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NATIONAL REPORT ON CARTOGRAPHY IN BELGIUM

Committee of Cartography and GIS

(Sub-committee of the Belgian Committee of Geography)

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National report on cartography in Belgium

INTRODUCTION

This national report from Belgium is produced by the Belgian Committee of Cartography and Geographical Information System (BCCGIS), which is the formal holder of the Belgian membership of ICA.

BCCGIS is a sub-committee of the Belgian Committee of Geography belonging to the Class of Sciences of the Academy of Belgium. The members of BCCGIS consist of academics representing seven universities of Belgium where courses of cartography are organised on the one hand, and of professional geographers or cartographers within federal and regional governments on the other hand (see a list of the members in annex).

The traditional role of BCCGIS is threefold:

- to centralise and to diffuse scientific and technical information dealing with cartography and GIS in Belgium;
- to provide a permanent link between the official cartographic producers and the academic community;
- to support initiatives aiming at promoting cartography and GIS in research and education.

The pages below form a short report concerning the activities of the belgian governmental institutions and universities who deal with GIS and cartography.

National geographic institute **Nationaal geografisch instituut** **Institut géographique national**	NATIONAAL GEOGRAFISCH INSTITUUT INSTITUT GEOGRAPHIQUE NATIONAL

Address:

Abdij ter Kameren 13 – B-1000 Brussel BELGIË

Abbaye de la Cambre 13 – B-1000 Bruxelles BELGIQUE

Contact Persons:

Ingrid Vanden Berghe – Administrateur-generaal/Administrateur général

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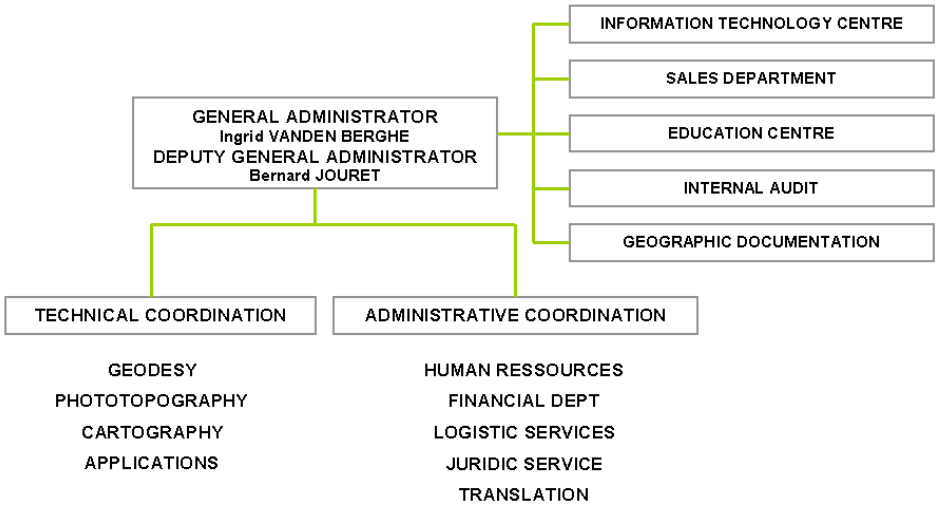
Short Description



1. The mission of NGI-B

The main task of The National Geographical Institute (NGI) , in collaboration with other national, foreign or international organisms is :

- to execute, on the national territory, the works needed for:
  - the implementation and maintenance of a geodesic network and a network of precision levelling;
  - the systematic and complete photographic aerial cover of the national territory;
  - the establishment and the updating of the basic topographic maps;
- to accomplish the works related to:
  - the data processing of the aerial and spatial remote sensing with a geographical character;
  - the numerisation of the cartographic data;
  - the elaboration of thematic maps;
- to establish, to publish or to distribute under a graphic, photographic or numerical form, the files corresponding to the missions of the Institute;
- to carry out the studies and essays of general interest corresponding to the activities mentioned above.

To fulfil the technical mission, tasks are distributed among 4 technical departments.
Their various tasks are realized with the assistance of other services, such as the information technology centre, logistic services, administrative departments and a sales department.

The technical departments are structured in various units or services, each being in charge of a product :

Department of Geodesy

•Service of planimetry (planimetric network)
•Service of levelling and gravimetry (altimetric network)
•Documentation Service (distribution of geodetic points)

Department of Phototopography:

•Service of field survey (collecting identifiers and topo-geographic elements in the field)
•Service of photogrammetry (aero triangulation, photogrammetric stereo plotting, orthorectified-photography, DEM, production of height contour lines)
•Service of flight and photo library (planning of aerial campaign, archiving and managing the photos)

Department of Cartography:

•Bureau of information (collecting information and topo-geographic data)

•Large scales (structuring and identifying digital data from stereo plotting at 1:10 000)

•Medium scales (structuring, identifying and generalizing digital data at 1:50 000; also generalization and map production at 1:100 000 from 1:50 000 data)

•Small scales (structuring, identifying and generalizing digital data at 1:250 000; also administrative data base)

•Symbolisation (producing symbolized output of the vectorial data for offset printing and raster map imagery at scales 1:10 000, 1:20 000,1:50 000,1:100 000,1:250 000 and standardized derived products)

•Image processing unit (image processing of satellite and aerial digital imagery; production of standardized raster data)

Department of Applications:

•Bureau of toponymy (collecting toponymic information and producing minutes of texts and toponymy)

•Creation of thematic maps (other map products and layout definition, also maps on request for external customers)

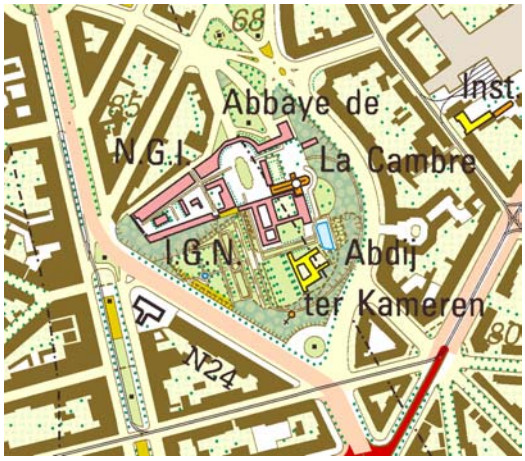
•Photo laboratory and pre-press (assembling graphics input and integrating final layout; production of films, reproduction of aerial photographs and other photo works)

•Offset printing (printing of maps)

Furthermore, each department, according to their specific technical domain, executes missions for external clients, often putting together the know-how of several departments of the NGI-B. These activities remain always linked to our "core business".

2. The production of standardized topo-geographic data at NGI-B

You will find on our web-site http://www.ngi.be a products description :
http://www.ngi.be/FR/FR1.shtm (French)http://www.ngi.be/NL/NL1.shtm (Dutch)
as well as "publications" on the different techniques :
http://www.ngi.be/NL/NL2.shtm (Dutch) http://www.ngi.be/FR/FR2.shtm (French)



3. The technical strategic plan for 2001-2005 at NGI-B

The technical strategic plan is structured into 5 main projects and a bunch of related projects.
One component is oriented towards the production and the improvement of the methodology used today. Another component concerns the development and implementation of new concepts that will have an influence on the present organisation of our various topo-geographic data production flow lines (« business process re-engineering »).

Technical aspects of the strategic plan

•Production project (10-2005)

Objective: to complete the 1:10 000 database for 31st December 2005

•Improvement and development project

•Seamless Geographic Information System of Reference (SGISR)

Objective: to set up a unique structure for managing basic topo-geographic data

•Related projects:

- •Updating
- •Planning
- •Techniques and methods for information collection
- •Metadata
- •Generalization
- •Quality control
- •Database of the toponymy
- •Addressing

•Digital Elevation Model (DEM)

Objective: to set up a unique seamless digital elevation model for the whole national territory adapted for applications integrated into the basic data of NGI-B

•Active Geodesic Network (AGN)

Objective: to develop a service aimed at providing in real time a precise positioning on the Earth's surface, based on a network of permanent GPS stations (in collaboration with the 3 regions of the country – operational in 2003).

•Geographic Information Distribution (GID)

Objective: improve the distribution of topo-geographic information produced by NGI-B

- Related projects:

  - •Definition of a diffusion policy
  - •Products and information about existing products
  - •Definition and production of digital standardized products
  - •Distribution of analog information on demand
  - •Development of CD-Rom products
  - •Development of Web-Gis applications

•Other projects in progress

- •Updating of the 1:50 000 GIS
- •Cartographic production of a 1:100 000 map
- •Yearly updating of the 1:250 000 GIS
- •Eurogeographics: EuroRegionalMap
- •Information and computer technology support
- •Execution of topographic and photogrammetric survey, production of cartographic information on demand
- •… And others

4. National and international activities at NGI-B

NGI-B is member of several international professional organisations whose activities are linked to our activities: EuroSDR, EuroGeographics, Eurogi, Euref …

NGI-B is *leader* of the Eurogeographics' project EuroRegionalMap.

NGI's members attend congresses and workshops organised by international associations related to our activities (ISPRS, ASPRS, ICA) and to users' groups of hardware and software

The sales department of NGI-B participates in commercial fairs, markets, and specific events, promoting our products.
Moreover, NGI-B executes, for external customers, production tasks abroad.

Research

First, NGI-B is not involved in fundamental research. We do not have specific research laboratory.
The tasks of applied research are realized inside the various technical departments and services. The overall goal is to improve production lines related to our nominal or special tasks, for as well internal as external users.
These tasks are essentially oriented towards the development of new production lines, e.g. the production of a cartographic map at scale 1:100 000 using a computer assisted generalization of the features of the 1:50 000 vectorial database.

If required, software tools available on the commercial market are adapted to fit our needs in collecting, structuring and manipulating topo-geographic data (customisation).

Support Centre GIS-Flanders

Address:
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B-1060 Brussels

Contact Persons:
Mr. Joris Sanders

Short Description

With the decree of 17 july 2000 the Flemish Government consolidated the collaborative framework GIS Flanders. Gis Flanders is defined as an "a framework of co-operation that, in a flexible way and with a phased approach, strives towards optimum use of geographical information in Flanders".

GIS Flanders is obligatory for:

- The Ministry of the Flemish Community
- The Flemish public institutions
- Provinces and municipalities

GIS Flanders is through agreement open for:

- Federal institutions
- European institutions
- The private sector

The first core task of GIS Flanders is to optimize the use of geographical information. In order to achieve this it must be possible to exchange the digital geographical data and this data must therefore be accessible for shared use.

The Flemish Governmental Decree regarding GIS Flanders stipulates the partners and determines the tasks for:

- A steering and controlling body, the GIS Flanders Steering Committee
- Two advisory bodies, the GIS Flanders Scientific Committee and the GI-Council
- An executive body, the GIS Flanders Support Centre

Within the framework of its responsibilities the **Support Centre** must closely monitor the developments in the world of GIS. The emergency of new technologies and areas of application for GIS are examined and where necessary and appropriate, adopted. Continuous investment in resources and people is required to keep abreast of technical progress and to guarantee optimum service provision to the growing number of GIS users.

Achievements

Building up a geographic data infrastructure

Starting up GIS Flanders means: getting geographical reference data on the three different scale levels available and used. All partners, including municipalities an provinces, must be able to use the same reference data. Only by working together and sharing the costs it is possible to provide the required geographical reference files and to guarantee that they are kept up to date. In 1996 an 1997 the Support Centre GIS Flanders, upon the proposal of the Steering Committee, provided the first steps to develop a geographical data infrastructure on a medium scale level. From 1998 the Support Centre GIS Flanders focussed also on the large scale level

Topographic map 1/10.000

The Support Centre GIS Flanders distributes the topographical map from the National Geographic Institute in Grid format on CD-Rom. It is the topographical map of the Flemish and Brussels Capital Region on a scale 1/10.000, published between 1978 and 1990.

