to identify common main obstacles of all centres and compare ideas about the future and possible trends.

In the third step the results of the survey have been compared with the concepts identified in chapter 2. For each concept has been explored till what extend it can be applied on the case studies. The organisation and activities of the GIS centres have been compared with organisational theories behind a shared service centres. The role of the GIS centres has been explored using the models for SDI development and using the GIS diffusion paradigm. Finally the tasks and position of each centre have been compared with possible main tasks of GIS centre identified in figure 2.4.

## 4.2 GIS centres

### 4.2.1 LNV GIS competence centre

**Introduction and objectives**

*Introduction*
The LNV GIS competence centre (GIS CC) has been founded in Januari 2005 by the Dutch ministry of agriculture, nature and food quality - abbreviated in Dutch as LNV -. The establishment of the GIS CC is an important step in the GIS strategy of LNV. The GIS CC needs to bring together data and GIS knowledge of LNV and its partners. The GIS CC should become the centre for GIS related questions, products and services of LNV and its partners. Next to this it should also stimulate new developments, innovations and GIS diffusion in the LNV ministry.
The centre is a 'virtual' cooperation between two LNV agencies: the service for land and water management - abbreviated in Dutch as DLG - and the National Service for the Implementation of Regulations - abbreviated in Dutch as DR -. Both services are important GIS users and have already a good level of GIS knowledge. Therefore was decided to join forces and to establish the GIS competence centre that should become a GIS centre for the whole LNV Ministry.

*Reasons for founding*
There were three main reasons for founding the GIS CC:
Firstly the GIS use and developments in LNV were fragmented because an overall coordination was lacking. The available GIS knowledge and skills were spread over different divisions and the GIS developments took place at different places in the organisation.
Secondly the establishment of a GIS Competence centre fits in a general trend in the public service to establish shared service centres. Efficiency improvements reached by integrating GIS knowledge and data of two agencies should reduce costs and lead to quality improvements of services.
Thirdly the GIS CC should stimulate new developments, innovations and GIS diffusion within the LNV ministry. GIS should become a more integrated part of working processes within LNV. This also fits with the ambitions of the two agencies that see GIS (innovative) services as a priority for their organisation.
Next to those three reasons also the enthusiasm and commitment of individuals and the support of the management level of the two involved agencies were important factors to establish a GIS CC.

*Activities*
Main activities of the GIS CC are production activities, which are about 40% of the work. The GIS CC takes care of the data management and data infrastructure of LNV and is maintaining GIS applications. Next to this it is also is developing new products and application and is it working on GI policy, e.g. standardization and architecture, for creating a vital spatial data infrastructure for LNV. It also has a representational function in committees and is involved in cooperation with other governmental bodies to facilitate easier data exchange. Geo advice is another task, which is about 40% of the work; the GIS CC gets specific orders for giving advices about the use of GIS in projects and the development of specific applications and visualisations.

*Users*
The main users of the GIS CC are internal users from LNV, with a substantial part coming from DLG and DR. A small part of the users come from outside LNV, but they all have a link or partnership with LNV. The GIS CC will not work on a commercial basis with other partners. However the GIS CC needs to be an accountable and customer-oriented unit working with accountable orders, agreements and contracts.

**Organisational and financial framework**

*Institutional framework*
The GIS CC is a 'virtual' cooperation between DR and DLG with the two principals of those services as the formal principals who together directing the GIS CC. They decide about the tasks, strategy and budget of the GIS CC on basis of a year plan. The GIS CC is hierarchical impeded in both services (see fig. 4.1). The head of the GIS CC is reporting directly to the directors of DR and DLG. And they report to the LNV board (in fig 4.1 bestuursraad). The GIS CC works together with the IFM department - the department of LNV developing general ICT policy - in formulating GI policy. In practice the GIS CC can operate quite independently and has also freedom to define its activities.

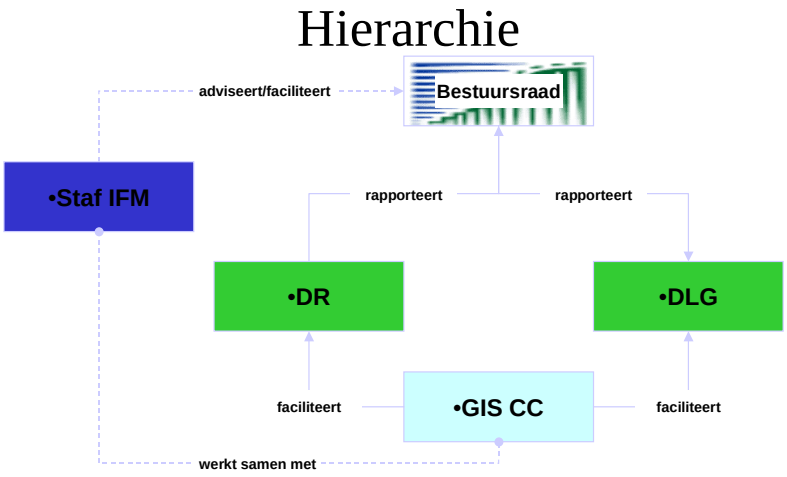


Figure 4.1. Organisational structure of the LNV GIS CC (GIS Competence Centre 2005)

*Budget*
The GIS CC has a total staff of approximately 25 FTE. Most of the budget is coming directly from the ministry of LNV for delivering basic products another substantial part is coming from DR and DLG services for delivering specific products and services. Orders from outside LNV also gain some revenues.

*Position in GI coordination*
The GIS CC has no mandate to enforce standardisation or a common purchase strategy in LNV. This needs established by general agreement, good contacts and delivering good standardized products used trough the organisation. In the national GIS field LNV has strengthen its position by joining forces and can play a bigger role in developing GI policy and common purchase strategies.

**Products and services of the GIS competence centre**

*Data products*
Data providers from outside the GIS CC supply 95% of the data, only a small amount is obtained by the GIS CC self. The GIS CC is cataloguing the data in databases, describing it by using metadata, and is maintaining it by keeping it up to date. The data is also further distributed inside LNV and to LNV partners and relations also by facilitating the downloading of data. Processed data products are provided in limited amounts and not on commercial basis.

*Services*
GIS Analysis and advices for specific problems and giving support to other LNV projects are important services of the GIS CC. The development and implementation of specific GIS applications is another

service of the GIS CC. The GIS CC is not giving GIS training or education for LNV employees, but is sometimes arranging courses for them. Other services of the GIS CC are representation in committees and the development of own GIS tools.

*Portal*
The GIS CC is developing a portal site accessible for LNV employees via the Intranet. This should be informative about the products and services the GIS CC offers and facilitate web services like: search of (meta)data by using map visualization capabilities; downloading of data; and basic analysis like overlays of maps. The portal will not be used for e-business activities and will not be accessible for people from outside LNV.

**Obstacles**

*Data obstacles*
The data is not an obstacle for the GIS CC; the data sets are complete, there are no important data lacking, the data sets are compatible and well documented.

*Barriers to sharing and re-use*
The main obstacles are institutional and financial barriers. The high costs different governmental bodies are charging each other impede an easy exchange of data. Also special conditions in contracts can hinder the use of data. A legal barrier is the strict privacy regulations for the use of the basic registration of parcels.

*Capacity building*
Another obstacle is the lack of GIS capacity building (investments) and awareness in other parts of the LNV organisation. The management level is not aware yet of the importance of GIS for the organisation.

**Developments and future expectations**

*Developments*
The GIS CC expects a moderate grow for the future because of a growth of GIS use within LNV. In this case more support will be necessary for LNV employees. Another possible development is that GIS employees of regional offices become part of a joined GIS CC.

*Indicators of development*
Those developments will lead to a moderate grow of budget and employees, but the amount of datasets will be the same. The GIS portal needs to grow and attract an increasing number of visitors. The GIS CC will continue working on new products and services, but there are no specific areas of growth. Giving more GIS support to LNV employees and working process will probably become a more important activity.

*Future position of GIS competence centre*
It is possible that the GIS CC will become part of a bigger organisation. An organisation together with the ICT service is possible, but then the GIS CC will loose its innovative and developing character.
A national GIS centre is not expected for the coming years. Another possibility would be becoming an independent agency together with other governmental bodies, like the cadastre, or in a PPS construction with Alterra, but for both of those options many obstacles need to be overcome. Most probably the current organisational structure will be in place for the coming years.

### 4.2.2 Centre for Geo-Information

#### Introduction and objectives

*Introduction*
The centre for geo-information (CGI) is part of the Wageningen University and Research centre (WUR). The WUR consists of a University part with five departments and a research part with five institutes. The CGI has emanated from a close cooperation between the University department environmental sciences and the research institute for the green world Alterra. The objective of CGI is to develop and transfer knowledge in the area of geo-information science and to give geo-information a recognisable place in the WUR organisation. The ambition of CGI is to be the best in the geo-information field. It needs to deliver high quality products, a good interdisciplinary cooperation and constantly develop and maintain its knowledge.

*Reasons for founding*
The most decisive occurrence for the development of the centre for geo-information has been the merger between Wageningen University and a numerous national agricultural research institutes; together they form the Wageningen University and Research Centre. Fundamental and applied research met within this merger and in 1998 the Centre for Geo-Information - offering both education and research - was born. The merger gave the opportunity to combine the best of both worlds and create synergy between the scientific and applied research.

*Activities*
The main activities of the CGI are to perform research and to provide data and geo-services. It has an own geo-portal, GeoDesk offering data products and services to internal and external users. CGI is executing independently orders and is also cooperating with other departments in the organisation, in a more advising and supportive role. The co-operation between the university and Alterra results in a combination of fundamental and applied research. The University concentrates on research in the geo-information domain itself, whereas the research institute focuses on research domains that make use of geo-information. CGI has also a division for ICT services called W!SL, providing specific ICT services for customers inside and outside WUR.
CGI is not directly involved in GIS policies and has no representative functions in committees or governmental bodies.

*Users*
CGI is working for internal and external customers. It is delivering data, services and giving GIS support to other departments inside the WUR. External orders for CGI are mainly coming from LNV, as a result from a historical relationship. CGI sees its self as knowledge supplier of LNV and is taking care of a part of the LNV spatial data infrastructure and web services. Orders also come from other governmental bodies and sometimes private parties. The University part of CGI is depending on general money for giving education and doing research and project based national and EU funding for scientific research.

#### Organisational and financial framework

*Institutional framework*
The WUR consist of a University part and a part research institutes. The LNV ministry is responsible for the University part and follows the educational directives of the Ministry of education. The WUR research institutes have emerged from the former DLO research institutes of the Ministry of LNV and are now part of an independent foundation. The foundation holds five different independent research

institutes without profit objectives, but they need to compete in the free market for orders. Next to this the University departments and research institutes together founded knowledge centres of which the CGI was one of the first to be established. Figure 4.6 shows the organisational framework in which the CGI operates. The CGI has two division: CGI U(niversity) providing education and doing fundamental research and CGI A(lterra) doing applied research for customers; together they run a geo-portal called GeoDeks, which provides data and services; within CGI Alterra W!SL portals and W!SL monitoring and evaluation together run the service desk providing GIS ICT services to customers within Wageningen UR and for relations of Wageningen UR.

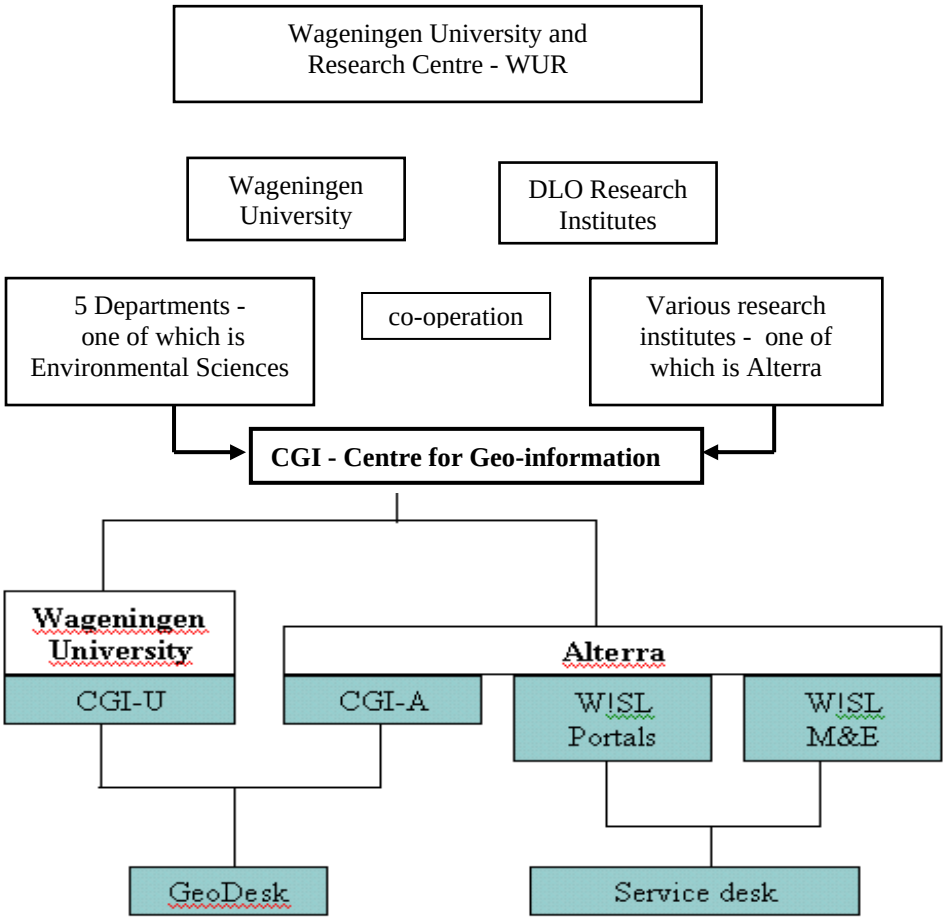


Figure 4.2. Organisational structure of the centre for geo-information (adapted from nieuwenhuis 2005)

*Budget*

The CGI is organized and works as a business case, but has no profitability objectives. Internally in the WUR payment is also business oriented; the hours need to be accounted. The three divisions of CGI are getting their financial resources in different ways.