Topographical mat 1/100.000

The scanned 1/100.000 scale topographical map of the National Geographic Institute is also distributed on CD-Rom by the Support Centre GIS Flanders. It concerns the topographical map of the Flemish and Brussels Capital Region on a scale 1/100.000, published between 1986 and 1990.

Black/white digital orthophotos (1995,1998)

Two digital orthophoto coverages of the Flemish an Brussels Capital Region are available for the partners of GIS Flanders (27 CD-Rom's per set).

Mid-scale base map GIS Flanders

The Support Centre GIS Flanders distributes a vector base map of the Flemish and Brussels Capital Region which will serve as temporary geographic reference map. This file comprises road centre lines, railways and administrative boundaries. Since 1999 a raster version is also available.

Land use map of the Flemish Region (1995, 2000)

Land use map derived by classification from 3 Lansat TM Images dating from August 1995. The reference classification obtained within the framework of this project (numeric product) and the CORINE Land Cover data (visual interpretation) for Flanders were combined to create a file in which elements of the functional classification of CORINE were integrated. An update of this dataset has been realized in 2000.

Regional zoning maps

The 25 maps, show the legal zoning plans showing possible land use destinations (residential area, agricultural area, industrial area, nature reserve, traffic infrastructure, etc.) of all 1.378.431 hectares of the Flemish Region. The Support Centre GIS-Flanders laced at the disposal of GIS-Flanders a digital and updated regional zoning map with accompanying incolouring and legend as an information product on CD-Rom.

Large-scale cadastral plans: KADSCAN and KADVEC

The traditional cadastral plans are analogue and not geometrically correct. Therefore the Support Centre GIS-Flanders decided to scan all 13.500 cadastral plans, to geometrically correct them and to digitize a central point identifying each parcel in a vectorial way. More recently, as a second step, the KADSCAN data are being digitized in order to obtain a vector dataset comprising parcel boundaries of al 5.500.000 parcels. KADVEC will be available at the end of 2004.

Large-scale Topographic Reference map

A large-scale base map is not yet available covering the entire area of Flanders. A GIS structured large-scale reference map provides a large number of possibilities for applications at municipal level. This is why GIS Flanders is endeavouring to create, manage and distribute in a uniform way and within a relatively short term (12 years) a large-scale reference map for Flanders which is suitable for a large number of users, including municipalities, the Land Registry, the utility-companies, public institutions and water companies. The planned dataset is characterised by a topographical content of both the public and the private sector, with high geometric accuracy

requirements for each of the objects on the maps. It is of prime importance that a continuous updating process is worked out.

Other thematic maps

Stepwise a whole series of thematic datasets are made available to the partners of GIS-Flanders. Amongst others, we mention the soil map Flanders and Brussels, the hydrographical map of Flanders, Forest map, Landscape map, habitat directive map, …

Metadata management system SPIDI

SPIDI: The online metadatabase for spatial information of GIS-Flanders. All GI users are able to access the metadatabase via the internet. SPIDI provides them with an easily accessible, efficient and user-friendly tool for accessing and building-up metadata of geographical data. The metadatabase is set up according to European preliminary standard for spatial metadata, taking into account the latest technical developments, and is named "SPIDI" (Spatial Information Directory). The next version of SPIDI will be based on the ISO 19115 standard. The internet address is: http://www.gisvlaanderen.be/spidi

Geographical data consultation and viewing system geo-Vlaanderen

A series of internet geo-offices have been built, using a generic approach in the webmapping architecture. Hence important geographic data layers are made accessible to all citizens in a user-friendly environment. The first office handles the zoning maps, but meanwhile others themes such as forests, water quality, streetmaps, natura2000, soils etc… have been added. Direct linking with other thematic databases, residing with the partners of GIS-Flanders is one of the important assets that stimulates co-operation within the GIS-Flanders framework.

Geographical data retrieving system GIRAF

In order to enable automation in the data delivery, and more frequent updating of datasets, an on-line service for geographic dataset delivery via internet has been set up. GIRAF uses a web interface and is linked with SPIDI, in a way that users can easily identify and order suitable datasets. Better and more flexible parameterisation in the choice of geographical extent, layers, objects etc… is an important asset of GIRAF. Data delivery is done via FTP, but delivery on cd-rom is still an alternative option in the case of voluminous datasets.

Communication

- The Internet

Since April 1996 the Support Centre GIS Flanders has a site on the internet in order to ensure dynamic and efficient communication to a public as wide as possible.

- Newsletter

The Support Centre GIS Flanders publishes newsletters (in Dutch) to inform current and potential GIS users about GIS Flanders and its activities.

- Documentation Centre

One of the tasks of the Support Centre GIS Flanders is the development of a GIS information centre. This information centre comprises journals, books and proceedings about GIS in the broad sense of the world.

- Help Desk

The documentation centre is important for carrying out the GIS activities but also in order support the helpdesk for answering all kinds of questions from the GIS users throughout civil services.

Brussels-Capital Region
Brussels UrbIS®© Digital Mapping

Address

CIRB – CIBG
Tél.: +32 2 282.47.74 Fax: +32 2 230.31.07
Avenue des Arts – Kunstlaan, 20 B10
Bruxelles 1000 Brussel
E-mail:urbis@cirb.irisnet.be
http://www.cirb.irisnet.be/ci/FR/Departements/Geomat

The **C.I.R.B**., Centre d'Informatique pour la Région Bruxelloise, the Brussels Region Computing Centre, is a public organization established by law in1987 whose main aim is to computerize the public authorities of the Brussels-Capital Region.
The C.I.R.B. also has mandate from the Regional Government to develop, promote and distribute the Brussels UrbIS®© Regional Digital Map. Brussels UrbIS®© is the regional standard and is used by over 120 administrations and private companies.

Brussels UrbIS®© (**Brussels Ur**ban **I**nformation **S**ystem) refers to a series of geographic and alphanumeric databases specific to the territory of the Brussels-Capital Region.
Brussels UrbIS®© is developing rapidly. The version 1 products have been available for several years, will be replaced by version 2 within the next year.

At the moment, certain products resulting from the version 2 development process are already being distributed, while other components are still being produced.

Brussels UrbIS®©, version 1, is based of land plots as recorded in the land survey office of the Brussels-Capital Region, plus the construction of public highways (axes and surface areas) and the administrative coding of all items. The work began with the version 1 production in 1989 followed by its regular updates. The graphic data are sufficiently accurate to enable them to be used topographically on an average scale of 1/10,000. They are represented in the Lambert 72 coordinate system.

Brussels UrbIS version 1 consists of two databases:

- **UrbIS Adm1**: Administrative database giving the administrative segments of the region, along with alphanumeric tables containing the official coding of administrative items;

- **UrbIS Pwn1**: Public Way Network, indicating the urban road network on the basis of axes and nodes, along with alphanumeric tables describing their characteristics and any traffic restrictions.

The UrbIS Adm and UrbIS Pwn databases are uniform in that they can be superimposed and refer to the same coding system.

Version 2 of Brussels UrbIS®© refers to a new range of products providing large-scale maps of the Brussels-Capital Region.

Some products are already available and others are currently being produced or prepared.

The following new products are already fully available:

- A collection of aerial photographs, **UrbIS Fot**, and a software program, Ufot, which can be used to consult them. The series of photographs, which were taken at a scale of 1/4,000, covers the entire Brussels-Capital Region. Each photograph covers an area of a maximum of 920m by 920m. These are not corrected photographs or orthophoto maps. The digitised images have a definition of 10cm per pixel and are in colour.
  The first collection was made in april 1996 and the second in mei 1999.

- A topographic database, **UrbIS Top**, obtained by means of photogrammetric plotting on the basis of aerial photographs supplemented by land-based photographs taken between 1996 and 1999. The data currently available do not cover the entire region. These files contain large-scale topographic data and are not attached to an alphanumeric database.

UrbIS Top is essentially intended for graphic use. The data are recorded in layers with given typologies. They are represented in the Lambert Belge 72 system of coordinates.
The planimetric accuracy of these data is such that they can be used up to a scale of 1/500.
UrbIS Fot and UrbIS Top cannot be superimposed upon one another. However, local superimposition is always possible using special tools capable calculating continuous deformation in graphic data.
UrbIS Fot and UrbIS Top are not identical to the data in version 1 either. This is suitable for use on a different scale.

- **UrbIS Adm2**: Administrative database giving the administrative segments of the region, along with alphanumeric tables containing the official coding of administrative items;

  This product correspond to the version 1 database, UrbIS Adm, with the following major improvements:
  - The planimetric accuracy of the items is ten times greater;
  - The building item has been added to the graphic and alphanumeric databases;
  - The database structure has been modified, as has the format (SUD format for Spatial UrbIS Data).

The alphanumeric data provide comprehensive administrative coding which can be used to produce thematic applications easily. These involve the spatial application of users databases which contain referenced to address, to street, to block or to statistical district. Small-scale thematic mapping applications (1/100,000 to 1/1,000) can therefore be produced using the data.

The most recent update of version 2 is the 2.0.1. which is currently being distributed until 2002.

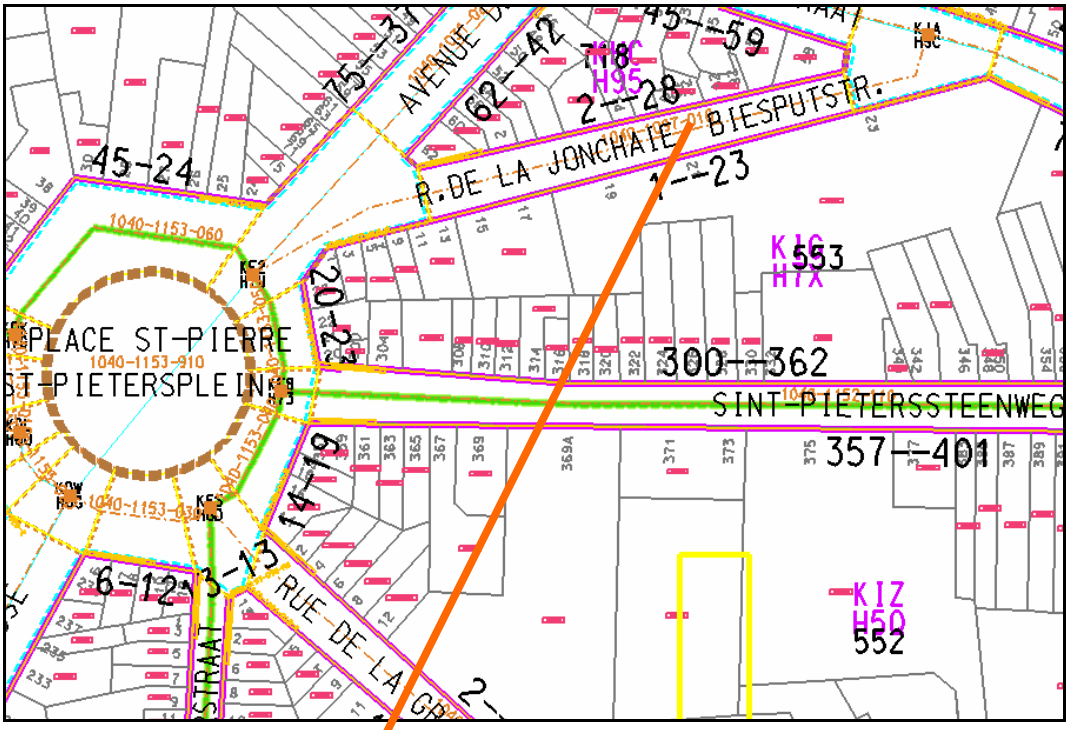
- **UrbIS Map** is a map use mainly for presentation of data.

The Brussels UrbIS®© product has evolved lot during the last twelve years. The version 2 databases have a new format aimed at facilitating data circulation, managing the background to the updates and facilitating the use of new technologies.
The production process guarantees the topological quality of the graphic data.

The databases in the Brussels UrbIS®© product only contain generic information on the Brussels-Capital Region. Like the tools, they are distributed to users on a CD-ROM under licence. It is up to the users to acquire the equipment and software programs needed to develop their specific applications.
In order to facilitate the use of Brussels UrbIS®©, the C.I.R.B. can give advice or provide assistance for the preparation of applications for the public authorites under the terms of authorisation agreements.
Brussels UrbIS®© has become the mapping reference for the creation of the Geographical Information System in the Brussels Region.

One example treated with five products

UrbIS Adm 1

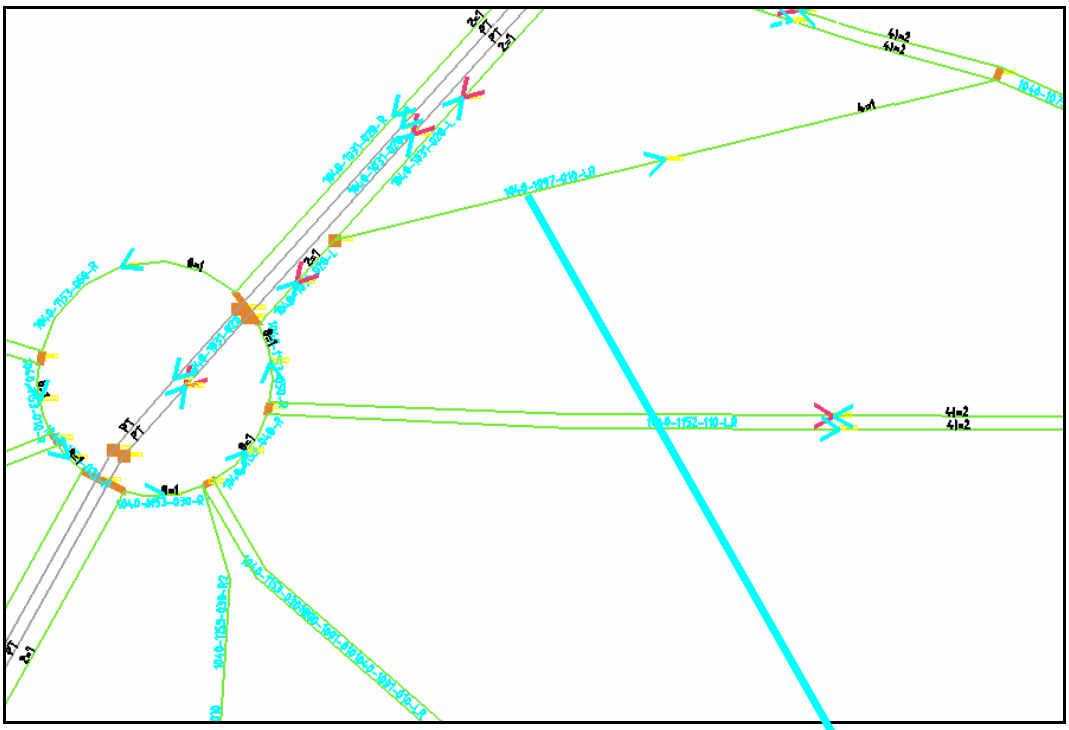


A611PWC : Table

MSLINK	PWNC	MUNC	PWRC	PWFN	PWDN	ADNB
75002253	10401091	21005	1434	Rue de la Grande Haie	Grote Haagstraat	81
75002274	10401092	21005	1561	Rue Gray	Graystraat	40
75002351	10401093	21005	0695	Avenue Hansen-Soulie	Hansen-Soulielaan	87
75001320	10401094	21005	1582	Rue Henri de Braeckeleer	Henri de Braeckeleerstraat	26
75001663	10401095	21005	3146	Avenue Henri Dietrich	Henri Dietrichlaan	10
75003203	10401096	21005	2410	Rue Jean Massart	Jean Massartstraat	12
75002648	10401097	21005	4641	Rue de la Jonchaie	Biesputstraat	19
75002654	10401098	21005	0169	Rue Jonniaux	Jonniauxstraat	33

Enr : 1593 sur 5574

UrbIS Pwn 1



UPwn_Ar : Table

NoIdB	NoIdE	StId	OriDat	ArLsQ	ArIdX	ArIdY	ArLg	ArCl	ArTr	ArWa	ArLv	ArOw	SsRc
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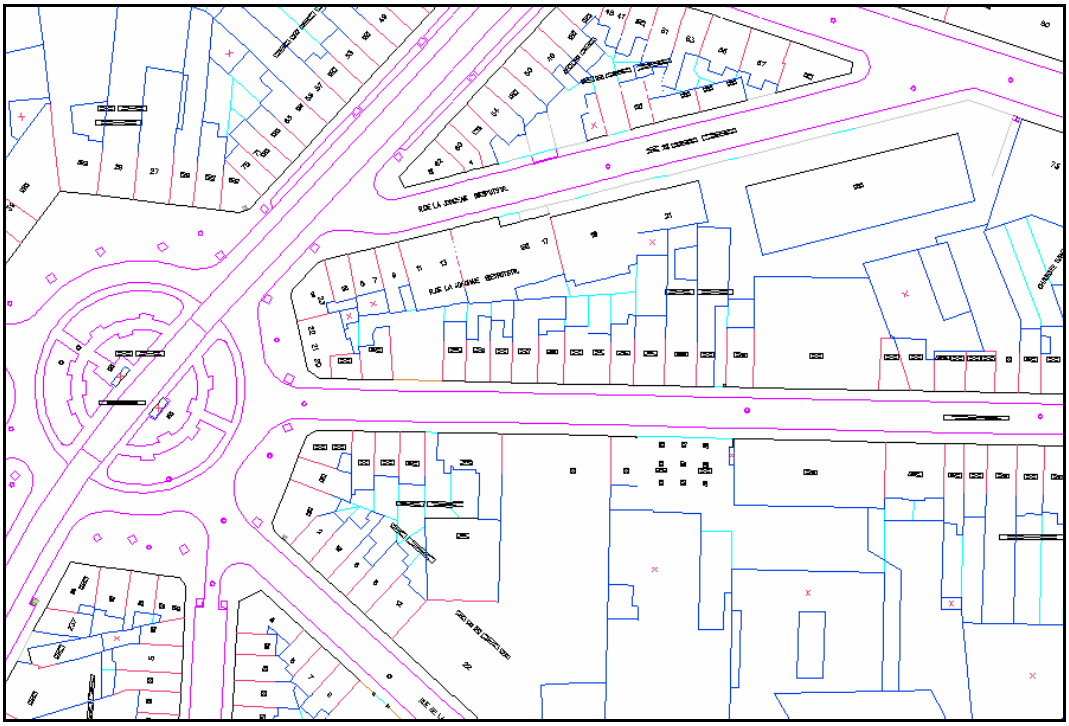
2605	2597	5629	31/08/1999	835611311	151841890	169371850	133	4		)=2		+	10401020040
2365	2629	5959	31/08/1999	835623599	152029278	169694220	156	4		=1		+	10401097010
2601	2594	5842	31/08/1999	835622233	151826306	169606008	135	4		)=2		-	10401112100
2601	2594	5842	31/08/1999	835622233	151827653	169603318	135	4		)=2		+	10401112100

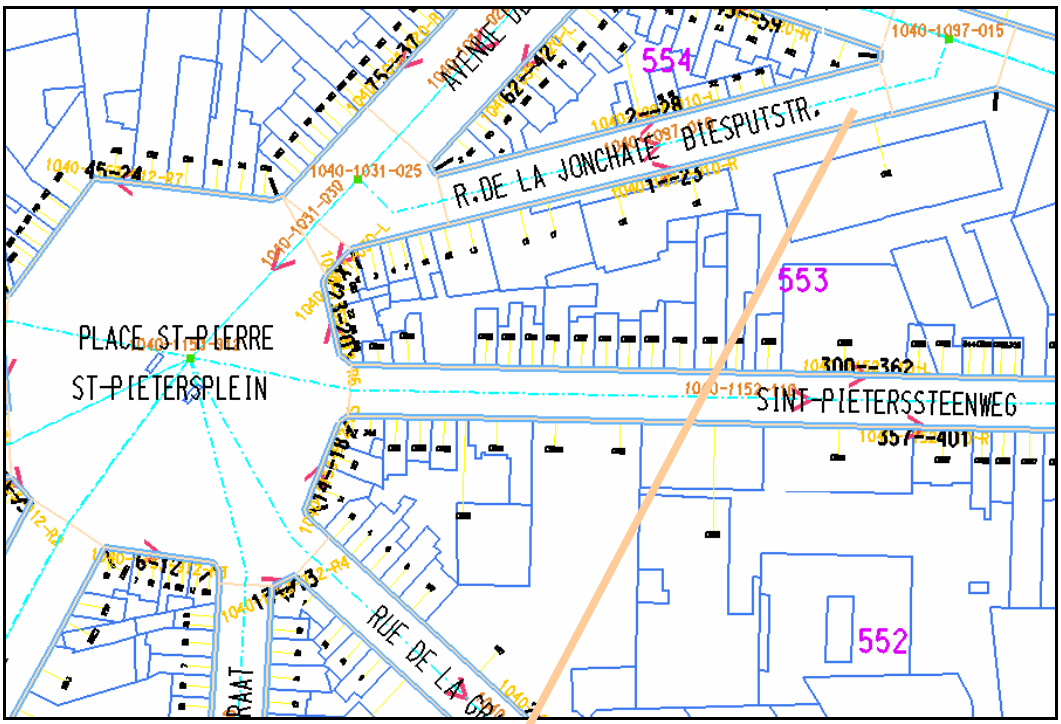
Enr : 5747 sur 31926

UrbIS Fot
(fot 2482 - mei 1999)

UrbIS Top



UrbIS Adm 2



UrbAdm_Ss : Table

RecId	SaId	SnId	PwId	SsId	SsX175	SsX	SsY	SsA	SsSc	SsScSt	SsFt	SsLv
20786	3106191		2355	3114731	835622973	151528992	169664026	52569	010	O	S	0
20787	3105489		2279	3114732	835435864	151512280	166702785	50232	010	O	S	0
20788	3106074		2865	3114733	835613083	152030783	168871410	53822	020	O	S	0
20789		3049601	5422	3114734	837491586	151893564	170191320	0	025	O	I	0
20790	3105778		5378	3114735	835589913	150503596	168820379	47877	030	O	S	0
20791	3106014		2648	3114736	835624804	152021997	169695334	2469	010	O	S	0
20792	3106056		924	3114737	835612208	151596054	169075644	10732	020	O	S	0
20793	3105749		2056	3114738	835451246	151714021	167386518	5523	010	O	S	0
20794	3106222		4709	3114739	835576322	151183917	168547702	6990	010	O	S	0
20795	3106242		2251	3114740	835609065	151132477	169185580	12079	010	O	S	0

Enr: 20785 sur 22186

Walloon Region **Ministère wallon de l'Equipement et des Transports (MET) et Ministère de la Région Wallonne (MRW)**	

Address:

MET – Direction de la Topographie et de la Cartographie - Boulevard du Nord, 8 - 5000 NAMUR

MRW – Direction Générale des Pouvoirs Locaux - Direction du Contrôle et des Etudes - Rue Van Opré, 91 - 5100 JAMBES

Contact Person:

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A Regional Cartographic Infrastructure for the Walloon Region

REGIONAL CARTOGRAPHIC INFRASTRUCTURE

Following the recommendations of the "contrat d'Avenir pour la Wallonie", the regional policy declaration of the Walloon Government, it was decided in 2002 to put on-line the geographical data produced by the Walloon administrations. A "Technical Cartographic Committee" was created at the higher political level of the Region with the task to submit to the Walloon Government proposals regarding geographical data dissemination. A first report on the question was published which proposed to divide into four themes with sub-themes for one of them:

- Organizational aspects
- technical aspects
  - metadata
  - reference data
  - thematic data
  - infrastructure
- legal aspects
- economic and social aspects

The "Technical Cartographic Committee" appointed then a group of consultants composed of different privates companies and universities with a high level of competency in the field. The "INFRASIG" project was born. For each theme or sub-theme, meetings between the consultants and the civil servants in charge in the Walloon administration has permitted to draw a first summary of the present situation. The results will lead to the implementation of a Walloon geoportal which will be accessible from September 2003 and will serve metadata, reference data and core thematic data.