The CGI-university gets a fixed yearly budget to perform their educational task from the University and is getting additional funding for doing mainly fundamental research via research programmes from the EU and the national government.

CGI-Alterra gets funding from research programmes and needs to get orders from the market. A major client of Alterra is still the Ministry of LNV, but Alterra is also carrying out orders for other governmental bodies and -sometimes private parties, but only if the orders have an innovative character.

*Position in GI coordination*
CGI has no responsibilities for a (spatial) data infrastructure or standardisation of geo-information in the WUR. Divisions of the WUR are working independently and need to have freedom to be self-innovative with GIS. The ICT infrastructure is centralised and is be maintained by the ICT service.
On the national level the CGI has no formal mandate in coordination of GI, but plays an important role by its research e.g. for the further development of the national spatial data infrastructure.

**Products and services of CGI**

*Data tasks*
CGI is collecting data from other centres e.g. it is buying satellite data and aerial pictures. It is also obtaining it is own data by field measurements and making aerial pictures and is documenting and cataloguing the data e.g. by creating metadata and maintain the data by keeping it up-to-data. Those (pre-processed) data set are also being distributed, mainly inside the WUR and for LNV. In CGI the data collection and distribution is the responsibility of the GeoDesk.

*Services*
CGI is taking orders for specific analysis, is giving advices on demand, and is developing and maintaining GIS applications and tools. It also has an important supportive task for GIS users in the WUR organisation. CGI is educating University students and is also giving some specific training to other clients. Services provided by CGI are policy support systems for decisions on natural resources; monitoring of rural areas, at national and global levels; integration of geo-information and remote sensing in process models for (spatial) planning and scenario studies; new methods of visualisation and communication of geo-information.

*Portal*
There is a public accessible website which gives information about CGI products and services. The geo-portal GeoDesk gives the possibility to search in the metadata, also using map visualization capabilities. There is no facility to directly download the data, and no tools on the website to analyse the data. There is no selling of value added products directly on the website, but this is underdevelopment.

**Obstacles**

*Data obstacles*
For the CGI no data obstacles exist; data sets are complete and no important data sets are lacking and the data sets are compatible and well documented.

*Barriers to sharing and re-use*
Several institutional obstacles can be identified that impede a good exchange and use of information. Prices charged by other (governmental) institutes for use of their data sets are high. There is a lack of a central coordination and vision about how to manage and finance geo-information in the administration leading to useless transactions of governmental money.

*Capacity building*
In the WUR sufficient knowledge about GIS is available; lack of GIS capacity is not a problem. However the knowledge and use of Remote Sensing is lacking behind.

Another obstacle of the CGI is the relation with private companies. Discussions about if the CGI should leave certain orders to private companies occur from time to time. The most important criterion for CGI is that a project needs to be innovative; CGI has no intention to operate as a private company.

**Developments and future expectations**

*Developments*
The ambition of the CGI is to continue with a steady grow like it did in the past. A priority will be to strengthen its international position and to be known as an international knowledge centre. It is also a priority is to stimulate developments and use of Remote Sensing techniques. A good opportunity is to further develop the axe between the LNV GIS CC and CGI. The establishment of the LNV GIS CC will offer new opportunities for CGI. A risk for CGI is the dependency on LNV orders. In the future it can become less self-evident that CGI gets orders from LNV e.g. because of political or institutional changes.

*Indicators of development*
Since its foundation in 1998 CGI had a steady grow in budget and employees. At the moment around 50 employees are working for CGI; including W!SL even 75. - W!SL was until recently a private company after being started from CGI, but is now part of CGI again - . The budget is now around 5 million euros each year. A continuation of a steady growth in employees and budget is expected.
The amount of (data) products, services and partners showed a steady growth since the establishment of CGI. The CGI has developed many innovative products and services during the past years and is intending to continue do so the coming years.

*Future position of centre*
CGI is historically together with DLG the green axe for knowledge and this position will not change. This axe might be further strengthened because the recently founded (DLG) GIS CC will provide new opportunities for further development of the GI field for the green space.
No spectacular organisational developments will take place in the general GI field. Different organisation will not run in competitions with each other because there are still enough GI possibilities and developments to explore. A national GIS centre will therefore not be established.

### 4.1.3 AGI

**Introduction and objectives**

*Introduction*
AGI is the advisory service for geo-information and IT of the DG for public works and water management - in Dutch Rijkswaterstaat (RWS) – which is a division of the Ministry of transport, public works and water management – in Dutch ministerie van verkeer en waterstaat (VenW). AGI supports core tasks of RWS and VenW by providing good, certificated, and standardised geo-information and an ICT infrastructure. AGI is responsible for IT as well as for geo-information, but has separated division for both (see figure 4.3).
AGI has recently been established after a reorganisation of work in RWS. The choice to integrate Geo-information and IT in AGI has been based on developments in the past. Responsibilities for geo-information files and GIS systems and IT services were already integrated in one single division of RWS.

*Reasons for founding*
In 2003 was decided to change the name of the division responsible for IT and geo-information into AGI -advisory service for geo-information and IT -. This name fits better with the responsibilities and activities of the division. The operation took place in the context of a reorganisation and restructuring of RWS. An important objective of the reorganisation process was to stop fragmentation and scattered developments of geo-information and IT in RWS.

*Activities*
AGI has two divisions, one responsible for IT and one responsible for geo-information. The geo-information division has a supportive task and is the GIS knowledge centre of RWS. AGI takes care of the organisation wide availability of geo-information layers and provides and maintains GIS tools. It also has an advisory role in projects using geo-information, and is implementing and developing of new products. AGI also has supportive staffs dealing with GI policies in RWS like network architecture and standardisation of information. They also carry out market scans to identify new GIS developments. AGI is an important actor in the Dutch GI field and has therefore also several representational functions in national bodies and committees.

*Users*
The primary focus of AGI is to support working processes in the RWS organisation. AGI has a national task concerning the AHN – Actual height model of the Netherlands - and NAP – reference point for elevation data of the Netherlands. Those tasks are carried out together with provinces and water boards and the information layers are used by many organisations in the Netherlands. Sporadic AGI is taking orders from outside VenW, e.g. in European projects.

**Organisational and financial framework**

*Institutional framework*
RWS is one of the DGs of VenW, and by far the biggest with over 11.000 employees. RWS is divided in six specialised divisions or services with a similar size. AGI has a supportive task for the other five services and has many interactions with the other services. The other services are specialised in: traffic and transport; building engineering; road and hydraulic engineering; coast and sea; fresh water management; and waste water treatment. They develop knowledge necessary for VenW policy making and implementation.

AGI has been further divided into three divisions (see figure 4.3): one for IT; one for geo-information; and one for management (directie bedrijfsvoering in fig 4.3). A staff department (bureau HID in fig 4.3) is supporting the directors of AGI. This research will focus on the activities of the geo-information division.

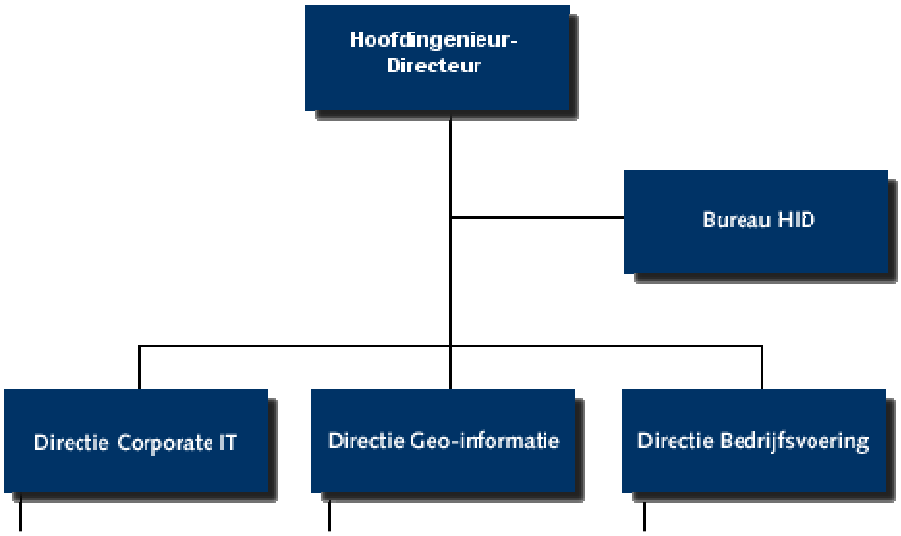


Figure 4.3. Organisational structure of AGI (www.rws.nl/rws/agi/home/)

*Budget*

AGI has 500 employees, with 120 employees working in the geo-information division. The yearly budget of AGI is around 120 million euros of which 40 million goes to geo-information. The budget is coming from VenW and is being accounted on basis of a year plan. No internal accountability takes place for services supplied by AGI to other VenW divisions. This has been discarded because of the administrative burden it implied.

How data request from outside VenW are handled depends on the requested products. There are no general guidelines for requests, but for the AHN and NAP accounting construction has been developed with involved partners. AGI has a preference to provide its products as much as possible for supply costs.

*Position in GI coordination*

An important objective of AGI is standardisation of geo-information and GIS use in RWS. AGI has the mandate to enforce standardisation by drafting directives that are binding for the RWS organisation. AGI needs to signal unwanted developments, but is not enforcing standardisation. The directives need to be accepted by the directors of the other RWS services.

On the national level AGI is an important actor in the GIS field and plays a significant role in developing GI policy and common purchase strategies, but has no official mandate for it.

**Products and services of AGI**

*Data tasks*

AGI is collecting data from other centres and own specific information and is distributing it in RWS and VenW. The collection of own specific information is out boarded to private companies. AGI self is taking care of the documentation and cataloguing of the data. Keeping the data up-to-data and complete is extremely important for the activities of RWS.

AGI is also supplying data to other organisations, mostly using DVDs, but a transition is made to use more web technologies. AGI is also offering several processed data products mostly based on information derived from projects.

*Services*
AGI is giving support to RWS projects and is carrying out specific GIS analyses. Under supervision of AGI also applications are being developed and maintained, but the actually development is done by private companies. Knowledge development is also a task of AGI; it takes care of GIS trainings for RWS employees. Furthermore AGI is responsible for the management of the software licences.

*Portal*
AGI has a public accessible web portal that's providing information about its products and services. The web portal gives the possibility to look for (meta)data and is using map visualisations. Directly downloading of information is possible and also functionalities for doing analysis are available. The distribution of data to external customers should be in the nearby future run automatically; updates and adjustments should automatically be provided to the customer.

**Obstacles**

*Data obstacles*
Main obstacles for AGI are incomplete or missing datasets and datasets not being well documented. Data sets not being updated and therefore not being reliable is another important obstacle. This causes compatibility problems between datasets not originating from the same source. The reason for those problems is the historical development of different parallel infrastructures in RWS. Every problem had its own specific solutions; there was no coordination and no long-term perspective in the RWS organisation, leading to disintegration and overlap of datasets, problems in updating of information, problems finding the right information and data models not being compatible.

*Barriers to sharing and re-use*
There are no financial, institutional or legal barriers that impede a good exchange and use of data, probably because AGI is working with own data and mostly internally in RWS.

*Capacity building*
There is enough GIS knowledge and capacity available in RWS.

**Developments and future expectations**

*Developments*
GIS will become a normal part of working processes. The experimental phase for GIS is over; slowly GIS is growing up and is becoming mature. The role of AGI is to further support the process of making GIS an integrated part in working processes. The objective of AGI is not to stimulate GIS use, but to support the use of GIS. AGI will e.g. for the construction of a road take care of the GIS knowledge next to other knowledge necessary to construct a road. The process of growing up also includes further professionalism of GIS in management; less fragmentation and scattered developments and more uniformed and linked GIS.