MORE INFO : http://cartographie.wallonie.be/

METADATA

In 1998, the Walloon Government decided to create a working group regarding territorial development. The working group was splitted in different working themes and, rapidly, it was necessary to add a unit in support to the actions of the working themes. The "Database Unit" had to generate a catalogue of the available geographic data and acted as a support unit for the themes.

During the years 1999 to 2001, a metadata catalogue was created based on a census of the geograhical data available at this time in the different administrations of the Walloon Region. The catalogue was initially fitted to some of the international standards and international recommendations (FGDC, Dublin Core, CEN). In 2002, it was decided, on basis of the work of the Metadata Group part of the INFRASIG project, to adapt the work done until then to the ISO 19115 Final Draft International Standard (FDIS) on Metadata. This part of the work is now under progress and a metadata server compliant to the FDIS19115 will be accessible from September 2003.

MORE INFO : http://lepur03.geo.ulg.ac.be/Page1.html

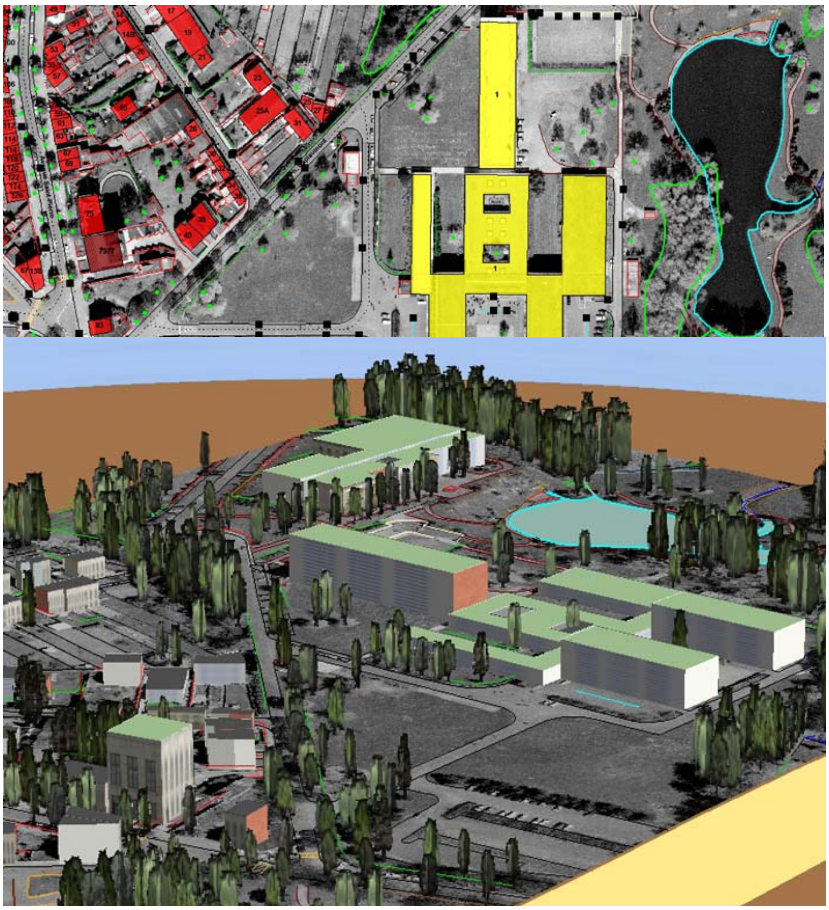
DATA

We will mainly focus here on the main projects of spatial data produced by the Region since 1999.

REFERENCE DATA

PICC (Projet Informatique de Cartographie Continue)

Decided in 1991 by the Walloon Government, P.I.C.C. aims at the creation of a 1/1000 3-D vectorial numeric base map.



The base map contains graphical objects and alphanumerical attributes connected to them. Data is produced from black and white aerial photographs with a scale between 1/4000 and 1/6000. All vectors produced from the photographs are labelled following rules of codification. All vectors are known in X, Y and Z Belgian Lambert 72 co-ordinates with 25 cm accuracy, allowing 3D modelling. The project is not yet completed but more than 40 % of the total coverage is already available and another part of 30 % of the priority coverage will soon be available.

For maps with a smaller scale than 1/5000, a generalised map at 1/10 000 scale will be derived. It will be used as basemap by NGI (National Geographical Institute of Belgium) for the production of their own 1/10 000 topographical map series.

MORE INFO : **http://internet.win.be/**

PLI (Plan de Localisation Informatique)

The PLI is constituted of parcels, buildings, rights of way and roads coming from the cadastral map vectorised and georeferenced on top of the 1/10 000 topographical maps of NGI. A unique attribute, based on the cadastral number, is associated with each parcel. PLI will be used specifically in combination with the land use plans for land use management.

MORE INFO : http://mrw.wallonie.be/dgatlp/dgatlp/

***PPNC* (Plans Photographiques Numériques Communaux)**

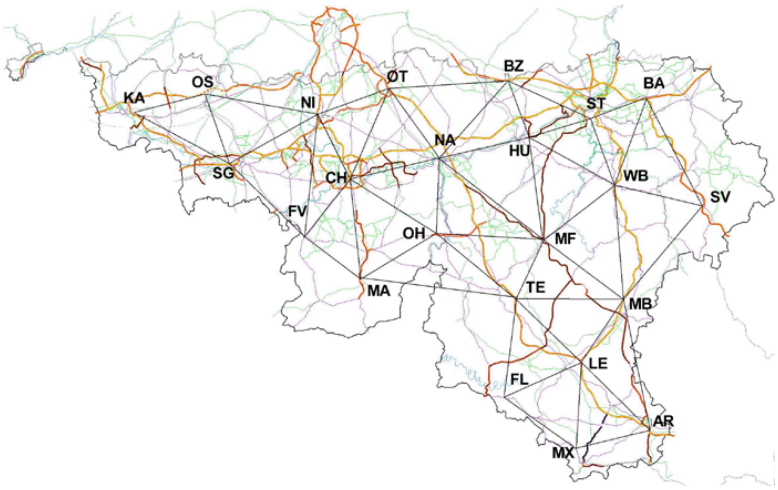
PPNC are colored orthophotomaps produced from aerial photographs taken between 1994 and 2001. They cover the whole Walloon Region with 3664 image files of 5 square kilometres and with a pixel size about 40 cm. A study for the up to dateness process is now under progress.

MORE INFO : http://mrw.wallonie.be/dgpl/

***WALCORS* (WALlonia Operating Reference System)**

A network of 23 GPS stations covers the whole region and will deliver on-line coordinates to all interested user. Each station can be reached with a GPS and a GSM Data. A RTCM messages type 20 and 21 for classical RTK is delivered. Moreover, the network is modeled in order to determine area correction parameters (FKP) delivered by RTCM type 59 messages. These messages are identical for all the stations and allow a homogenous accuracy for the whole network. RINEX files are also available on a Web server for post-processing.

Each station is associated with a transformation parameters set to get LAMBERT 72 coordinates.



This avoids to occupy NGI markers.

Besides, a DGPS correction signal is broadcasted over the DAB (digital radio) network from the RTBF (public radio and TV service). This signal allows getting a submetric accuracy. The target applications are GIS data collection, automatic vehicle location (AVL) and precision farming.

MORE INFO : http://gps.wallonie.be/

THEMATIC DATA

A lot of different thematic data are available today. We will mention here the GIS environmental portal of the Region and the Web page of the Regional Development Unit. More info on thematic data can be found by browsing the metadata catalogue.

MORE INFO :

http://mrw.wallonie.be/dgrne/cartosig/index.asp
http://mrw.wallonie.be/dgatlp/dgatlp/Pages/Observatoire/Pages/DirOHG/Geomatique/Donnees/Inventaire.htm

http://lepur03.geo.ulg.ac.be/Page1.html

INFRASTRUCTURE

The access, dissemination and maintenance of the geographic data will be based on international standards (ISO, OGC, W3C) and the results of European projects like INSPIRE.

LEGAL ASPECTS

By studying the actual legal constraints on data access and use at the National and European level and the actual practices applies at the Regional level, recommendations will be proposed. This includes copyright, privacy and intellectual property and responsibility.

ECONOMIC & SOCIAL ASPECTS

By studying the needs of the potential users and the actual practices at the Regional level and outside the Walloon Region, a price policy for all geographical documents of the Region will be established. The policy will be based on a cost-recovery or other scenario to be defined.

FUNDP, University of Namur
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Contact Persons:

Mrs Françoise Orban, Head of the department

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Short Description

The researches of the Department of Geography are focused on the Land Planning problematic by the way of:

1. Sustainable development and territorial dynamics;
2. Automatic cartography and geographical information systems (GIS);
3. Geographical Landscape Analysis;
4. Earth Images classification and remote sensing (collaboration with the Unity of Statistics (see http://www.fundp.ac.be/~geosatel).

Courses of Cartography, GIS and connected matters

Course Title	Hours			Section	Level
	Th	*Pract*	*Field*		
Applied Cartography	45	75	40	Geography	G
Remote sensing	15	10		Geography	G

Level: U(ndergraduate) – G(raduate) – M(aster)

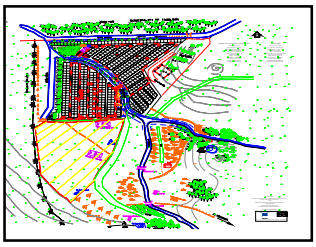
Research connected to Cartography

1. Automatic Thematic Cartography and G.I.S: An original methodological approach of automatic cartography is elaborated in the aim to perform statistical and cartographical approaches to optimize the construction of maps and syntheses useful for spatial policy;
2. GIS making, with the community maps, in the context of urban agriculture: The theme of the thesis will approach the case of the "Urban and Periurban farming" and the development of a GIS that can be used by the urban planners and guarantees the integration of the community's view for more sustainable cities;
3. GIS-based Urban Environmental Resources Management and Food Security Project (Cagayan de Oro, Philippines): Data gathered from the pilot areas will be encoded into the city geographic information system (GIS) to establish an urban environmental planning system for Cagayan de Oro through a participative process. This landplaning system will promote the solid waste management for the food security of the city. The project will further demonstrate the capability and effectiveness of GIS to enable a citywide extension of the project activities.
4. Image classification of the earth for a tropical forest cartography: The goal of this project is to propose some cartographic tools to help for a sustainable development of tropical forest resources by indigenous people in coordination with the government policy in the Philippines. It gathers together indigenous landuse maps, governmental maps and classified remote sensing images for a better dialogue between indigenous people and the government.

Department of Geography

Community-Based GIS

Case study : Barangay Bugo, Cagayan de Oro, Mindanao, Philippines

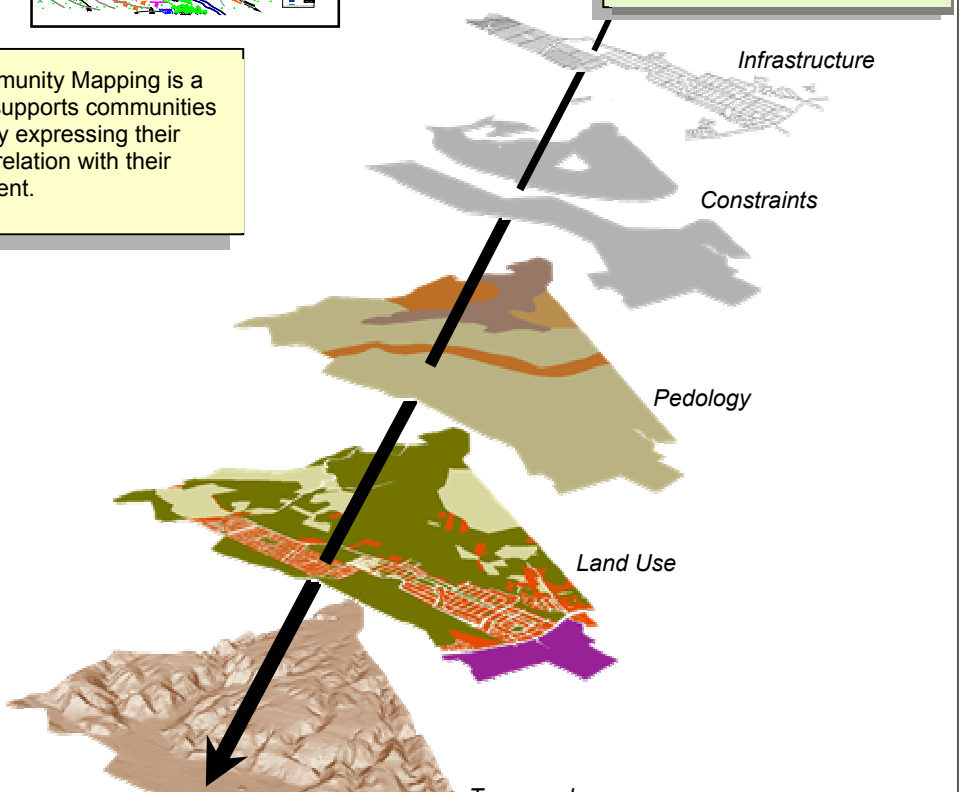


GIS

A Geographic Information System is a computer based cartography system wherein the data are georeferenced and can be interrelated

CM

The Community Mapping is a tool that supports communities in spatially expressing their needs in relation with their environment.



Such a GIS allows to take into account the views and the expectations of the local populations through the integration of the community and the technical maps in order to facilitate the dialogue between the people and the government

CLUP

A genuine Comprehensive Land Use Plan can be produced by such a CB-GIS as it implements a participative approach for land planning

***Authors**: Van Oudenhove Jean-Pierre, Orban-Ferauge Françoise, Van Eetvelde-Denil Barbara (FUNDP, Namur)*

In collaboration with: Joyce Lago (CDO GIS Office), Bugo community (Villa Trinitas)

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Contact Persons:
Prof. dr. Dominique VANNESTE

Short Description

The Institute for Social and Economic Geography of K.U.Leuven (ISEG) has played an important and even a decisive part in introducing the infra-municipal statistical/functional zoning in Belgium, the so-called 'statistical sectors'. Ever since, this basical network of spatial entities has been used by the Belgian national statistical institute (NIS/INS) to collect census data (Population and Housing Census of 1970, 1981, 1991). Lots of municipalities (mostly the major cities) are using this infra-municipal zoning to collect additional data.

Ever since, the staff of ISEG is very much involved in advising the NIS/INS in the way of adapting this network in the course of time.

A very accurate version of the coordinate set of this zoning is present at ISEG in several formats in order to be used with several types of software. These expertise has been kept and extended by fundamental scientific research and several projects. ISEG not only offers knowledge about the concept of functional spatial zoning but its staff does apply the concept constantly in several fields of research that cover the whole of social and economic spatial patterns and processes in Belgium. Some of these research fields are also extended to parts or the whole of Western Europe. Most of these studies include spatial analysis (by GIS and cartography).

When developing a very strong expertise in handling the census data, mainly on the level of the municipalities and the statistical sectors, the construction and analysis of longitudinal databases, the use of multivariate data analysis methods and GIS/ desktop mapping are part of this know-how.

For the moment, ISEG is involved in the production of several volumes of the Third National Atlas of Belgium.

Courses of Cartography, GIS and connected matters

Course Title	Hours			Section	Level
	Th	*Pract*	*Field*		
Geographic Information Systems	30	30		Geography, Archeology (optional), Economy (optional)	M
Spatial Analysis Techniques	15	30		Geography	G

Level: U(ndergraduate) – G(raduate) – M(aster)

Research

Expertise and research with strong cartographic and GIS affinities

* economic geography

- spatial welfare distribution and housing on different scales (regional on the level of communes and intra-urban on the level of statistical sectors) (*planned research project*)
- economic profiles and potentials of regions
- location strategies and patterns of foreign firms in Belgium (*on-going research project*)
- territorial implications of the netwerk economy by Belgian and foreign firms located in Belgium (*on-going research project)*
- Equipment of the Belgian municipalities and urban hierarchy (*project*
- Survival strategies for a multifunctional agriculture in peri-urban areas (*project*)

*social geography

- Atlas of deprived neighbourhoods
- The spatial dimension of social networks: territoriality and meeting place
- Urban region formation and electoral change: the geographical dimension of electoral behaviour in the Brussels urban regio

- Comparative study of economic restructuring and its socio- spatial dimension in West-European cities (*project*)
- Tourismification of urban destinations
- Poverty, households and transport mobility in Flanders (*project*)
- Migrants and Access to housing in the European Union (*project*)

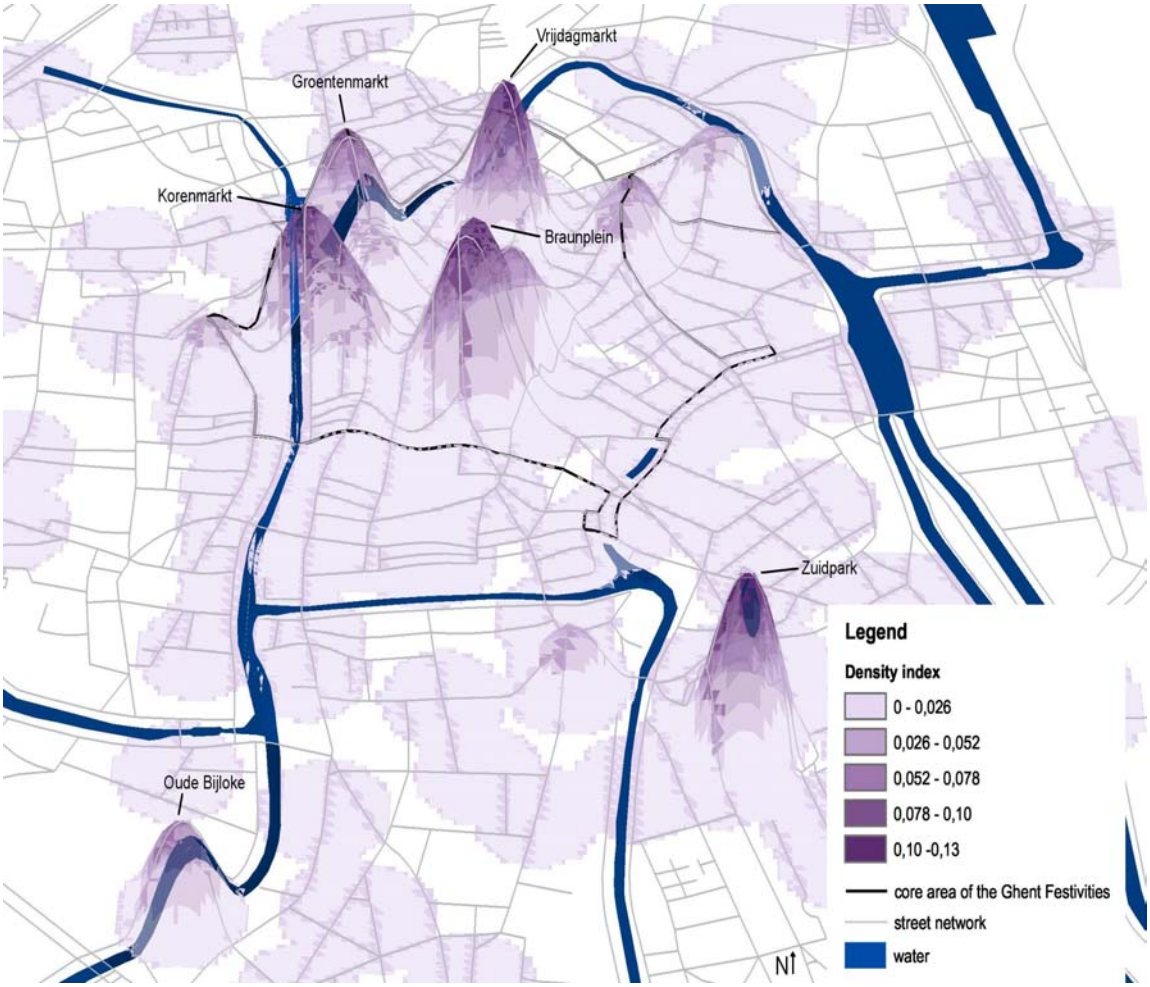
* spatial analysis

- Socio-economic applications of spatial analysis techniques.
- Spatial data and relevant spatial subdivisions for environmental reporting in Flanders (*project*)
- Impact of cultural events on mobility (*Flemish Center for Tourism Policy Studies*)

*development of educational ICT materials (webmodules for higher geography education)

- www.kuleuven.ac.be/south_africa (*finished research project)*
- www.kuleuven.ac.be/VFT (Virtual Field Trips) (*finished research project)*

for further information: www.kuleuven.ac.be/geography/iseg



This figure was part of a poster on visualization of space-time paths of visitors at the Ghent Festivities. The density surface represents the total amount of time visitors spent in a certain location. Strategies to improve 3D representations were worked out. Examples are the orientation of the 3D scene to the north, the choice of a set of useful reference layers and the denotation of reference points by arrows and text, all combined in a map with maximum legibility. The poster was given a prize at the Research day 'GIS and the 4th dimension', organized by the Belgian Sub-commission for Cartography and GIS (Van Holm - Flemish Center for Tourism Policy Studies -K.U.Leuven, 2002*)*.

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Prof. M. Rounsevell (G.I.S.) – rounsevell@geog.ucl.ac.be

Prof. I. Thomas (cartography and spatial data analysis) – isabelle@geog.ucl.ac.be

Prof. P. Defourny (geomatics; remote sensing) – defourny@enge.ucl.ac.be

Short description

Several courses are integrated in the undergraduate, graduate and PhD teaching programs of the *Department of Geography* (Faculty of Sciences). They are devoted to several topics such as cartography, G.I.S., remote sensing, topography or geodesy. Moreover, the Department participates in an interuniversity master in Cartography and Remote Sensing organised jointly by the three main French-speaking Belgian universities. The department of environmental sciences and land use planning also offers courses in GIS and in Global Positioning Systems.