*Indicators of development*
An increase in budget and number of employees is not expected. However it is possible that more GIS specialists now working in other divisions of the organisation will become part of AGI leading to an increase of employees and budget. The number of datasets will decrease; datasets will become bigger and detailed datasets will be aggregated leading to a decrease of the number of datasets. More data will become available via geo-services and web databases. This will lead to an increase in number of visitors and users of the website.

*Future position of AGI*
There has been no discussion to separate IT and geo-information. In the future this might be discussed again. There is a strong link between GIS and IT, but between geo-information and IT this link is less evident.

It is possible that AGI geo-information in the long term future will develop to the central information centre of RWS. All basic data and work processes related to information processing can be brought into one information centre, not only specific geo-information, but also information collected by other RWS services.

On the national level a ‘virtual’ cooperation between different national bodies, services and ministries working with geo-information has many advantages. National cooperation will make it easier to develop a common purchase strategy and to better organise knowledge exchange. Provinces, municipalities and water boards will have a national GIS contact point and will be able to use GIS knowledge of the national level.

### 4.1.4 KLIC

**Introduction and objectives**

*Introduction*

KLIC is the Dutch information centre for cables and pipes and is a national foundation to prevent damaging of cables and pipes. KLIC is providing information about the location of cables and pipes to diggers in case of intended works. Figure 4.4 shows the procedure: diggers make a request to KLIC and indicate the location of the digging activity; KLIC is informing the cable and pipe managers in the area; the managers provide, within 3 days, the information about the location of the cables and pipes to the digger. In 2008 the Internet application KLIC online will be introduced and the procedure will change. Figure 4.5 shows the new procedure: A authorised digger will indicate online where exactly he is going to dig and KLIC online will show him automatically, and with high accuracy, the latest data about the underground infrastructure.

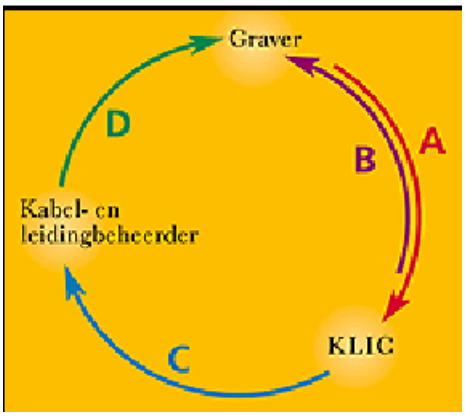


Figure 4.4. KLIC procedure (www.klic.nl)

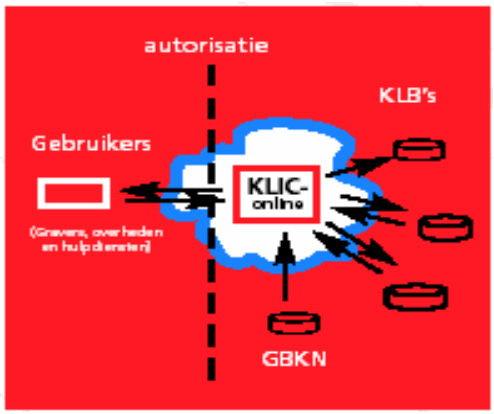


Figure 4.5. KLIC online procedure (www.klic.nl)

*Reasons for founding*

KLIC has been established after conflicts between road constructers and cable and pipes managers. Without political pressure all stakeholders saw the advantages of an information centre for cables and pipes. KLIC has two main tasks:

1. Initiation of measurements to reduce digging damage, e.g. by informative campaigns and involvement in different projects;
2. Supply of necessary information about the location of cables and pipes to diggers.

*Activities*

KLIC is facilitating information exchange between diggers and different cable and pipe managers. The data collection, management and distribution of the data are the responsibilities of cable and pipe managers. In the future KLIC online will facilitate direct information exchange between digger and manager. Data of the cable and pipe managers needs to be directly available for KLIC online, which will give KLIC a more coordinating function.

*Users*

Around 900 companies and governmental bodies are member of the KLIC foundation, including all distributors of energy, water, and cable- and telecom companies. KLIC is processing around 160.000 requests from diggers and is passing on more then 1.100.000 requests to cables and pipes managers.

**Organisational and financial framework**

*Institutional framework*
KLIC is a foundation lead by a committee with representatives from participating parties. KLIC also has a director responsible for the daily management. Membership of KLIC is on voluntary basis, but almost all cables and pipes managers are member of KLIC. To become a member of KLIC a contract, stating the obligation of the membership, needs to be signed.

*Budget*
KLIC has a total budget of 2,5 million euro coming from the contributions of the cables and pipes managers. Diggers pay nothing for obtaining the information. KLIC has around 40 employees and 23 FTE.

*Position in GI coordination*
There is no standard for information about cables and pipes; every manager supplies the information in its own way. For the KLIC online application KLIC is together with other parties working on a standard information model.

**Products and services of the centre for geo-information**

*Data tasks*
KLIC has no information about the exact location of the cables and pipes. It is only registering which cables and pipes are situated in an area and who are the managers. The managers provide the information about the exact location to the diggers; KLIC is only processing requests. KLIC will become a more direct intermediate for information exchange with KLIC online, but the cables and pipes managers will still manage their own information.

*Services*
KLIC is not supporting users are data providers in their data management or is analysing data for them. KLIC online will make KLIC more service e.g. by supporting requests via its helpdesk and give training in how to use the system.

*Portal*
The website of KLIC is informative about the objectives of KLIC and possibilities to make a request. The website is also offering the possibility to make a request online using the KLIC atlas, offering the possibility to indicate the location of digging activities directly online with a polygon. At the moment the information supply is not digital, but KLIC online will offer the possibility to directly download the information or to receive it by email.

**Obstacles**

*Data obstacles*
KLIC doesn't have a full 100% coverage; a few smaller companies didn't join KLIC yet and some data get lost. Not all the data sets are up-to-data. This is the responsibility of the cables and pipes managers.

*Barriers to sharing and re-use*
The information is only stored by the cable and pipe managers and will only be provided on specific request from the diggers. This means that the information cannot be used for other purposes.

A financial barrier for the realisation of KLIC online is that all data about cables and pipes needs to be digitalised and vectorized, which implies high costs for the cable and pipe managers. There are no technical barriers for the realisation of KLIC online.

*Capacity building*
Awareness rising among diggers for the importance of making a KLIC request is still necessary.
With building simple applications KLIC tries to avoid that users need to have specific GIS knowledge, everybody should be able to use KLIC applications.

Another barrier for KLIC is the time - three working days - between the request and the moment the information is supplied. This is to long for some diggers, but with KLIC online this problem will be solved.

**Developments and future expectations**

*Developments*
At the end of the year a new legal regulation concerning digging activities will be discussed in parliament. An official legal framework for digging activities will be established regulating that:

1. KLIC will be officially appointed as national information centre for cables and pipes;
2. Diggers will be obligated to inform about intended digging activities and need to pay for the information they get;
3. KLIC will become part of the cadastral office;
4. Information about cables and pipes needs to be available via the Internet using the KLIC online principle.

This will put KLIC in a new organisational framework and will give KLIC an official legal status. However the tasks and work of KLIC will not change very much.

*Indicators of development*
Every year there is an increase of 10-15% in the requests made. This increase will probably continue and will be managed by a combination of more employees, efficiency improvements and a small increase of budget. The amount of data sets will not increase much because most cables and pipes managers are already member of KLIC. New products KLIC is working on are: a guide for companies showing which cables and pipes are located in an area; and a guide which should support insurance companies.

*Future position of KLIC*
In 2008 KLIC online will give new possibilities for developing applications, e.g. an application for emergency services and calamities, and the use of KLIC information, e.g. for environmental risk assessments, calculations of road paths and coordination purposes. The linkage with cadastral data, in the new organisation structure, will also offer new possibilities.

### 4.1.5 GIS Vlaanderen

**Introduction and objectives**

*Introduction*
GIS Vlaanderen is a governmental GIS centre for geo-information, GIS knowledge and advice, and a central forum for GIS products in Flanders. Governmental bodies and other GIS parties provide their data to GIS Vlaanderen who takes care of the distribution. In the GIS vlaanderen framework every data provider gets access to the data of the other providers. GIS Vlaanderen is also an important contact point for governmental bodies and is giving advices about geo-information management and GIS use. GIS Vlaanderen was established in 1995 by the Flemish government and has received a legal status by the regional Decree of 17 July 2000 as an official collaboration between the Flemish Community, the Flemish Region, the Flemish public institutions, provinces and municipalities. The decree of GIS Flanders stated as objective: “Collaboration to stimulate and coordinate the optimal use of geographic information in Flanders”.

*Reasons for founding*
GIS Vlaanderen was established to optimise the elaboration, the use, the exchange and the maintenance of GI within the Flemish public administrations and institutions. GIS Vlaanderen needed to improve governmental GI services, introduce quality standards for GI, uniform reference data, and better coordinate GIS activties.

*Activities*
The main task of GIS Vlaanderen is to stimulate and coordinate the use of geographic information.
GIS Vlaanderen is the Flemish centre for geodata. Data producers provide their data and GIS Vlaanderen is checking the data to see if quality standards are met and facilitates distribution of the data. They also extract information from the data and develop GIS applications.
GIS Vlaanderen is doing specific analysis and has an advisory role in the public administration. It e.g. gives advices to municipalities about obtaining data and how to use GIS in their organisation. An important task is to increase awareness of the possibilities of GIS and geo-information and to give training in the use of it.
Research and development is done to build up expertise about technical evolutions and to build new GIS applications.
GIS Vlaanderen is the leading party concerning policy development in the GI field. It is coordinating the development of (meta)data standards and the development of the Flemish SDI.

*Users*
GIS Vlaanderen is working mainly for the public sector, but also private companies and citizens have access to data and services. It is an official collaboration of the Flemish public sector, but also third parties can enter by signing a cooperation agreement with GIS Vlaanderen. Federal institutes like the administration of the cadastre, registration and domains and the National Geographic Institute, have already signed such an agreement. The agreements are also open for private sector companies, but up until now GIS Vlaanderen has not entered into partnerships with the private sector.

**Organisational and financial framework.**

*Institutional framework*
GIS Vlaanderen is part of the Flemish land agency (VLM), an agency of the Ministery of Internal Affairs, Civil Servant Affairs and External Relations of the Government of the Flemish Region. Figure 4.6 shows the actors involved in GIS Vlaanderen. The tasks are defined and steered by a Steering

Committee, composed of delegates of the different partners. The Geographical Information Council is a neutral advisory body on issues concerning production, use and exchange of geographic information in Flanders. A Scientific Committee composed of representatives of the four major Flemish universities has an advisory role on issues of a scientific nature.

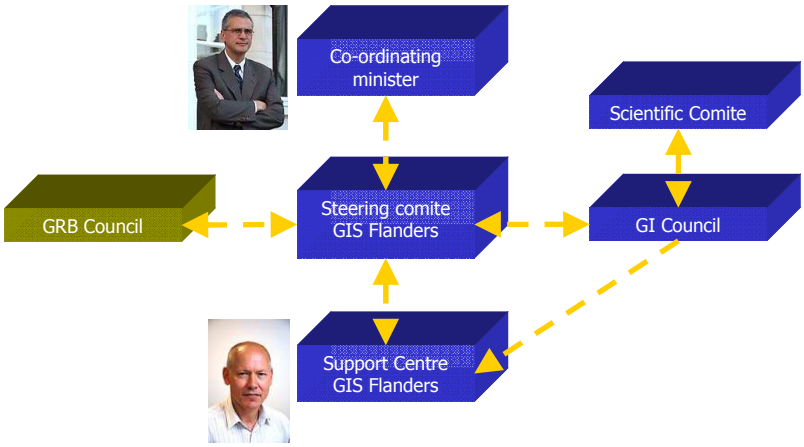


Figure 4.6. Actors in GIS Vlaanderen (www.gisvlaanderen.be)

The Support Centre (SC) of GIS-Vlaanderen is the secretariat and executive body responsible for the coordination, organisation and the provision of data and services. The SC is a department of the VLM and operates as the central contact point for anyone wishing to access GIS Vlaanderen. They are also the coordinator of the Flemish SDI and produces data itself.
The SC has two main entities: *Geographical information implementation*, responsible for customer related activities and facilitating application of data and information and *Geographical data infrastructure*, responsible for activities to optimise the geographical data and information content and the development of facilities like web services giving access to the data. Next to the two main entities there is also an *internal support* entity and a *project planning and operations* entity.

*Budget*
The funding model in Flanders is a combined model which encompasses both grants and cost recovery mechanisms.
The SC receives funding by means of a yearly contribution from the Flemish regional budget. This contribution secures the financial security of the coordination tasks of GIS-Vlaanderen. A number of projects are entirely financed from this budget and put at the disposal of the partners of GIS-Vlaanderen; other projects or co-financed by partners or third parties. The SC also receives remunerations for the provision of specific services, and for the provision and maintenance of reference and thematic files. Contributions of the partners in the operational costs of the SC are also a source of financing. Around 90 people are working for GIS Vlaanderen with an estimated budget of 7 million euro.

*Position in GI coordination*
GIS Vlaanderen is the leading party in GI policy development and is the coordinator of the Felmish SDI and standardisation of (meta)data. It is providing data quality guidelines for acceptance of the data set in the GIS Vlaanderen framework, but has legal binding competences to enforce data standardisation.

**Products and services of the centre for geo-information**

*Data tasks*
GIS Vlaanderen is the data centre of Flandres: data and metadata from different sources is being collected, checked and catalogued; data can be searched by its metadata, and is being distributed to users. The data is not being maintained; this the responsibility of the data owner.
GIS Vlaanderen is self producing and processing data, often out boarded to other organisations or private companies .

*Services*
GIS Vlaanderen has a supportive role in the Flemish administration and is providing different services. It provides analysis and giving specific advices on GIS related issues to the Flemish public sector. It is also facilitating and improving the GI–services of the public sector by developing new applications and gives advice about the implementation of technical guidelines and standards. It is not providing training or education.

*Portal*
The website is informing visitors about products and services offered by GIS Vlaanderen. The website facilitates searching for metadata and is using map visualisations. Direct downloading and buying of data is possible by its portal called GIRAF. Analysis on the website or not yet possible but the functionality already exists.

**Obstacles**

*Data obstacles*
The data sets of GIS Vlaanderen are not covering the complete Belgium territory; GIS Vlaanderen is only responsible for information from Flanders and not for information from Wallonia.
The quality check of datasets makes sure that data sets are compatible, but compatibility can always be improved.

*Barriers to sharing and re-use*
There are no institutional or legal barriers for sharing and re-using of data. GIS Vlaanderen is the coordinating body and is providing a satisfying institutional and financial framework. However the cooperation between different governmental services on the federal level can be improved for example by the development of a common data purchase strategy.

*Capacity building*
GIS Vlaanderen is well known in the Flemish GI sector and also citizens know it because of the aerial pictures on the website. Lack of knowledge and awareness is not an obstacle for GIS Vlaanderen.

A problem of the centralisation and standardisation of geo-information is the loss of flexibility and freedom. The rules or sometimes to restrictive and can impede data collection for specific uses and own applications.

**Developments and future expectations**

*Developments*
GIS Vlaanderen will keep its position as coordinating body for GIS and geo-information in the Flemish administration and will continue developing new GI services and applications. An important new task will be to develop the large-scale reference data for Flanders. This will imply a bigger workload for GIS till 2015 and a further grow afterwards when the data can be used.

*Indicators of development*
GIS Vlaanderen has grown in the last ten years from an organisation of 5 people and 3 projects in 1995 till 90 people and 150 projects in 2004. A further increase of budget and staff is expected due to new services and tasks and an increasing number of data sets.
The most important new development for the coming years will be more and better web-based services. There are no high expectations for 3D GIS, because of lack of good applicable data, and also in the area of Remote Sensing there will be no major developments.

*Future position of GIS Vlaanderen*
GIS Vlaanderen has a solid organisational and institutional position, also for the coming five years. In the future it will get a more supportive and advisory role. Partners will more and more make use of GIS and will need support and advice for the usage.

### 4.1.6 IDEC

**Introduction and objectives**

*Introduction*
IDEC (spatial data infrastructure of Catalonia) is initiated by the Catalan government and is aiming to change the culture within the public administrations in terms of the way to handle and share spatial information. In general the infrastructure for the whole sector, including the commercial sector needs to be improved, and other actors will be actively involved in the project. IDEC should stimulate developments and innovations in the geo-information sector in general. It should be seen as an environment to be used by any kind of user growing constantly with more data, metadata, services, etc. It was promoted in 2000 by the Catalan Section of Spanish Association of GI (AESIG) and started in January 2002.

The main driver behind the IDEC project is the support centre (SC) of IDEC. This centre is located inside the Cartographic Institute of Catalonia (ICC). The SC is not producing data by itself, but is the body that facilitates sharing of data between many data users and producers, mainly administrative bodies. The host of the support centre, ICC, is a big data producer and an important player in the GIS sector of Catalonia.

*Reasons for founding*
The initiative to create IDEC came from the Catalan administration, in response to the needs implicitly and explicitly expressed within the sector. The IDEC project was created with the idea of becoming a formal and sustainable entity in the future.
IDEC needs to offer a forum for those involved with spatial information to meet, including the various actors involved across the sector. The SC needs to raise awareness for the importance of data sharing and setting up a Catalan spatial data infrastructure.

*Activities*
The SC has set up several web portals to facilitate data sharing. The website of SC facilitates publishing of the metadata and data and offers several web services. The metadata and some data sets are free of charge available for users. The SC is not carrying out GI analysis on specific requests or providing specific services, but is developing general geoservices based on client WMS reuse and WMS-WFS access. Research activities are directly linked with the development of applications (e.g. Control and security data access environment, data distribution using GML, etc.). It is also organizing sessions for data producers and users mainly for the public sector.

*Users*
Main user is in the first phase the public administrations, but the metadata catalogue is open to all users and private companies.

**Organisational and financial framework**

*Institutional framework*
IDEC is an initiative of Catalan government and is a project-based program in close cooperation with the Cartographic Institute of Catalonia (ICC) and several other parties. The SC has been created as coordinating body for IDEC. Recently the project has been prolonged for a next time frame. IDEC has been created with the idea of it becoming a formal and sustainable entity in the future. It is expected it will become in 2006 some kind of permanent organisation, alone or within some other organisation (e.g. the regional map agency). Many different actors are involved in the IDEC projects and the ICC

has many different national and international relations. For the partners IDEC implies a new culture of public management and clear benefits for the future.

*Budget*
The project received approximately 900.000 euros in funding during the first three years (2002-2004). This support covered investments of the SC in equipment, software and human resources including four FTE of technical staff. The ICC also provides support and is providing a technological infrastructure for systems and communications. It is expected that the current structure, with personnel and available equipment, will be sufficient to assure the normal functioning of the project's activities in the future.

*Position in GI coordination*
Standardisation of geo-information and creating a spatial data infrastructure is one of major goals of IDEC and the SC has the mandate to organise this, but no legal basis to enforce standardisation. For 2006 a bill concerning cartographic information is being prepared by the Catalan Parliament giving IDEC an official status.

**Products and services of the centre for geo-information**

*Data tasks*
The aim of IDEC is to compile and publish information about existing geo-information and products. Catalogues and metadata generation facilitate the localization, discovery, accessibility and recovery of GI. Main data sets are Topographic data, Orthophotos, Cadastral data, data from Urban and Land planning, and series of thematic data including environmental and agricultural data sets and some local geodata. IDEC is not producing data by itself, but some data like aerial pictures can be obtained by IDEC. In the future also pre-processed data products will be available as a geo service.

*Services*
The IDEC project tries to study the needs of the users and on basis of this define appropriate products and services to fulfil those needs. The SC is not doing GIS analysis or giving specific advices about application of data.
The SC is developing and maintaining the thematic SDIs. The thematic SDIs should provide services, via geo-portals, focused on a concrete item or a specific sector.
Knowledge management and awareness rising is also a priority for the IDEC project e.g. by organizing workshops and meetings. Officially it is not a task of IDEC to give advice, but sometimes advice is given e.g. to local projects.

*Portal*
The website/portal of IDEC gives information about the products and services provided by the centre. It allows searching for data and services, including map visualisation and tools to analyse the data. It is also possible to obtain value-added products and services. Directly downloading of data is possible, using WFS and WCS standards.
The approach of IDEC is to create thematic SDI's with thematic geo-portals about specific items. The thematic SDI provides the same services then the general SDI, but focused on a concrete item or specific sector. In figure 4.7 an example of the Coasts SDI portal is given established for users participating in the coast management.

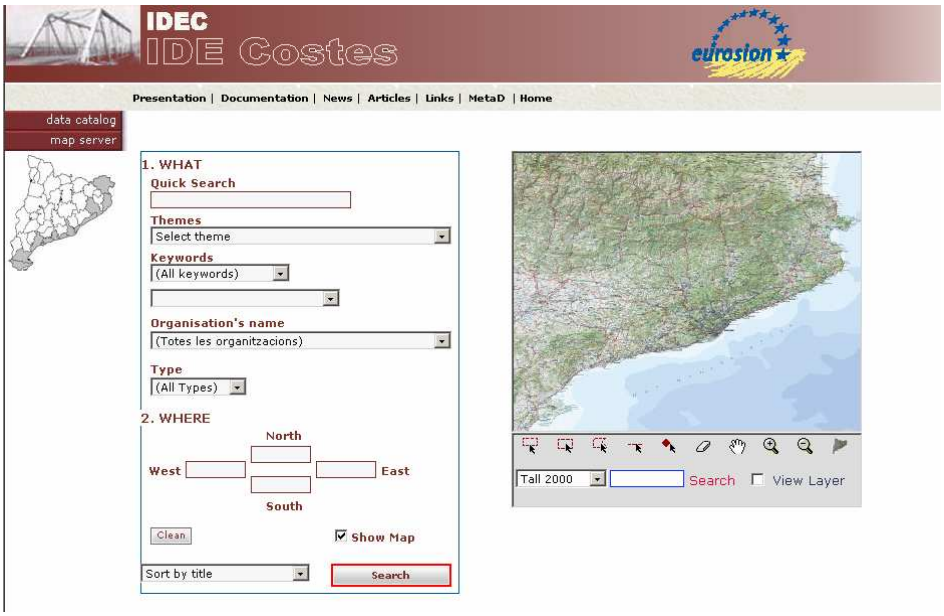


Figure 4.7. Thematic IDEC Coasts portal (http://www.geoportal-idec.net/idecostes/ )

**Obstacles**

*Data obstacles*

Data sets in Catalonia are not complete and efforts need to be made to make them complete. Data sets are compatible because IDEC is using open GIS as standard which is generally accepted in the Catalonia.

*Barriers to sharing and re-use*

Cultural, institutional, financial and legal barriers prevent or delay sometimes the use of already existing spatial data. Institutes and data owners need to be made aware of the benefits of sharing data. An obstacle is for example the property of data; it is difficult to use the data because there are property rights on the data, which don't allow usages for other purposes.

*Capacity building*

Capacity building in for example municipalities takes time. Progress can be made in the coming years. IDEC is known as the leading project and there is a good drive in the project.

**Developments and future expectations**

*Developments*

The SC will continue to be the coordinating body of IDEC and is expected it get in 2006 an official permanent status, as in depended body or within ICC. IDEC will continue to promote information sharing in the public administration and will give support to implementation of standards and rules for the SDI. It will also promote new projects, mainly thematic SDIs, based in the increasing data and information availability.

*Indicators of development*

No increase in budget or employees is expected. There will be an increase in number of datasets. The immediate participation of local governments will increase (meta)data availability and increase the number of users benefiting from IDEC. IDEC will continue promoting thematic SDIs and develop more

geo-services, for public administrations and citizens. New products and services of IDEC will be new geo-services and applications based on them.

*Future position of IDEC SC*

Governmental institutes and private companies will increasingly make use of GIS and geo-information. Therefore it is a good time to start up a coordination project. IDEC functions as initiator of new development in GIS in Catalonia. Time is changing fast and the current position of IDEC is not stable it might grow to an institutionalised centre, but in five years there can be a completely different situation.

On national level a similar initiative has been started. Which need to be linked with IDEC.

### 4.1.7 Landesvermessungsamt

**Introduction and objectives**

*Introduction*
The landesvermessungsamt (LVA) is the survey and mapping authority of the German state Nordrhein-Westfalen (NRW) and is offering a wide range of data products. Furthermore it has an important coordination role inthe development of the regional SDI, Geospatial Data Infrastructure NRW (GDI NRW). The landesvermessungsamt geodatazentrum is part of the LVA and is the central office for cadastral information of NRW. The geodata centre was founded, with as main task to put the cadastral data of all counties in a central database and to offer the data directly to clients.

CeGI is another important player in the GI field of NRW also with links to the LVA. This is a communication and coordination platform for the development of innovative spatial information applications for the economy, science and public authorities, but not a real GIS centre.

*Reasons for founding*
The LVA has a long history as official surveying and mapping authority for Nordrhein Westfalen with an official legal status and task. It is responsible for important regional data layers and has extensive GIS experience. In recent years it has played a key role in the development of the spatial data infrastructure of NRW.
The geodata centre has been founded in 2000 as a division of the LVA with as main task to put the cadastral data of all counties in a central database and to take care of the relationship with customers that want to use data of more then one county.