Courses of cartography, GIS and connected matters at UCL

Course Title	Hours			Section	Level
	Th	*Pract*	*Field*		
Cartography and spatial data analysis	30	30		Geography	U
G.I.S.	30	30		Geography	G
	15	15		Geography	G
	15	15		Agronomy	M
Geodesy	22,5			Astronomy	M
	15	7,5		Astronomy	U
Remote Sensing	30	30		Geography	G
	15	15		Geography	G
	15	15		Geography	M
		30		Geography	M
Geomatics and Environment	30	30		Agronomy	G
	30	45		Agronomy	M
	15	15		Agronomy	M
Topography	30	30		Agronomy	G

Level: U(ndergraduate) – G(raduate) – M(aster)

Research and directions ins GIS and cartography

(see websites for further details)

- Modelling of processes land-use & land-cover changes
- GIS analysis and database management
- Quantitative methods in spatial analysis and cartography
- Landscape ecology and biodiversity assessment

University of Liège : Unit of Geomatics

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Phone : +32-(0)4.366.5742 (secretariat)

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http://www.geo.ulg.ac.be

Contact Persons:

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Phone : +32-(0)4.366.54.24

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Short Description

Founded in 1817, the University of Liege is the only public Community-sponsored university in the French-speaking part of Belgium which offers a complete range of university courses at undergraduate and post-graduate levels. It is divided into eight faculties. Its staff comprises 3,300 employees, including 2,400 faculty members (involved in teaching and research) and 800 administrative and technical support staff. 18% of its 15,000 students come from 70 different countries.

The diploma in geomatics and surveying has been created in 1992 into the Department of Geographical Sciences (Faculty of Sciences). It is only proposed by the University of Liege in the French-speaking part of Belgium. This program is based on a sound training in mathematics, computer science and geo-sciences. Moreover it gathers courses devoted to the major techniques dealing with acquisition, digitization, assessment, management, analysis and visualization of geographical spatial data..

Courses of Cartography, GIS and connected matters

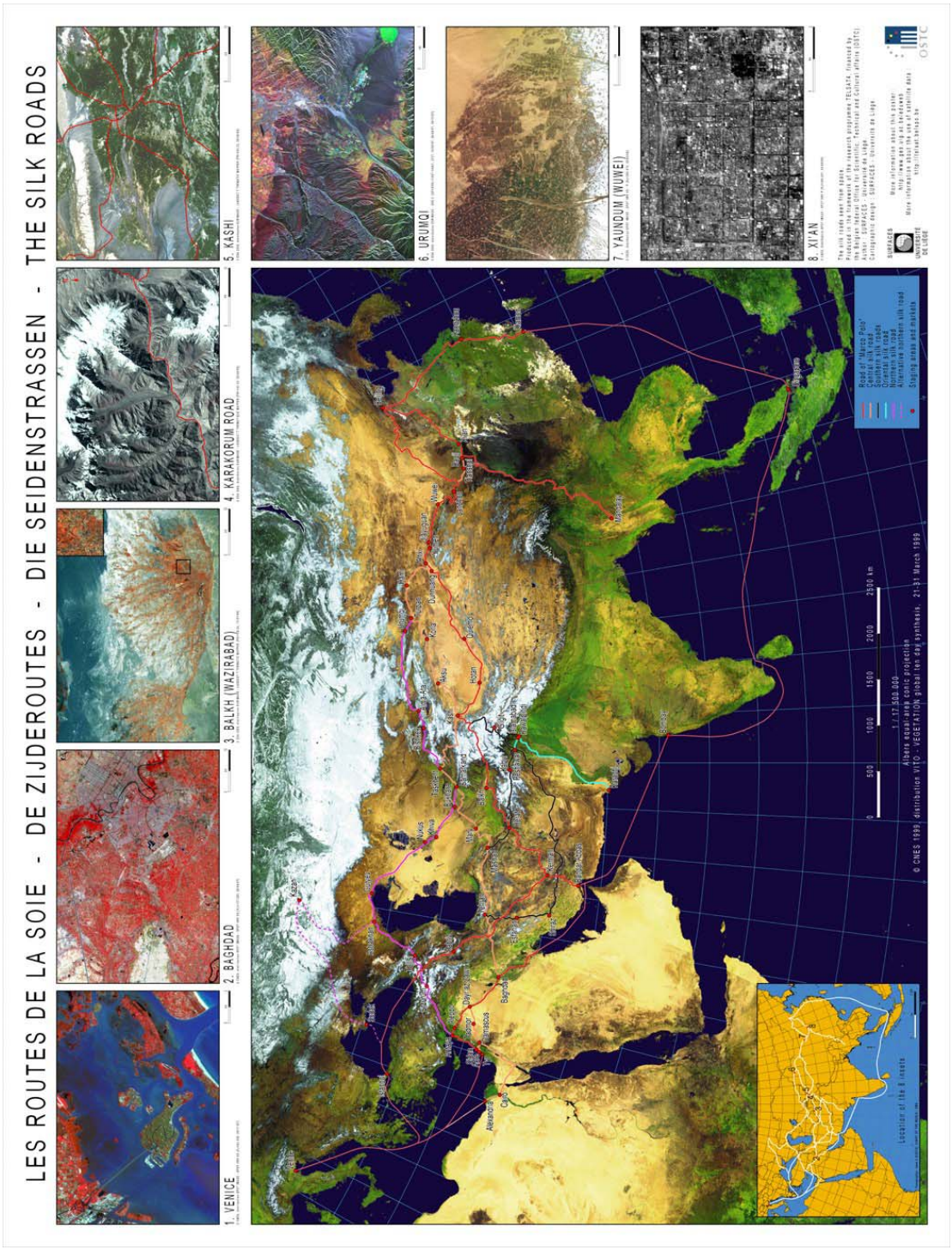
Course Title	Hours			Section	Level
	Th	*Pract*	*Field*		
Geodesy	30	15	8	Geomatics	U
Surveying I	30	15	24	Geomatics	U
Surveying II	30	45	16	Geomatics Ms Carto & RS	G M
Field Surveying	12	0	104	Geomatics	G
Cartography I	40	40 30	0	Geomatics Geography	U U
Cartography II	15	15	0	Geomatics	G
Photogrammetry	30	15 60	0	Geomatics Ms Carto & RS	G M
Remote sensing	30	40	0	Geomatics Geography	G G
Oceanographic remote sensing	15	15	0	Oceanology	M
Satellite positioning	15	10	20	Geomatics	G
Spatial databases	30	30	0	Geomatics	G
Introduction to GIS	15	15	4	Geology, Geography	G G
Introduction to GIS	15	15	0	Land planning Environment	M M
Spatial analysis & GIS	30	30	0	Geomatics, geography	G
Advanced GIS	30	30	0	Geomatics, Ms Carto & RS	G M

Level: U(ndergraduate) – G(raduate) – M(aster)

Research

The laboratory SURFACES (acronym for « *Service Universitaire de Recherches Fondamentales et Appliquées en Cartographie et Études Spatiales* ») was created in 1986 within the Faculty of Sciences of the University of Liège in order to promote research projects as well in digital cartography and spatial analysis as in the rising domains – at that time – of GIS and high resolution remote sensing. The laboratory was incorporated in the Unit of Geomatics when the last was created in 1997, together with the units of surveying and photogrammetry. Presently the

laboratory SURFACES is in charge of all external study contracts negotiated by the Unit of Geomatics. It presents a sound experience through more than 100 projects. A comprehensive list of projects and publications is available on the Web pages of the Unit at: http://www.geo.ulg.ac.be The research agenda of the Department includes several fundamental topics developed in the framework of doctoral theses – such as GIS design formalism and CASE tool, conceptual design of 3D and spatio-temporal GIS, GIS spatial decision support systems, combination of radar-optical remote sensing. Moreover, individual researches are largely dictated by programmes defined in international WG and networks where the Department is represented: interferometry (ESA), image fusion (EARSeL), automatic generalization and satellite mapping (ICA), spatial data bases (AGILE), interoperability (EEGECS), etc. Besides the fundamental research achieved for industry becomes a significant part of the activities of the laboratory, as it is shown by the recent projects with IGN-F International (GIS design), CNES (image fusion) and companies belonging to the Open-GIS Consortium (distributed GIS). Concerning applied research, the spin-off after fifteen years of projects with regional, national and international partners (E.U., OSTC, Brussels and Walloon regions, etc.) sustains a regular flow of applications dealing with urban and regional GIS design and implementations, land use studies, spatial data quality assessment, precision surveying, digital photogrammetry, etc., largely in favour of public authorities.


LES ROUTES DE LA SOIE - DE ZIJDEROUTES - DIE SEIDENSTRASSEN - THE SILK ROADS
1. VENICE
2. BAGHDAD
3. BALKH (WAZIRABAD)
4. KARAKORUM ROAD
5. KASHI
6. URUMQI
7. YAUNDUM (WUJWEI)
8. XI'AN

Centre for Cartography and GIS
Department of Geography
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Short Description

The Centre for Cartography and GIS (CCG) of the Vrije Universiteit Brussel (VUB) was founded in 1989. Its main activities are education, research, and provision of services in the field of cartography, GIS and related matters.

The CCG is responsible for the organization of all cartography and GIS courses that are part of the Geography degree program of the university, both at undergraduate and graduate level. Some of these courses are also attended by students enrolled in other programs, including Applied Information Technology, Geology, Bio-engineering, Civil Engineering and Architecture. The CCG also organizes specific GIS training courses for Master programs in Environmental Science and Technology, Ecological Marine Management and Physical Land Resources. Next to its teaching activities within graduate and master programs offered by the university, the CCG also organizes short training courses for GIS professionals, which take place once a year as well as on demand.

Research activities at the Centre for Cartography and GIS focus on map projection issues, error modeling and error propagation in GIS, and land-use/land-cover mapping from remotely sensed data. Presently the Centre is coordinating a research project on spatial information extraction for local and regional decision makers, using very-high-resolution remotely sensed data (SPIDER). The project is a collaboration between five Belgian university laboratories. The aim of the project is to investigate how present-day EO-technology can support local and regional decision-making,

and to develop value-added products that respond to some of the information needs of Belgian local and regional authorities.

Courses of Cartography, GIS and connected matters

Course Title	Hours			Section	Level
	Th	*Pract*	*Field*		
Cartography	30	15		Geography	U
Geographical information systems	30	30		Geography	U
Geodesy	15			Geography	G
GIS and spatial analysis	30	30		Env. Sc. & Techn.	M
Implementation of GIS	15	30		Geography	G
Introduction to GIS	15	15		Marine ecology	M
Land information systems	30	30		Physical land res.	M
Map projections and coordinate systems	30	30		Geography	G
Remote sensing	15	20		Geogr. / Civ. Eng.	G/M
Spatial analysis	30	30		Geography	G
Topography and photogrammetry	15	20	x	Geogr. / Civ. Eng.	G/M

Level: U(ndergraduate) – G(raduate) – M(aster)

Research

Map projection research

Map projection research focuses on the definition of new strategies for reducing distortion on small-scale map projections. Several map projections with low distortion have been developed, including a set of new projections for world maps and a low-error projection for the small-scale mapping of the present member states of the European Union. The *Canters projection*, which is suited for general reference maps of the entire world, and which has been especially designed for educational purposes, is used in Belgian geography text books and atlases, and has also been adopted by Belgian organisations active in development cooperation (ABOS, NCOS). Next to the development of *tailor-made* map projections, the Centre is also developing new strategies for semi-automated map projection selection, to assist cartographers in making a proper map projection choice. Many of the results of this research can be found in *Small-scale map projection design* by F. Canters, recently published in the Research Monographs in GIS series by Taylor & Francis.

Error modeling and error propagation in GIS

Research activities in the domain of error modeling and error propagation focus on the modeling of uncertainty in categorical data (area-class maps, satellite derived land-cover data). Strategies are developed to explore the spatial structure of uncertainty in categorical GIS coverages and to incorporate this knowledge in the error modeling process. Research results are used to estimate the impact of uncertainty in categorical data on the outcome of environmental models that make use of these data (habitat modeling of endangered species, structural landscape classification, …). Recent work focuses on the use of multinomial regression models and sequential indicator simulation to model attribute uncertainty in categorical vegetation maps, using underlying soil properties as secondary information.