*Activities*
The main focus of the LVA is on data products, examples of products offered are: hauskoordinaten: which define the exact position of each house and bodenrichtwerte: giving actual ground prices. It is delivering maps and plots on demand and with its WMS application it offers free of charge maps and aerial pictures of Nordrhein-Westfalen for private use (www.tim-online.nrw.de). The geodata centre offers cadastral data to a scale level of 1:1.000 covering almost the entire territory of Nordrhein-Westfalen. The LVA has also role in giving advices to governmental bodies. For the development of its own application it is doing some research and development. It also plays a central role in the development of the geographic information infrastructure and has representational function in boards and committees.

*Users*
Users of the products of the LVA are other governmental institutes, private companies and citizens. Main customers for the geodata centre are e.g. companies that want to make pipelines, cables or other works where cadastral data from more counties is needed.

**Organisational and financial framework**

*Institutional framework*
The LVA is an agency of the ministry of interior with an official tasks described in the state law. The geodata centre is a division inside the LVA with data coming from the counties. The counties deliver the data and that the geodata centre is facilitating distribution of the data via its services.

*Budget*
The LVA is financed by the state and has a total budget of over 20 million euro with a cost-recovery of ca. 10% and 400 employees working for the LVA.
The geodata centre sells each year data with a total value of 1 million euro. In a legal contract between the geodata centre and the countries is stated that 70% of those revenues from sales goes back to the countries and 30% goes to the LVA for the service they provide.

*Position in GI coordination*
LVA is an important coordinating body for in the creation of the GDI NRW. The GDI NRW is initiated by the NRW cabinet and brought into a legal framework. For the GDI NRW agreements between different actors about the standards, architecture and organisation of the GDI needed to be reached in a platform. LVA plays a significant role in this process, especially in delivering technical support, but agreements are on voluntary basis.

**Products and services of the centre for geo-information**

*Data tasks*
Main tasks of the LVA are data collection, data management, mapping activities and providing pre-processed data products like maps of an area.
The geodata centre is collecting the data from the counties in NRW, documenting and cataloguing the data, maintaining it by getting the most actual information of the counties, and distributing it to its customers. Data distribution is by far the most important activity of the geodata centre data; another activity is quality feedback on the data.

*Services*
The LVA is doing analysis and is giving advice on GIS related issues e.g. giving support to governmental bodies using GIS. The LVA is also delivering maps and plots on demand. The LVA is not developing and maintaining GIS applications. The LVA is giving training sessions to teach people how to use GIS.

*Portal*
The website of LVA is informative about the work of the LVA and facilitates searching for (meta)data. It also offers mapping visualisation possibilities at different scale levels, with tools to add lines or figures. TIM-online is the name of the application to access all topographic maps and digital Orthophotos of Nordrhein-Westfalen. Directly downloading of data and GIS analysis are not possible. In the future the geo-portal should also offer e-business activities.

**Obstacles**

*Data obstacles*
The territory of NRW is still missing 10% of the cadastral data. This is not a big problem and will probably be solved within two years. The data of the LVA is mainly data collected by the LVA self and

is complete. A problem on national German level is still to make the data compatible. Only recently initiatives started to make data compatible on national level.

*Barriers to sharing and re-use*
In NRW the SDI coordination has a clear strategy and is operating successfully. On national level coordination has been lacked behind in recent years, but has lately been improved.
For the NRW counties the geodata centre has clear rules. There are now institutional barriers and everybody is willing to cooperate.

*Capacity building*
There is enough knowledge about GIS in NRW. Universities are teaching GIS and also on county level there is a good knowledge and awareness of GIS and the possibilities of geo-information.

**Developments and future expectations**

*Developments*
The LVA will shift its activities more to its core business as a surveying and mapping agency and will decrease its research and development activities in other areas.

*Indicators of development*
The state budget for the LVA is expected to decrease; on the other hand an increase of money coming directly from clients is expected. A decrease in number of employees is expected, because of further automation of processes.
The LVA is working on building new databases. There will be more datasets included and the data will be available on more detailed levels. A further increase in number of users of services like TIM online is expected.
New activities introduced by the LVA are e-commerce services via its geo-portal; more products will be sold via e-commerce solutions. LVA is also planning to introduce web feature services in 2006, as well as gazetteer services.

*Future position of LVA*
In the future the data will be kept and maintained at the lowest possible level, according to the INSPIRE principle. Standardisation will take place on all levels, from local level up to the European level and common European profiles will be developed. Germany is at the moment already working on a prototype access point on national level. The LVA will be part of this development and will play an important role in the further development of the NRW GDI. Next to this it will keep its legal tasks as surveying and mapping agency.

## 4.3 Similarities and differences between GIS centres

### Introduction and objectives

*Introduction*
The GIS centres have different histories; they are founded in different years (table 4.1) and have been established with different objectives.

| | Age in years |
|---|---|
| GIS CC | < 1 |
| CGI | 7 |
| AGI | 2 |
| KLIC | >10 |
| GIS Vlaanderen | 10 |
| IDEC | 3 |
| LVA NRW | >10 |

Table 4.1. Age of GIS centres

AGI and the GIS CC have recently been founded. KLIC and the Landesvermessungsamt have already a long history as information centres.

The centres have been created with different objectives.

- The main reason for founding the GIS CC, and CGI was bringing existing GIS data and knowledge of different divisions or organisations together in a central division;
- The main reason to found AGI was re-positioning of an already existing governmental service to make it (partly) a GIS centre. KLIC and the LVA have been established as information centres and GIS has become an important activity;
- GIS Vlaanderen and IDEC are coordination bodies for governmental initiatives trying to stimulate the creation of an regional SDI and stimulate GIS developments.

*Reasons for founding*
Most important reason for founding the centres are creating an environment and infrastructure facilitating easy use and exchange of spatial information and provide shared services and GIS application.

*Activities*
Table 4.2 shows possible activities of GIS centres are indicated and for each activity the importance for each centre. Activities identified are: production e.g. data, standard analysis; advice e.g. specific support and advices; R&D, develop products and applications; GI policy: standardisation and architecture; representation in coordinating bodies and committees.

| | Production | Advice | R&D | GI policy | Representation |
|---|---|---|---|---|---|
| GIS CC | ++ | ++ | + | + | + |
| CGI | ++ | ++ | +++ | - | + |
| AGI | ++ | ++ | + | + | + |
| KLIC | +++ | + | - | - | + |
| GIS Vlaanderen | ++ | ++ | + | ++ | + |
| IDEC | ++ | + | + | ++ | + |
| LVA NRW | +++ | + | + | ++ | ++ |

+++ main priority; ++ important activity; + activity performed; - not an activity

Table 4.2. Activities of the GIS centres

An important activity is production; all centres are facilitating data exchange and distribution. IDEC, LVA and KLIC do not have an advisory or supportive task. IDEC, LVA, and GIS Vlaanderen are having an important role in developing a regional spatial data infrastructure; GI Policy and representation tasks are therefore important. KLIC is limited to one activity only, providing information about cables and pipes. For the CGI research and development is the main priority being part of a University and research centre.

*Users*

The GIS centres are having different user groups. The main focus of AGI and the GIS CC is internal in the organisations – Ministries - they are part of. GIS Vlaanderen, IDEC, LVA and CGI are also (semi-) public organisations mainly working for the public administration. GIS Vlaanderen and IDEC are not working for one organisation, but for the whole regional public administration. The data of both and of the LVA is also accessible for private companies and citizens. CGI has two major users, internally the WUR organisation and externally the LNV ministry, and is also involved in several partnerships. KLIC is not a public sector body; it is a voluntary cooperation facilitating data exchange between data users and suppliers.

**Organisational and financial framework**

*Institutional framework*

The institutional frameworks in which the centres are operating are different. The GIS CC, CGI and AGI are part of a bigger organisation. GIS CC and CGI are both cooperation between two divisions in the organisation. AGI is operating as an independent division next to other division of the organisation. The LVA and GIS Vlaanderen are both independent with a legal mandate for carrying out certain tasks. KLIC is an independent foundation based on a voluntary agreement. IDEC is a project based program, but might become an institutionalised centre in the future.

*Budget and funding*

There is wide variation in yearly budget, number of employees and way of funding. The budgets are difficult to compare and are depending on the tasks of the centres. All centres are having a fixed income depending on the tasks, but GIS CC, GIS Vlaanderen and LVA are also depending partly on cost recovery income from orders or data selling. CGI has a fixed budget to perform its educational tasks, but needs to get orders for its research tasks.

*Position in GI coordination*
It is not the task of CGI and KLIC to standardise data or to develop network architecture for their organisation. The GIS CC and IDEC have a mandate to organise this, but on the basis of consensus and general agreement of the stakeholders. For GIS Vlaanderen and the LVA it is a main goal to achieve standardisation of data and to create a network, they provide guidelines to stakeholders. AGI has a mandate to enforce standardisation, but also needs acceptation to achieve this.

On the federal level GIS Vlaanderen, IDEC and LVA have a leading role in the development spatial of the data infrastructure. AGI and GIS CC are important players in the national GIS field, but have no central role or mandate in national coordination; CGI plays a role by its research. KLIC is not strongly involved in federal or national cooperation.

**Products and Services**

*Data tasks*
Data tasks that have been identified are: collection of data from other centres; production, obtaining of own data; documentation by metadata and cataloguing the data; maintenance of data, keeping it up to data and complete; distribution of data to other centres; offering of data products e.g. maps. Table 4.3 indicates the importance of each data task for each centre.

| | collection | production | docum. | mainten. | distribution | products |
|---|---|---|---|---|---|---|
| GIS CC | ++ | + | ++ | ++ | ++ | + |
| CGI | ++ | ++ | ++ | ++ | ++ | + |
| AGI | ++ | ++ | ++ | +++ | ++ | + |
| KLIC | ++ | - | - | - | ++ | + |
| GIS Vlaanderen | ++ | ++ | ++ | + | ++ | ++ |
| IDEC | ++ | - | ++ | + | ++ | + |
| LVA NRW | ++ | ++ | ++ | ++ | ++ | ++ |

+++ main priority; ++ important activity; + activity performed; - not an activity

Table 4.3. Data tasks of the GIS centres

All centres are having important data tasks only for KLIC this task is less evident; KLIC is passing on requests, but is not actively involved in the data management. LVA, GIS Vlaanderen, AGI, CGI are all important data centres as well for acquiring (collection) data as for self obtaining (production) of data. Documentation of data is important for all centres except KLIC; Maintenance is important for all centres, but IDEC and GIS Vlaanderen see this as primary task of the data owner or supplier, for AGI it is crucial for its activities. Distribution of data and products is done by all centres; supplying data products is a main activity for GIS Vlaanderen and LVA, not for the other centres.

*Services*
Services are supportive tasks on specific request of clients. Different types of services have been identified: advice or consultancy, mostly on project basis; developing and maintaining specific GIS applications or tools; Knowledge, give training or provide education (table4 .4).

| | Advice | Applications | Knowledge |
|---|---|---|---|
| GIS CC | ++ | ++ | + |
| CGI | ++ | ++ | +++ |
| AGI | ++ | ++ | ++ |
| KLIC | - | +++ | - |
| GIS Vlaanderen | ++ | ++ | + |
| IDEC | + | ++ | + |
| LVA NRW | + | ++ | - |

+++ main priority; ++ important activity; + activity performed; - not an activity

Table 4.4. Services provided by the GIS centres

Giving specific advices on requests are important tasks for GIS CC, CGI, AGI and GIS Vlaanderen. Those centres carry out specific GIS analysis on a project basis, and give advices to other divisions or organisation. Maintaining specific – mostly web-based - applications is done by all centres. For CGI educating students is a main priority and also AGI is providing education and training; the other centres just give advice about trainings.

*Portal*
The centres are offering different functionalities on their website. The following functionalities have been identified: Informative about the centre; searching for (meta)data; using map visualisation to support search; directly downloading of data; online analysis of data; support for E-business (table 4.5).

| | Informative | Search | Mapping | Download | Analysis | E-business |
|---|---|---|---|---|---|---|
| GIS CC | ++ | ++ | ++ | ++ | + | - |
| CGI | ++ | ++ | ++ | - | - | - |
| AGI | ++ | ++ | ++ | ++ | ++ | ++ |
| KLIC | ++ | - | ++ | - | - | - |
| GIS Vlaanderen | ++ | ++ | ++ | ++ | - | ++ |
| IDEC | ++ | ++ | ++ | ++ | ++ | ++ |
| LVA NRW | ++ | ++ | ++ | - | - | - |

++ available functionality; + limited available functionality; - not available

Table 4.5. Portal functionalities provided by the GIS centres

AGI and IDEC focus on having a good portal site and offer all identified functionalities on their website. The other centres all have (meta)data search and map visualization functionalities. Three centres offer analysis functionalities and performing E-business activities; CGI and NRW are developing these functionalities and will offer it soon.

*Overall picture of GIS centre*
Data tasks are still of major importance for all centres. The centres are all responsible for creating infrastructure facilitating easy use and exchange of spatial information. However all centres are also

developing GIS applications and tools. The portal sites show that the all centres are applying web-based services to offer the data. Furthermore GIS CC, CGI, AGI and GIS Vlaanderen have also an important supportive tasks and advisory role in their organisation or to clients.

**Obstacles**

*Data obstacles*
Three main data obstacles have been identified: Incomplete and missing data sets; data sets not being compatible and lack of documentation of data.

| | Incomplete | Not compatible | Documentation (metadata) |
|---|---|---|---|
| GIS CC | - | - | - |
| CGI | - | - | - |
| AGI | ++ | ++ | + |
| KLIC | + | ++ | + |
| GIS Vlaanderen | ++ | + | - |
| IDEC | ++ | + | + |
| LVA NRW | + | ++ | - |

+++ main obstacle ++ important obstacle; + minore obstacle; - not an obstacle

Table 4.6. Main data obstacles of GIS centres

GIS CC and CGI did not identify data obstacles; they have all the data they need to perform their activities and do not have problems with data sets not being compatible. AGI and KLIC have identified important data obstacles, probably because they have data from many different sources and need very precise and up-to-data information. Incomplete data and data sets not being compatible are also important obstacles for GIS Vlaanderen, IDEC and LVA, probably because they have a regional responsibility with different actors involved.

*Barriers to sharing and re-use*
Three main barriers for sharing and re-using of data have been identified: institutional, problems with data exchange between different institutes; financial barriers, high costs for getting the right data; legal problems because of protection or copyright on the data.

| | Institutional | Financial | Legal |
|---|---|---|---|
| GIS CC | ++ | ++ | + |
| CGI | ++ | ++ | - |
| AGI | - | - | - |
| KLIC | - | - | - |
| GIS Vlaanderen | + | - | - |
| IDEC | ++ | + | + |
| LVA NRW | + | - | - |

+++ main obstacle ++ important obstacle; + minore obstacle; - not an obstacle

Table 4.7. Main barriers to sharing and re-use of data

GIS CC, CGI and IDEC indicated that institutional barriers impede sharing and re-using of data. The main barriers for GIS CC and CGI are the lack of national coordination on the issue of data sharing, and the high prices for data of (other) governmental bodies charge. AGI does not have this problem because it is mainly using own specific data.
GIS Vlaanderen and LVA provide a satisfying institutional and financial framework with clear benefits for the participants, but according to GIS Vlaanderen the cooperation between ministries can be improved; according to LVA cooperation on national level can be improved. The GIS CC and IDEC have (minor) legal obstacles; GIS CC with privacy legislation on its data and IDEC with copyright on distributed data.

*Capacity building*
An obstacle for GIS centres can be that (potential) users have a lack of GIS knowledge and awareness.

| | Lack of awareness | Lack of GIS knowledge |
|---|---|---|
| GIS CC | ++ | ++ |
| CGI | - | - |
| AGI | - | - |
| KLIC | - | + |
| GIS Vlaanderen | - | - |
| IDEC | - | + |
| LVA NRW | - | - |

+++ main obstacle ++ important obstacle; + minore obstacle; - not an obstacle

Table 4.8. Lack of GIS awareness and knowledge

Users have enough GIS knowledge and the GIS centres are well known in the GI sector. Only the GIS CC did identify a lack of awareness at the higher management level and a lack of GIS knowledge in parts of the organisation. The KLIC users are normally not GIS users therefore KLIC applications can also be used without GIS experience are training.

**Development and future expectation**

*Developments*
Most centres expect a continuation of ongoing developments. GIS CC, CGI and GIS Vlaanderen expect a moderate grow: GIS CC expects an increase in supportive tasks; CGI expects a growth of remote sensing activities and more international projects; GIS Vlaanderen is expecting an increase in the provision applications and a growth of supportive tasks for its partners
IDEC and AGI do not expect further growth. IDEC will continue working on standards and rules for the public administration and the development of thematic portals. AGI will continue to have a supportive task, but will also try to make geo-information and GIS in the organisation more uniform.
KLIC will undergo a major organisational change the coming years, but the consequences are not clear yet. It will continue to work the coming years on the implementation of KLIC online.
LVA is expecting a decrease in activities especially research and development activities and will focus more on its core business as a surveying and mapping agency.

*Indicators for future developments*

As indicators for future development have been identified: budget of the centre; number of employees; number of visitor of the website/portal; amount of data sets; amount of - web-based - services provided by the centre; supportive tasks of the centre

| | Budget | Employees | Visitors | Data sets | Services | Support |
|---|---|---|---|---|---|---|
| GIS CC | ++ | ++ | ++ | + | ++ | +++ |
| CGI | ++ | ++ | ++ | ++ | ++ | + |
| AGI | + | + | ++ | - | +++ | ++ |
| KLIC | ++ | ++ | ++ | + | ++ | ++ |
| GIS Vlaanderen | ++ | ++ | ++ | ++ | +++ | +++ |
| IDEC | + | + | +++ | +++ | +++ | + |
| LVA NRW | - | - | +++ | +++ | +++ | + |

+++ (strong) growth; ++ moderate growth; + stable; - decrease

Table 4.9. Indicators for development of GIS centres

GIS CC, CGI, KLIC and GIS Vlaanderen are expecting a moderate grow of budget and employees. GI and IDEC are expecting to consolidate their position; LVA expects a decrease. All centres expect a growth of visitors; IDEC and LVA even a strong growth due to new applications and data.
AGI is expecting a decrease in number of data sets, but IDEC and LVA are expecting a strong grow. All centres are expecting to develop more web-based services and applications. GIS CC and GIS Vlaanderen are expecting to focus in the future on a more supportive and advisory role to their clients.

*Future position of the centres*
The development of a national GIS centre is not expected by the Dutch centres the coming years. GIS CC might become part of bigger organisation, but most probably it will keep the same organisational position. The CGI is not expecting any organisation changes at all. AGI sees future possibilities for the establishment of a national centre by a virtual cooperation between different Dutch centres. AGI itself can possibly become a central information centre for RWS. GIS Vlaanderen is not foreseeing major changes in the coming five years because of the existing solid institutional and financial framework. The future of IDEC is unsure maybe it becomes institutionalised centre, but the GIS field is very dynamic and difficult to predict. LVA is expecting developments inline with the INSPIRE principle, keeping standardised data at the lowest possible level and creating different access points.

## 4.4 SSC and SDI concepts applied on GIS centres

### 4.4.1 GIS centres in the shared service centre concept

**GIS centres as shared service centres**

The seven case studies have all characteristics of a shared service centre as defined in paragraph 2.1. They all deliver services in a specific area – GIS and geo-information - to other units or organisations. However the case studies are all imbedded in the public sector and do not have all the characteristics of the business organisation described in paragraph 2.1.

GIS CC, AGI and CGI fit well inside the concept of a SSC. They are a division or unit inside a bigger organisation and (part of) their task is to give support to other units of the organisation. They are responsible for an infrastructure facilitating the exchange and use of spatial information between different divisions and provide shared services like GI (data) portals and GIS application – software and tools - to other units. All of them are accountable for the services they provide, on the basis of a year plan describing the tasks or on basis of a pricing policy.

The concept of SSC can not directly be applied on GIS Vlaanderen, LVA, IDEC and KLIC. GIS Vlaanderen and IDEC are not divisions or units working in the framework of a bigger organisation, but are also accountable units inside the public administration. They can be seen as central unit with in the administration coordinating and facilitating use and exchange of geo-information. They both have a defined responsibility for an infrastructure facilitating the dissemination and use of spatial information between - in their case - different governmental bodies and they are providing shared services for them.
LVA is the surveying and mapping agency of NRW and doesn't fit very well in the concept of a SSC. LVA is organisation with a legal federal task, and is not a specific service centre for other units or organisations. However the LVA is delivering services and data used in the public administration and has also coordinating tasks in the area of geo-information.
KLIC is a SSC of over 900 cable and pipe managers offering information about the location of all cables and pipes to diggers. The advantages are for both sites; diggers can use a joined service for their requests; cable and pipe managers avoid damages.

Avoiding duplication of work, offer common standard services, and standardisations of processes, facilitating easier cooperation, are SSC advantages which have been identified in the case studies. However GIS centres like GIS Vlaanderen, CGI, GIS CC, AGI offer also specific GIS knowledge and competences and want to stimulate GIS developments. This might even go even beyond the service and supportive oriented SSC concept.

**Position in organisation model**

In paragraph 2.1, figure 2.1. an organisational model presents 6 possible models for organising a SSC. The seven GIS centres can be positioned in this model.

GIS CC has characteristics from models d and a. It is a separate section in a BU and has good reputation where other departments can rely on (model d), but the GIS CC is not part of one BU, but is a cooperation between two BUs – DLG and DR - , together coordinating the work of the GIS CC. This is a kind of joint venture between business units like in model a.
CGI is in a similar organisational position as GIS CC and has also characteristics of d and a. It is also a separate section in a BU with a good reputation in the GI field where other organisation can rely on

(model d), but it is also a joint venture of two BUs – University and Alterra - that share responsibility for the CGI (model a).

AGI fits with organisational model b: an infrastructure next to the operational units. AGI is on of the six specialised services of RWS and has supportive tasks for other services and has many interactions with the other services.

GIS Vlaanderen fits into model d; being a separate section of the VLM, with the VLM being a BU of the Ministry. However GIS Vlaanderen is also a central contact point for the whole federal administration and has its own independent steering committee with representatives from the Flemish GI community. Looking from the perspective of the federal administration GIS Vlaanderen can be seen as separate body working as a service centre for the whole administration. This fits best with model e, a separate body with a board, but in this case without joint venture ownership.
IDEC has not yet an institutionalised organisational structure, but being part of the Cartographic Institute of Catalonia and also being a central contact point for the whole federal administration, model d and e can also be both applied on IDEC.

KLIC and the LVA are difficult to position in the organisational model. KLIC is an independent foundation owned by its 900 members and a board of representatives. This fits best with model e.
LVA has not really organisational characteristics of a SSC. It has a legal federal task, and is not a specific service centre for other units or organisations.

The model chosen by an organisation is the result of a complex of external and internal factors e.g. reasons of establishment, vision and organisation flexibility. The GIS centres are all operating in the public sector and organisation structures are sometimes more complex then Business Unit model of figure 2.1. Furthermore not all case studies have been established with the objective of being a shared service centre. Only AGI and GIS CC have been established with as main objective being a supportive centre for their organisations. However important activities of the other centres can be seen as SSC activity and also in their organisation structures important elements of the SSC organisation model can be identified. The LVA might be the only centre not having an important supportive task and an organisational model not fitting with the SSC model.

### 4.3.2 Position in the Spatial Data infrastructure

**Product based versus process based model**
All case studies have data tasks and have responsibilities to facilitate an easy data exchange, inside the organisation and with partners, by providing a spatial data infrastructure. The GIS centres play a key role in the development of SDIs by standardizing of data and processes, responsibilities for data management and provision of services. In paragraph 2.2 two models for SDI development have been explored: a product-based model aiming at linking existing and future databases and the process based model which defines a framework to facilitate the management of spatial information assets. The aims and activities of the GIS centres are different within both models. This paragraph explores how the activities of the GIS centres can be positioned in the SDI models.

Linking existing and upcoming databases is the main aim of IDEC and KLIC. The focus of IDEC is on linking and sharing of public administration data and to make it accessible by creating portals. KLIC is also linking databases and developed procedures to deliver the information to its users. LVA is also developing policies and standards to make its data accessible for users. The geodata centre of the LVA is linking cadastral data from different counties and makes it accessible for users. CGI is not specifically aiming at linking existing databases in the WUR organisation, but is managing the GeoDesk, which is distributing data from different sources inside the organisation and to partners.
All those activities fit into the product-based model.

The activities of AGI, GIS CC, and GIS Vlaanderen fit better in the process-based model. AGI operates as a coordinating agency trying to develop a framework to facilitate the management and exchange of information within RWS and provide communication channels for knowledge and capacity building. GIS CC has a similar role as AGI; operating as a coordinating agency within LNV; providing an infrastructure for GIS knowledge and capacity and facilitating and stimulating exchange of data sets and knowledge in LNV. GIS Vlaanderen is an important data centre, but also a centre for knowledge and advice. It function as a coordination agency to provide better communication channels of knowledge and capacity for sharing and using of data from the spatial data community in Flanders.

Both SDI models - product based and process based – have been identified; it depends on the reason of establishment and the objectives of the SDI and GIS centre which model is more relevant. Facilitating easy data exchange is an objective of all centres, but activities of AGI, GIS CC, and GIS Vlaanderen go further, they also provide a framework to communicate for GIS knowledge and capacity. They can be seen as coordinating bodies in process based SDIs.

**SDI hierarchy**
In paragraph 2.2 it was stated that the SDI concept can be found on different hierarchal levels. The case studies can be positioned in the hierarchal levels identified in figure 2.4. The international case studies IDEC, GIS Vlaanderen and LVA are all key nodes in an (federal) state SDI and have an important coordinating function in the development of the federal SDI.
The national case studies AGI, GIS CC, KLIC and CGI are all in the first place part of a corporate SDI. AGI is the coordinating body for the SDI of RWS and GIS CC for LNV. KLIC is part of corporate SDI of the cable and pipe managers, but is only passing on data.