Land-use/land-cover mapping

Many of the research activities that are carried out by the CCG have to do with the extraction of land-cover/land-use information from optical sensor data, at low, high-, as well as very-high resolutions. Because of the general interest of the lab in spatial uncertainty issues (see above), much of this research deals with problems of uncertainty in land-cover classification output, caused by spectral confusion and/or class mixing at the sub-pixel level. Recent work includes:

a. the modeling of uncertainty in land-use/land-cover maps, obtained through classification of high-resolution satellite data (Landsat, SPOT), and the assessment of the effects of classification uncertainty on the output of GIS-based techniques for spatial modeling (see also above);

b. the improvement of land-cover area estimates obtained from low-resolution data (NOAA-AVHRR, SPOT-VGT), using inverse calibration techniques and sub-pixel classification;

c. the extraction of urban land-cover from very-high-resolution data (Ikonos, Quickbird), and the inference of land use from land cover, using knowledge-based postclassification techniques.

Illustrations below:
From: Canters, F., W. De Genst and H. Dufourmont, 2002, Assessing effects of input uncertainty in structural landscape classification, *International Journal of Geographical Information Science*, 16, 2, 129-149.

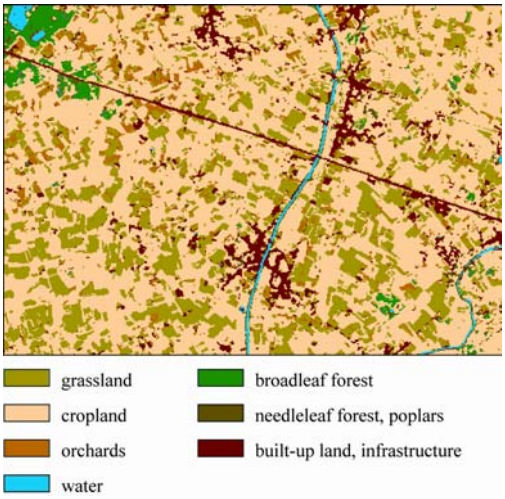

Figure 1. Land-cover classification for a rural area in the Province of East Flanders (Ghent-Deinze, Belgium).

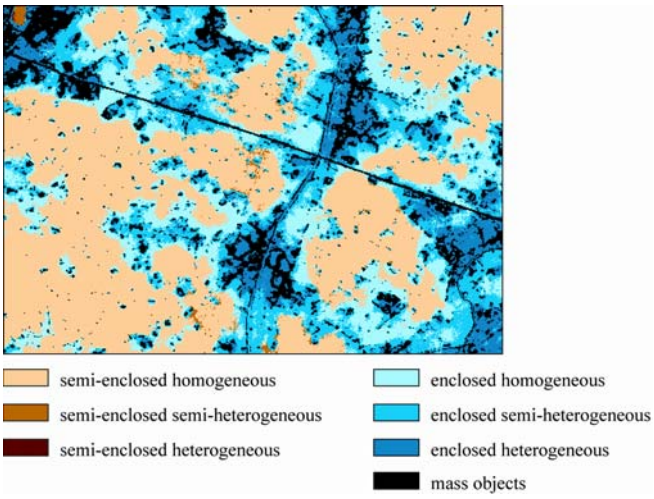

Figure 2. Landscape classification based on a satellite-derived land-cover map (figure 1) and a DEM.

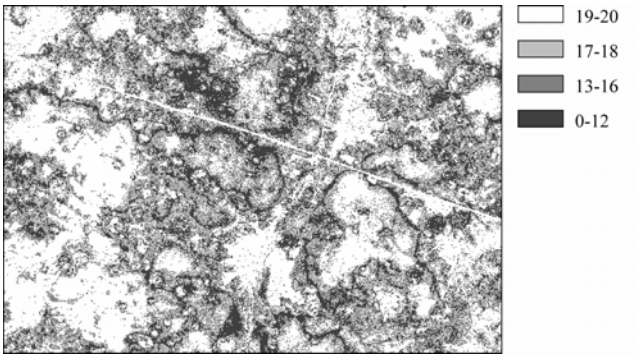

Figure 3. Landscape classification uncertainty: the number in the legend refers to the number of times a pixel is assigned to the most likely landscape class (figure 2) in a Monte Carlo simulation (n=20) that assesses the combined effect of image classification uncertainty and DEM error on landscape classification uncertainty. High numbers indicate less uncertainty in the outcome of the landscape classification model.

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Short Description

In the frame of the general aims of the University of Gent the department of Geography has to carry out three assignements: education, research and service providing. GIS processing and cartography are practised in fundamental way and in applied mode. In the last case its techniques are used for analysis and reporting in different applications.

The department of Geography dispenses courses to Geography students at Undergraduate till Master degree level. At the University of Gent two options exist in the geography curriculum: geography s.s. and land surveying. The option land surveying started in 1990. The University of Gent in the only Flemish university offering this education at universitary level. It is an ideal preparation for people who like to practice as independent surveyor or to hold a position in g.i.s. or l.i.s. The option geography s.s. gives access to different professions, including teaching. From the first undergraduate year there is a differentiation in the courses to be attended.
The master degree students in geography s.s. have the choice between four specialisations (physical environment; society, planning and development; landscape studies and environment; cartography).
The Faculty delivers also the Degree of Doctor. No special courses are organised, but students have to develop an original and high-level aim of research. Some of the courses are also

attended by students enrolled in other programs (geology, engineering, ….). Specific courses related to G.I.S. are also dispensed.

In 2004 a new structure of Bachelor and Master will be introduced consisting of a bachelor geography, a master geography and a master geomathics and land surveying.

Courses of Cartography, GIS and connected matters

Course Title	Hours			Section	Level
	Th	*Pract*	*Field*		
Introduction to Geographical Information Systems	22,5	20		Geography	U
Introduction to Geographical Information Systems	22,5	20		Land surveying	U
Introduction to Aerial Photography mapping and Remote Sensing	22,5	40		Geography	U
Introduction to Aerial Photography mapping and Remote Sensing	22,5	40		Land surveying	U
General and Thematical Cartography	22,5	40		Geography	U
General and Thematical Cartography	22,5	40		Geography	U
Applied Informatics I	22,5	60		Land surveying	U
Applied Informatics II	7,5	40		Land surveying	G
Cartography: projections and constructions I	22,5			Geography	G
Cartography: projections and constructions I	22,5			Land surveying	G
Cartography: projections and constructions II	15	20		Geography	G
Cartography: projections and constructions II	15	20		Land surveying	G
Spatial Analysis and G.I.S.	22,5	20		Geography	G
Photogrammetry	15	20		Land surveying	G
Cartographic Modelling	22,5			Geography Land surveying	M – O
Cartography in land registration	22,5			Geography Land surveying	M – O

Computer aided Cartography	22,5	60		Geography Land surveying	M – O
Geographical Information Systems	15	20		Geography	M
Geographical Information Systems	15	20		Land surveying	M - O
Remote Sensing and Imagery	10	20		Geography	M - O
Critical Historical Cartography	22,5			Geography	M - O
Cartographical Terrainwork	7,5	60		Geography	M - O

Level: U(ndergraduate) – G(raduate) – M(aster)

Research

"Spatial data processing and mapping" is one of the research topics of the department of geography. It includes research in the following fiels:

Regional geography, geographic information systems and spatial data processing

Mapping activities focus upon inventoring and surveying of the landscape (mainly Flanders) including geomorphology, natural, cultural, historical and archeological elements. This includes building of databases linked to digital maps and photographic archives. G.I.S. is used for the integration and map production. Data are produced that can be interpreted in "GIS Vlaanderen" of the Flemish Community. Spatial analysis is performed with G.I.S. on landscape ecological monitoring, spatial planning and decision making, archeological pattern reconstruction and biodiversity monitoring.

Remote Sensing and image interpretation

Treatment and interpretation of remote sensing images. A first group of research workers is specially involved with applications to Mediterranean and arid zones in a context of global change and study of the agricultural and human impact. Another group is involved in applied research on high resolution imagery. Photomrammetry research is focussed on terestrial architectural applications.

Production methodology

Cartographic approach for inaccessible areas, special visualisation techniques for web cartography, printing processes, etc.

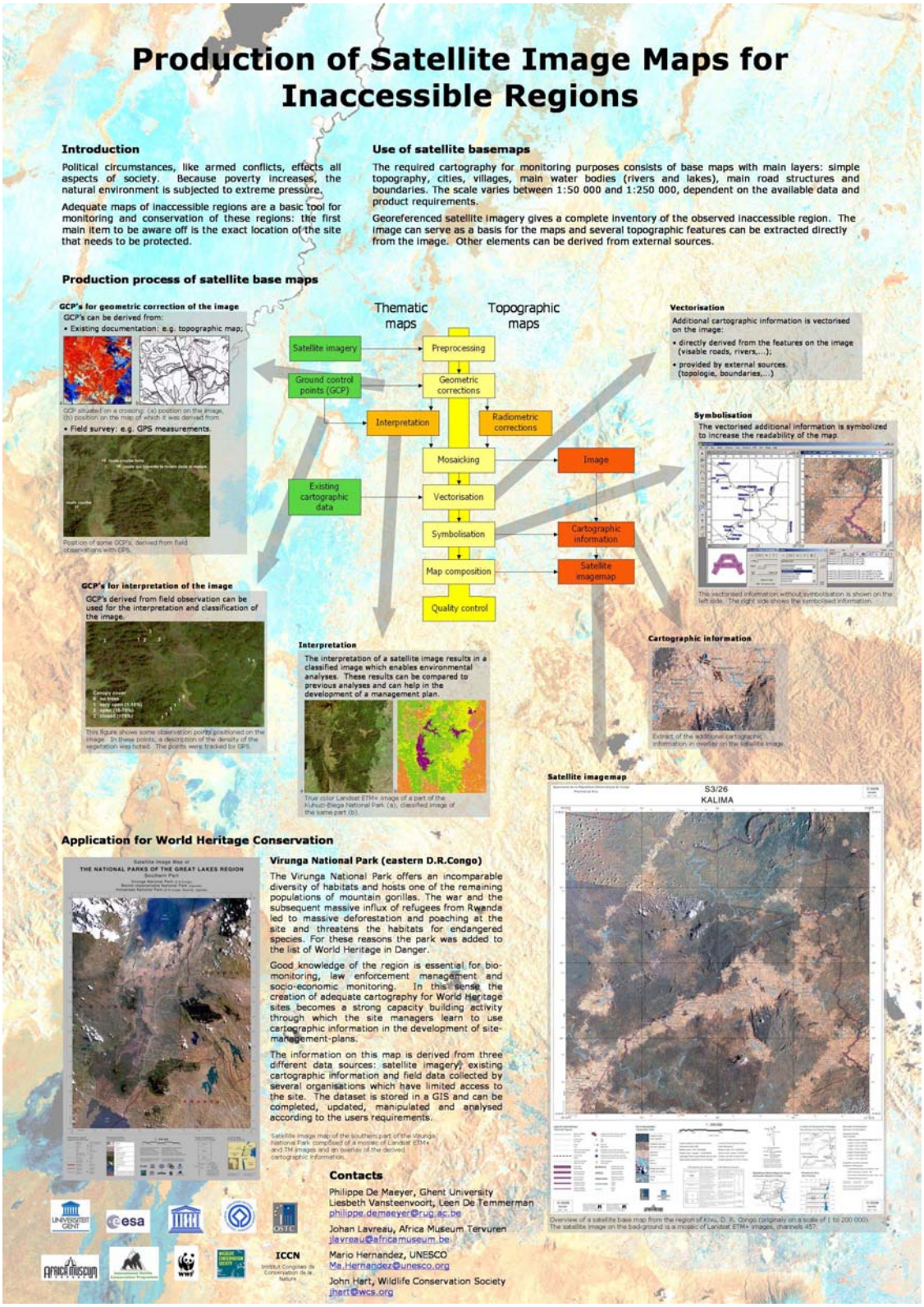
Data-models in cartography and G.I.S.