The case studies showed that GIS centres can operate and are relevant on different hierarchal levels. The international case studies showed that GIS centres can be important coordinating bodies for regional SDI developments and can be important contact points for governmental bodies. The Dutch case studies are operating on corporate level creating a framework for an SDI on corporate level by linking BUs in an organisation.

### 4.3.3 GIS centre

**GIS centres as coordinating bodies**

The activities of all centres go beyond being a geospatial data service centres. They all facilitate and coordinate data exchange, inside the organisation and with partners, by providing a spatial data infrastructure. Providing applications and portal with functionalities to search data are other activities coordinated and facilitated by all centres. Communication of knowledge by giving specific advices or education is an important task of GIS CC, CGI, AGI and GIS Vlaanderen; for the other centres this is not an important activity.

**GIS diffusion and innovations**

Communication of GIS knowledge and stimulating GIS use in an organisation is an important task of GIS CC. It should play an important role in creating a systematic pattern for the GIS diffusion process in LNV. Next to this it should also be an innovative centre by developing innovative products and application and implement them in the LNV organisation.

GIS Vlaanderen and IDEC also play an important role in communication of GIS knowledge and stimulating GIS use. GIS Vlaanderen has been quite successful in stimulating innovations and structuring of GIS use in the Flemish public sector. IDEC is aiming to stimulate innovations and developments in the Catalan GI sector.

CGI focuses is on fundamental and applied research this makes innovations very important for CGI, but CGI is not specially aiming at GIS diffusion in the own organisation.

AGI its focus is on better structuring and planning of GIS in RWS. GIS has been diffused throughout the organisation, but the development has not been structured. AGI is now aiming at the creation of a more coordinated GIS use that is well structured and good planned. Next to this it should also take care of development and implementation of new innovative products in RWS

LVA is not specifically aiming at GIS diffusion are being innovative, but is doing research and supports sometimes governmental bodies in GIS development.

KLIC is not communicating GIS knowledge to its partners and is not promoting GIS innovations.

Communicating of GIS and stimulating GIS use have been important reasons for the establishment of GIS CC, GIS Vlaanderen and IDEC. GIS Vlaanderen and IDEC have already been quite successful doing so. CGI and AGI are not aiming at stimulating GIS because GIS has already been diffused in their organisations, but innovations are important for the organisations and the centres facilitate a better structured GIS development. LVA and KLIC have no objective to stimulate GIS.

The case studies have shown that GIS centres can play an important role in GIS diffusion and in a better structuring and communication of GIS innovations.

**Position and tasks of a GIS centre**

In figure 2.4 the position and tasks of a GIS centre have been identified based on the literature review. GIS centres have been positioned in an SDI and four possible tasks of a GIS centre have been identified. In table 4.10 is indicated to what extend those tasks are carried out by the case studies in this research.

| | Coordinate sharing and using of data/software | provide services and applications | standardize data and processes | communicate GIS knowledge and innovations |
|---|---|---|---|---|
| GIS CC | ++ | ++ | + | ++ |
| CGI | + | ++ | + | ++ |
| AGI | ++ | ++ | ++ | ++ |
| KLIC | ++ | + | + | - |
| GIS Vlaanderen | ++ | ++ | ++ | ++ |
| IDEC | ++ | + | ++ | ++ |
| LVA NRW | + | + | + | + |

+++ main taks; ++ important task; + task performed; - not an activity

Table 4.10. Tasks of the GIS centres

GIS CC, AGI, KLIC, GIS Vlaanderen and IDEC play all an important role in the coordination of sharing and using of data: AGI and GIS CC in their own organisation; IDEC and GIS Vlaanderen for the GI community at federal level; KLIC by supplying necessary information about the location of cables and pipes to diggers.
CGI has no central coordination task in the WUR, but is distributing information; LVA has also not a central role, but is involved in the coordination at federal level.

Important activities of GIS CC, CGI, AGI and GIS Vlaanderen are to provide services and applications. The centres provide GIS analysis and are developing and maintaining specific applications and (web-based) services, they also have a supportive and advisory role for their users. KLIC, IDEC and LVA do provide web-based services, but do not have a strong supportive role to their users.

Standardizing data and processes is a main activity for GIS Vlaanderen, IDEC and AGI; GIS Vlaanderen and IDEC in their role as coordinating bodies of the regional SDI. AGI has the responsibility to standardise data and processes within RWS. GIS CC and CGI have also responsibilities for delivering standardised data and the standardization of GIS processes, but this is not of major importance for the organisation. KLIC is working on standardized information model for the presentation of supplied information, but has no responsibility for the standardization of the information itself. LVA is actively involved in the SDI of NRW which plays an important role in standardisation.

Communicate GIS knowledge and innovations is an important task for GIS CC and AGI within their own organisation. They are the ‘knowledge’ centres for GIS and should communicate this in the organisation. GIS Vlaanderen has a similar role but then on the level of the federal administration. CGI is a research centre, which is selling GIS knowledge and innovations. IDEC is a platform for the Catalan administration playing a stimulating role and communicating knowledge and innovations in the Catalan public sector. LVA is delivering some support to governmental bodies. KLIC is building simple applications for its users, which can be used without GIS knowledge and specific technology therefore it is not communicating GIS knowledge.

Table 4.6 shows that all identified tasks are performed by the case studies. To what extend the tasks are being performed is depending on the objectives of the individual GIS centre. Every GIS centre will have its own focus and no standard model for a GIS centre can be made. A GIS centre needs to define it tasks depending on its position and the context it is operating in

.

# Chapter 5
# Discussion and Conclusions

## 5.1 Discussion

The first idea of this research was to find success factors for the development of GIS competence centres. Literature should provide guidelines to compare different competence centres and identify case studies. However it turned out that the subject of GIS competence centre had not been studied before, so no definition existed. This made it difficult to select case studies and to find indicators to measure success of a GIS centre. Therefore an important objective of the research became to define a GIS centre and to explore its role and activities.

The absence of research on GIS centres and variation in type of GIS centres made it also difficult to obtain comparable hard facts and figures about GIS centres. Therefore the methodology chosen was to obtain information by having interviews with representatives of GIS centre. This gave the opportunity to explore more in depth the development, organisational framework, activities and future expectations of a GIS centre. A disadvantage of this methodology is the dependency on the views and knowledge of the interviewed persons. It also makes a study descriptive, making it difficult to compare different centres. The survey with predefined question helped to compare the different case studies, but the variety of types of case studies and interviewed persons makes it hard to draw conclusions by just comparing interviews.

Because the lack of good definitions the starting point for the selection of the case studies has been the position of the GIS CC. On basis of the role and activities of the GIS CC criteria were defined and on basis of a quick scan seven case studies have been selected. This has been a practical solution for the fact that no selection criteria could be found from literature and no overall picture of case studies exists. Due to practical reasons (mainly time and travel cost) only seven case studies could be carried out. This was not enough to make sound quantitative or statistical analysis.

The focus of this research has been mainly on the governmental and public services. The public GIS centres have often also important tasks in the coordination of national or regional SDIs, and the promotion of GIS in the public sector. Therefore the concept of the business unit model was sometimes difficult to apply in the scope of this research.

Further research could be done on:

- Application of management models, like the INK management model, to measure development of GIS centre and to make comparison with other domains then GIS possible;
- A more extensive research on GIS centres including more case studies allowing a more quantitative approach and statistical analysis;
- Ongoing research to measure trends and developments in tasks and position of GIS centres enabling to measure success and fail factors;
- Further exploration of possible position of GIS centres in the SDI concept and models;
- Further definition of role and tasks of GIS centres; ask additional questions about future role of GIS centres and;
- Better perspective on the users of GIS centre; what they see as a successful GIS centre?

## 5.2 Conclusions

By combining knowledge from SDI research with management theories this research has explored the role and activities of a GIS centre. In previous SDI research little attention has been given to the role of coordinating bodies and service centres, which have in this research been defined as GIS centres.
This research has identified the role of GIS centres in organising and stimulating geo-information and GIS use and shown that there is a complex of factors that is of importance concerning the exchange and use of geo-information. GIS centres are not only focussing on geo-information itself and the exchange of information, but also on the use of it in an organisation. Organising spatial oriented working-processes and providing tools for dealing with spatial problems are important objective of GIS centres like the GIS.

In this chapter conclusions are presented on basis of the three main research questions formulated in paragraph 1.4. In paragraph 5.1.1 a GIS centre has been defined and conclusions have been made about the organisational framework of a GIS centre. In paragraph 5.1.2 key issues for development have been identified. In paragraph 5.1.3 the position and tasks of the LNV GIS CC will be compared with the results of this study.

### 5.2.1 Definition and organisation of a GIS centre

Applying the shared service centre concept on a GIS centre implicates that it needs to be an accountable unit in one organisation or a common unit of more organisations. Therefore GIS centres need to have an accountable plan where the expected budgets, responsibilities and delivered services and products are being indicated and can be justified.
A GIS centre has an important task to facilitate an easy data exchange, inside the organisation and with partners by providing a spatial data infrastructure (SDI). A GIS centre is a key node in such an infrastructure and is playing an important coordinating role in defining procedures, policies and standards for spatial data management and exchange. GIS centres can have responsibilities for SDIs on different hierarchal levels; SDIs corporate level - internal in an organisation or between different organisation - , but also for a national or regional SDI.

A GIS centre has an important supportive role by providing GIS services, software and applications to facilitate the work of other units or organisations. This can be different types of services e.g. provide GIS tools which support different activities; give advice and support to GIS activities in an organisation; be responsible for the GIS part of a project.
An important function of a GIS centre can also be diffusion of GIS knowledge in an organisation. A GIS centre can play an important role in creating the right infrastructure for communicating and stimulating GIS developments and knowledge and promote innovations.

This leads to the following definition of a GIS centre:

“ A GIS centre can be defined as an accountable unit having a supportive role by providing GIS services, software and applications to facilitate the work of other units or organisations. Furthermore a GIS centre has a coordinating role concerning the spatial data infrastructure and in the diffusion of GIS knowledge and innovations in an organisation.”

The first part of the definition fits in the general concept of a shared service centre. A SSC needs to be an accountable unit that delivers specific services in a specific area. In the case of a GIS centre the specific services are GIS services.
The second part of the definition is more specific for the GIS context, where a good data management and exchange are crucial and need a good coordination. To integrate activities and to make optimal use of knowledge and capital a GIS centre has also coordinating, and sometimes stimulating role, in the communication of GIS knowledge and innovations in organisation.

### 5.2.2 Key issues concerning the development of a GIS centre

Rather big differences in role and tasks of Dutch GIS centres and GIS centres from other countries have been identified. They are organised in different ways and perform different activities. Identification of key issues applicable for all GIS centres has been difficult.

Crucial for the development of a GIS centre is the context in which it has been founded and its original objectives. The initial situation in which a GIS centre is established defines its organisational and financial framework and the activities of the GIS centre.

A centre can be established with a focus on initiating and coordinating a better data exchange and GIS developments, e.g. GIS Vlaanderen and IDEC have been founded as regional centres coordinating the development of a regional SDI, and also the LVA NRW has been an important coordinating body in the development of the regional SDI. Those centres play an important role in coordinating and stimulating data exchange on the regional level. KLIC is focussed on facilitating exchange of information and linking databases, but also developed procedures to deliver the information to its users.

In the case of AGI, GIS CC and CGI the focus is not only on data exchange, but also on better coordination of scattered developments. Next to data management and coordinating tasks for the SDI the centres have also been established to better coordinate and support GIS developments in the organisation. The centres should facilitate a more efficient and effective use of available knowledge and provide products and (supportive) services for the whole organisation. CGI is also a GIS knowledge centre which aims to be innovative and transfer knowledge.

Awareness and commitment on the higher administrative levels are important for the development of GIS centres. A lack of GIS awareness has lead to scattered and uncoordinated developments in the Dutch administration although there is high level of GIS knowledge available in the national administration. The recent establishment of GIS centres can play an important role in better coordination of GIS developments in the public sector. The GIS developments in Flanders and Nordhrhein Westfalen have been more coordinated from the beginning, with an important role for the GIS centres by increasing the awareness and commitment in the administrations. This has lead to better coordinated GIS development and diffusion. IDEC is now trying to initiate a similar process.

Important obstacles for development of GIS centres identified are incomplete and not compatible data sets, and institutional barriers. GIS centres have been founded to better coordinate GIS in an organisation or administration. Important for the development of a GIS centre is its success in overcoming those obstacles. However lack of awareness or lack of GIS knowledge was only for the recently founded GIS CC an obstacle. This can be an indication for success of GIS centres in raising awareness and dissemination of knowledge.

In general in the GIS centres a trend to a more service oriented approach and knowledge dissemination can be identified. The focus is not only on coordination of the SDI, but GIS centres focus more on the coordination of GIS developments and innovations, being a kind of consultant with specific knowledge in the area of GIS. Important new developments for GIS centres will be web-based services.

### 5.2.3 Tasks and position of the LNV GIS competence centre

The main reasons for the establishment of the LNV GIS competence centre have been better coordination of fragmented GIS use in LNV, efficiency and quality improvements and stimulate new developments and innovations. Those three reasons fit all with GIS centre concept explored in this research. The research has shown that the GIS centres can play an important role in reaching those objectives. The regional centres show that they have been successful in coordinating SDI developments and in dissemination of GIS knowledge and innovations in the public sector. The GIS centres are important places for innovation and play an important supportive role in GIS developments. According to the shared service centre theory more and better coordination should also result in efficiency and quality improvements of GIS services, but in this research no methodology has been used to measure those impacts. From experiences from other centres can be expected that the GIS CC will lead to better coordination of GIS use, stimulate GIS development and facilitate knowledge dissemination and innovations in the LNV Ministry.

The establishment of a GIS centre fits in a general management trend of bringing activities into a shared service centre. From the SSC concept can be learned that needs to be decided what exactly will be the domain of the GIS centre and for what departments or organisations it is going to work. Organisational models for a SSC can be applied on GIS centres, but it has been difficult to find centres operating in a similar context and organised the same way. This makes it difficult to give recommendations about the best way of organising the LNV GIS competence centre.

The tasks of the GIS CC include also innovation and knowledge dissemination which go beyond the concept of a shared service centre, but have been explored by Rajabifard, et. al (2002). The process based model (see fig 2.2) identifies a coordinating agency facilitating the management of information assets and providing communication channels for a knowledge infrastructure and capacity building. The GIS CC can be as such a coordinating agency for the SDI of the ministry of LNV. The establishment of the GIS CC will give LNV also a clear contact point for GIS related products and services and can make LNV a stronger player in the national GIS field.

From the case studies important trends and lessons can be learned. For the GIS CC it will be important to keep data sets complete and compatible; this is seen as main obstacle by other centres. However at the moment this is not an obstacle for the GIS centre. Obstacles for the GIS CC are the organisational and financial framework and capacity building, but most other case studies didn't identify this as an obstacle. The organisational and financial obstacles of the GIS CC are mostly related to relations with other administrative bodies. The GIS CC can play an important role in the creation of a good (national) organisational and financial framework. In the own organisation a priority should to improve knowledge and awareness of GIS. Other GIS centres have been successful in capacity building and their current position as a GIS centre is based on this success.

For the future the centres expect a moderate grow of budget, employees and users, inline with developments of the past. All centres expect to develop more web-based services and applications. This should also become an important focus of the GIS CC. The GIS CC also expects to focus in the future more on a supportive and advisory role to the clients. This fits SDI process based concept where communication of knowledge infrastructure and capacity building are important and is also the role GIS Vlaanderen is expecting to take.

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# Appendix I

List of interviewed persons and WebPages  of GIS centres

**List of interviewed persons**

| | | |
|---|---|---|
| Adri van de Brink | - | DLG and chair board National Clearinghouse Geo-information in the Netherlands |
| Jaap Berends | - | Twijnstra Gudde (consultant geo-information) |
| Bert Huis | - | LNV GIS CC (section Dienst Regelingen) |
| Remco Wicherson | - | LNV GIS CC (section Dienst Landelijk gebied) |
| Gerard Nieuwenhuis | - | CGI-WUR (operational manager) |
| Raymond Feron | - | AGI-RWS (chair geo-information section) |
| Ad van Houtum | - | KLIC (operational manager) |
| Jo van Valckenborgh | - | GIS Vlaanderen (chair research and development) |
| Irene Compte | - | University of Girona |
| Jordi Guimet | - | IDEC Catalunya (project director) |
| Jens Riecken | - | Landes Vermessungsamt Nordrhein Westfalen (chair cadastral Information systems) |

**WebPages of GIS centres**

GIS Vlaanderen - www.gisvlaanderen.be
CGI - www.geo-informatie.nl/
AGI - www.rws.nl/rws/agi/home/
KLIC – www.klic.nl
IDEC - www.geoportal-idec.net
LVA - www.lverma.nrw.de

# Appendix II

**Survey outline**

The survey used as basis for the comparison of the case studies and as guideline for the interviews.

**GIS centres survey**

**Introduction**

This survey will be carried among different GIS centres which are comparable with the GIS-CC. A selection of seven GIS centres has been made to serve as case studies. The selection has been made on basis of the following criteria:

- The centre is working in the field of GIS and has facilitating or coordinating function
- The activities of the centre are not limited to only data and data management, but include services or applied use of geo-information.
- The centre has a public function and is not (only) operating commercial.
- The centre is innovative and has a good reputation 'in de field'. It is mentioned as example in papers and seminars or has interesting applications.
- There is enough information (policy documents, internet, contact persons, etc.) available about the centre.

First a general description of the 7 case studies will be given. This should give background information about the context and organisation of the centre, the history and reason for funding, its mission statement, and the main developments that has gone through.

Then for each case study a more in depth survey will be carried out. A selection of five different themes has been made. Important inputs for this selection were the policy documents of the GIS-CC, previous research carried out on SDI, and literature about SDI. The selected themes are relevant for context and aim of the research and can be linked to the GIS-CC. For each theme a further selection has been made of key issues and predefined possibilities for each key issue. On basis of the key issues for each theme typologies can be made. This makes it possible to group the GIS centres and can highlight e.g. per group the most important obstacles and developments.

1. **Activities and strategy**

This should give a first general indication of the type of GIS centre and its main priorities. Based on three key issues a general picture of the activities and organisation of the GIS centres will be given:

- *Main activities*: The main activities of the centre will be identified. This can be one or a combination of more then one the following activities (jaarplan GIS-CC):
    - Production: e.g. data, GI analysis, (standard) applications.
    - Geo advice: GI advices and services on demand; knowledge management.
    - Research and development: develop and test (new innovative) products and applications.
    - GI policy: e.g. architecture, standardisation.
    - Representation: e.g. in committees, governmental bodies
    - Evaluating new technologies and developments on regular basis

- *The focus of the organisation is mainly internal, external or both:*
    - Internal: the organisation its main focus is on GI within the organisational framework where it is impeded; not much external contacts or orders and no partners.
    - External: The GIS centre is operating in depended and its main focus is on orders from organisations where it has no direct links (market). Many external contacts and partners.
    - Both: Partly external orders; partly working internal.

- *User type and relation*: The main users/clients will be identified and be grouped in one of the following user types (research joep crompvoets).
    - Government and administration: level: EU, national, regional and local government; Institutions and agencies (governmental): e.g. environmental, planning agencies and institutions, utility and emergency services.
    - Education: Universities, GI education programmes, other.
    - Research and development: public and private research institutes.
    - Commercial users: Tourism, IT developers, Insurance, Property developers.
    - Citizens.

  It also will be analysed what the relation is with the users/clients. Are they partners of the centre? Are they clients that need to pay? How frequently they use the products and services of the centre? Are the clients satisfied with the centre?

- *Objectives and strategy:* at different administrative levels: policy level, management level, operational level: *(Daniel Steudler)*
    - Clear targets for the whole system (all levels)
    - Defined way forward to reach and satisfy the objectives (yes/no)
    - Continuing education on a regular basis of personal (yes/no)

## 2. Organizational and financial framework

The institutional and financial framework and the position of the GIS centres in GI coordination will be compared. Differences exist in institutional and financial framework and the GI coordination competences of a GIS centre. Some centres have a stronger (legal) coordination position while other rely more on voluntary agreements. Also the way GIS centre are funded differs.

- *Institutional and organizational framework*
    - Political framework and position (who is responsible – influence of politics (yes/no) – GIS centre is seen as important)
    - Legal framework (exist – non exist) In what legal framework the GIS centre is operating and what issues are legally bind?

- *Mandate and position of organisation in GI coordination, national and international*
    - *No mandate*: The GI centre is a not ambiguous in stimulating coordination and use of GI and has no competences to do so.
    - *Weak basis:* (voluntary) not many formal or legal competences assigned to centre for coordination; it has only a facilitating position based on voluntary cooperation and agreements.
    - Strong basis: GI centre has a strong legal position and high ambition level. It function as the leading body for the coordination of GI in its area.

- *Financial framework (financial resources)*
    - The centre has a fixed yearly budget coming from the government or other organisation(s). It needs to fulfil the workload of those organisation(s).
    - The centre is partly depending on subsidies and fixed payments coming from its mother organisation(s); partly it needs to generate its own (market) income.
    - The centre is taking orders from its mother organisation(s); partly it needs to generate its own (market) income.
    - The centre needs to generate all its income form the market.

## 3. Products and services

There is a wide variety in products and services offered by GIS centres. The different centres have different data tasks and offer different services to their clients. The centres also differ in the type of products and services they offer directly via a portal or website.

- *Data tasks of the centre*: The GIS centres have different tasks or combination of tasks for data management and collection; the following have been identified.
    - Data collection: the centre is collecting data from other centres for its own use.
    - Data production: the centre is obtaining its own data e.g. by: field measurements, remote sensing or questionnaires
    - Documentation and cataloguing of data e.g. by creating (standardized) metadata and organize data in databases.
    - Data maintenance: keeping the data up to data and complete.
    - Data (re)distribution: the centre is providing data to clients e.g. by facilitating downloading from its database.
    - Pre-processed data products: The centre is offering products based on data sets e.g. pre- processed data, different types of standard maps.

- *Services*: Next to data competences and products, many centres also offer specific services to clients. This to meet specific demands of clients. The following types of services have been identified.
    - Analysis/advice for a specific problems where GI plays an important role.
    - Application development/maintenance: development of specific GIS tools and software and if necessary give also support to implementation and maintenance of the application.
    - Knowledge management: e.g. give GIS input in project groups, give courses, training and education in GIS.

- Al most all centres are having a website or portal site. Different types of facilities and services are offered on those sites.
    - Informative: the site is informing visitors about the products and services provided by the centre.
    - Searching: the website allows searching for specific (meta)data and gives the location of the data.
    - Mapping: map visualization capabilities (mostly to add value to search process).
    - Downloading: site facilitates directly downloading of data and/or products (e.g. standard maps).
    - Analysis: website provide tools to make analysis with data.
    - Support for e-business; Value-added products are directly being sold via website.

## 4. Main obstacles for GIS centres:

For a good implementation and functioning of a GIS centre several obstacles need to be overcome. A GINIE (Geographic information network in Europe) research identified a number of frequently occurring obstacles comparing different European SDI's (Craglia, 2004). Several of those could also very well be important obstacles for GIS centres. The following list gives a selection of those that possibly can be important obstacles for GIS centres. The GIS centres should give in indication how big the different obstacles are within their centre and also should indicate what other drawbacks they see.

- Gaps in spatial data (missing or incomplete) and lacking of documentation (incomplete description).

- Incompatible spatial data sets (combination between data sets not possible) and information initiatives (the infrastructure to find, access and use spatial data often function in isolation only).
- Barriers to sharing an re-use: cultural, institutional, financial and legal barriers prevent or delay the use of existing spatial data.
- Lack of coordination and leadership; level of coordination is weak and insufficient.
- Gross underestimation of the cultural and organisational issues that influence the implementation of a GIS centre.
- Insufficient consideration given to crucial need for capacity building (education, training) and targeted research.

## 5. Developments and future expectations

The GIS centres have developed differently since their initiation. Different indicators have been identified to measure the development of the GIS centres. Indicators are partly taken from Crompvoets research “assessing the worldwide developments of national spatial data clearinghouses” The indicators can be used to measure the grow of the centres by comparing the initial situation with the current situation, but also the development in efficiency can be measured e.g. a centre can manage more data sets with less people. Also the future plans an expectation of the centres will be used to get a good picture of the development a GIS centre is making.

- *Development since initial phase*; The initial phase will be compared with the current situation and the development over the years will be outlined.
    - Budget; initial budget; current budget; development over the years.
    - Total FTE; development of man power over the years
    - Number of partners: development of partnerships over the years, internal as well as external.
    - Number of visitors website: development of website visitors over the years (Crompvoets, 2004).
    - Number of data sets: development in number of datasets managed by GIS centre over the years (Crompvoets, 2004).
    - Development of products and services: new products and services introduced by centre over the years; type of new products and services introduced by centre.

- *Future plans:* What will happen in the coming years with the centre:
    - Shrink: fewer resources available for GIS centre: GIS has less (policy) priority; the centre is working more efficient (less money and manpower are needed); the centre failed to reach its objectives.
    - Consolidation: The centre tries to consolidate the position it has now in the GIS field; No plans for expansion.
    - The GIS centre has expansion plans for the coming years. More resources, manpower need and/or more products and services will be offered.

- Position of centre in 5 years (new innovations: role GIS?)