Spatio-temporal models, standardisation in cartography and G.I.S.

Applied G.I.S., Networks and applications, data-extraction from satellite images.

Marine cartography, Cartography of continental shelf and estuary

Historical cartography, Beginning from the 18th Century, involving historic-Flanders (Flanders with the North of France and the South of the Netherlands included).


Production of Satellite Image Maps for Inaccessible Regions
Introduction
Political circumstances, like armed conflicts, effects all aspects of society. Because poverty increases, the natural environment is subjected to extreme pressure.
Adequate maps of inaccessible regions are a basic tool for monitoring and conservation of these regions: the first main item to be aware off is the exact location of the site that needs to be protected.
Use of satellite basemaps
The required cartography for monitoring purposes consists of base maps with main layers: simple topography, cities, villages, main water bodies (rivers and lakes), main road structures and boundaries. The scale varies between 1:50 000 and 1:250 000, dependent on the available data and product requirements.
Georeferenced satellite imagery gives a complete inventory of the observed inaccessible region. The image can serve as a basis for the maps and several topographic features can be extracted directly from the image. Other elements can be derived from external sources.
Production process of satellite base maps
GCP's for geometric correction of the image
GCP's can be derived from:
• Existing documentation: e.g. topographic map;
• Field survey: e.g. GPS measurements.
Thematic maps
Topographic maps
Satellite imagery
Ground control points (GCP)
Existing cartographic data
Preprocessing
Geometric corrections
Interpretation
Radiometric corrections
Mosaicking
Vectorisation
Symbolisation
Map composition
Quality control
Image
Cartographic information
Satellite imagemap
Vectorisation
Additional cartographic information is vectorised on the image:
• directly derived from the features on the image (visable roads, rivers,...);
• provided by external sources (topologie, boundaries,...)
Symbolisation
The vectorised additional information is symbolized to increase the readability of the map.
GCP's for interpretation of the image
GCP's derived from field observation can be used for the interpretation and classification of the image.
Interpretation
The interpretation of a satellite image results in a classified image which enables environmental analyses. These results can be compared to previous analyses and can help in the development of a management plan.
Cartographic information
Satellite imagemap
S3/26
KALIMA
Application for World Heritage Conservation
Virunga National Park (eastern D.R.Congo)
The Virunga National Park offers an incomparable diversity of habitats and hosts one of the remaining populations of mountain gorillas. The war and the subsequent massive influx of refugees from Rwanda led to massive deforestation and poaching at the site and threatens the habitats for endangered species. For these reasons the park was added to the list of World Heritage in Danger.
Good knowledge of the region is essential for bio-monitoring, law enforcement management and socio-economic monitoring. In this sense the creation of adequate cartography for World Heritage sites becomes a strong capacity building activity through which the site managers learn to use cartographic information in the development of site-management-plans.
The information on this map is derived from three different data sources: satellite imagery, existing cartographic information and field data collected by several organisations which have limited access to the site. The dataset is stored in a GIS and can be completed, updated, manipulated and analysed according to the users requirements.
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Short Description

The contribution of the human geography department to teaching in geography rely on 4 full time teachers, 6 part time teachers and 1.15 assistant. Courses are given during the four years in geography. Topics are broad : economic geography, urban geography, quantitative geography, demography, geography of population, geomarketing, land planning, GIS and remote sensing, cartography, map reading, geography of Belgium, history of landscapes, methodology of human geography, rural areas in the world, analysis of urban areas, spatial modelling, geography of Europe, of North Africa and Middle East, of Tropical africa, of Latine America, of East Asia, of North America.

Courses of Cartography, GIS and connected matters

Course Title	Hours			Section	Level
	Th	*Pract*	*Field*		
Geographic Information Systems	30	15		Geography, agronomy	G
Remote Sensing	15	15		Geography, agronomy, urbanism	G
Numeric cartography and land surveying	15			Geography	G
Map reading in human geography	7.5	22.5		Geography, tourism	U
Spatial modelling	15	15		Geography	G, M
Methodology in human geography	15	38		Geography	U
Quantitative methods of regional analysis	30	15		Geography	G, M
Mathematic geography : cartography	15	15		Geography	G, M

Level: U(ndergraduate) – G(raduate) – M(aster)

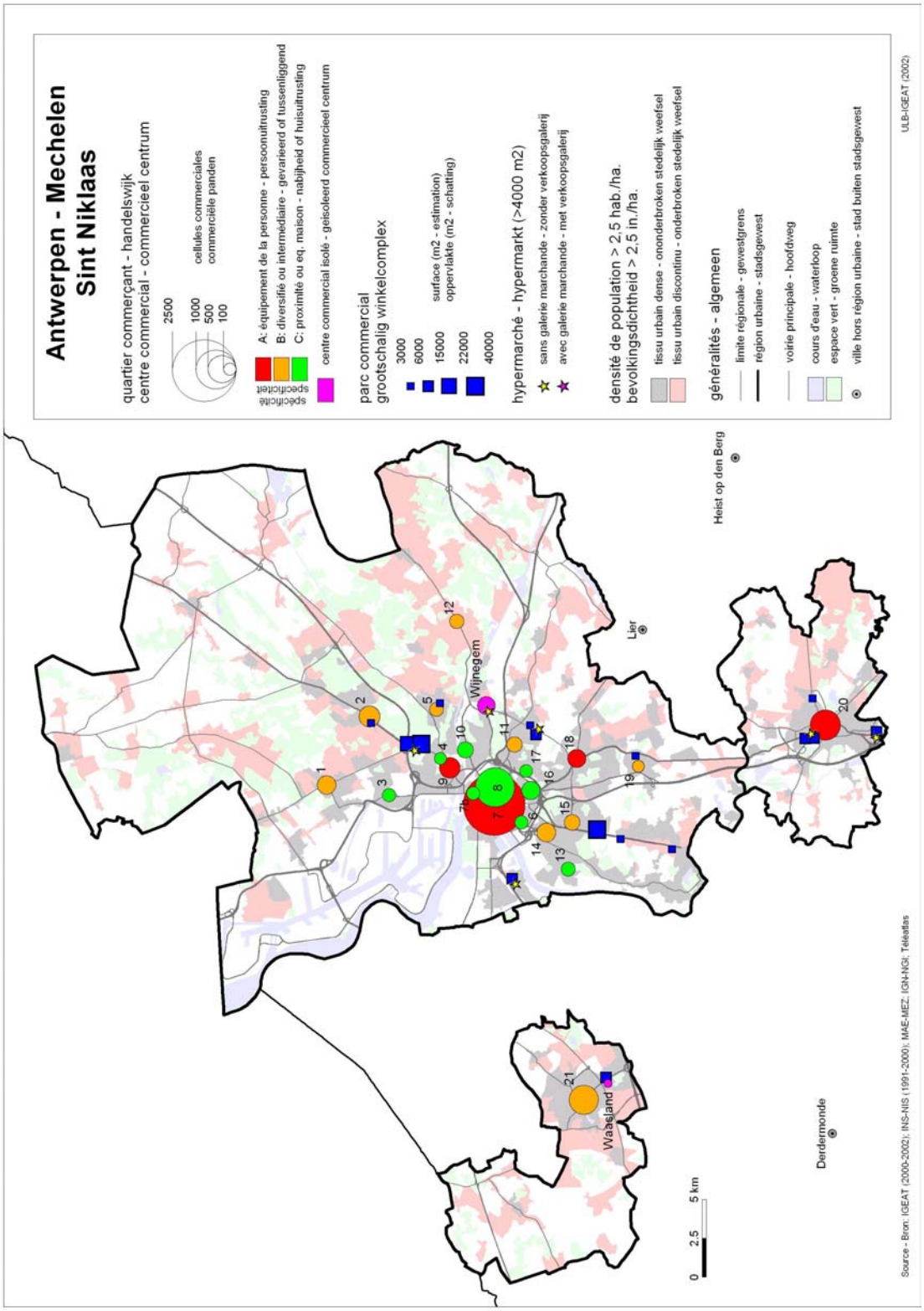
For further information of programmes : http://www.ulb.ac.be/facs/sciences/geog/index.html

Research

4 PhD students on grants and 17 researchers on contracts, supervised by 4 seniors researchers are conducting research in applied geography, geomarketing, remote sensing, GIS and land planning. The total annual budget of these research contrats is around 1 500 000 euros, coming mainly from public authorities. These research works lead to a number of books and publications; in the last 5 years, we published 12 books as author or editor, 25 contributions to books, 15 articles in international peer-reviewed journals, 30 in national peer-reviewed journals and we were responsible of the edition of 5 volumes of journals. Since 1990, 13 PhD thesis were sustained and 13 other thesis are ongoing. We are also involved in a large number of international collaborations.

Among all these research works, two main axis are well developped : the analysis of urban areas and the territorial development, both in relation with urban planning, in a comparative approach and focusing on recent changes.

for further information on research activities : http://www.ulb.ac.be/igeat


Antwerpen - Mechelen
Sint Niklaas
quartier commerçant - handelswijk
centre commercial - commercieel centrum
2500
1000
500
100
cellules commerciales
commerciële panden
A: équipement de la personne - persoonuitrusting
B: diversifié ou intermédiaire - gevarieerd of tussenliggend
C: proximité ou eq. maison - nabijheid of huisuitrusting
spécialité
specialiteit
centre commercial isolé - geïsoleerd commercieel centrum
parc commercial
grootschalig winkelcomplex
3000
6000
15000
22000
40000
surface (m2 - estimation)
oppervlakte (m2 - schatting)
hypermarché - hypermarkt (>40000 m2)
sans galerie marchande - zonder verkoopsgalerij
avec galerie marchande - met verkoopsgalerij
densité de population > 2,5 hab./ha.
bevolkingsdichtheid > 2,5 in./ha.
tissu urbain dense - ononderbroken stedelijk weefsel
tissu urbain discontinu - onderbroken stedelijk weefsel
généralités - algemeen
limite régionale - gewestgrens
région urbaine - stadsgewest
voirie principale - hoofdweg
cours d'eau - waterloop
espace vert - groene ruimte
ville hors région urbaine - stad buiten stadsgewest
ULB-IGEAT (2002)
Source - Bron: IGEAT (2000-2002); INS-NIS (1991-2000); MAE-MEZ; IGN-NGI; Teleatlas
0
2,5
5 km
Heist op den Berg
Lier
Wijnegem
Waasland
Dendermonde
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

This map draws a syntesis of the main retail equipments (district centre & higher) of the urban region (the city and its suburbs). It is the result of an exhaustive approach of collect and analysis : localisation of retail centres based on existing studies and phone databases, delineation and inventories of commercial areas, data structuration into a GIS, statistical analysis of the supply structure (PCA, statistical tests, …), cartographic symbolisation, … This global view is completed for the downtown area of the 4 larger belgian cities by an approach at the scale of street sections. Those large and medium scale maps complete a ste of maps based on employment data at the communal level. Whole collected and processed data allows to draw an exhaustive panorama of the retail geography in the 17 largest belgian cities and its recent evolution. Such a work, covering the country at different scales and using standardised methods, haven't been achieved since 1975. It is meant to support the federal urban policy as well as the commercial planning policy.

Members of the Belgian Committee on Cartography and GIS

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