

Centre for Geoinformation Science (CGIS) 2012 Annual Report



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Natural and Agricultural Sciences

Table of Contents

1. Message from the Acting Director	1
2. Strategy	2
2.1 Vision	2
2.2 Mission	2
3. The CGIS team.....	3
3.1. Advisory Board	3
3.2 Management Committee	4
3.3 Postgraduate students	6
4. Summary of 2012 activities.....	8
4.1 Marketing and operations	8
4.2 Internal platform at UP	8
4.3 Facilitator of UP GISc research collaborations	10
4.4 Partner to the geoinformation industry of South Africa.....	12
4.5 Attendance at conferences, workshops and meetings	15
4.6 CGIS visitors	16
5. Research output.....	18
5.1 Peer-reviewed journal articles	18
5.2 Papers presented at refereed conferences	18
5.3 Chapters in books	19
5.4 Theses, dissertations and Honours reports.....	19
6. Funding.....	21
Annex A: Constitution of the Centre for Geoinformation Science (CGIS)	22

1. Message from the Acting Director

Geoinformation Science (GISc), also known as Geoinformatics, is concerned with the nature of geographic information and the use of geospatial technologies to collect, store, integrate, transform, retrieve, analyse, display and distribute geographic information from different sources. GISc is a multi-disciplinary endeavour, drawing on other disciplines, such as geography, mathematics, statistics and computer science. Due to recent developments, there is a renewed need for the coordination of GISc research, education and training, professional development and community engagement at the University of Pretoria.

Firstly, South Africa is in the process of establishing a spatial data infrastructure to facilitate and coordinate the capture, sharing, access and maintenance of spatial information among organs of state. This is a first for the country and the required expertise in South Africa is limited. Consequently, there is a need to build capacity in GISc and SDI-related fields.

Secondly, the recently established South African National Space Agency (SANSA), the development of next generation space geodesy equipment and systems, and various initiatives for globally coordinated earth observation are another driving force that call for GISc research, education and training.

Thirdly, GISc professional registration with the South African Council for Professional and Technical Surveyors (PLATO) Council now requires a formal GISc education. Anecdotal evidence suggests that there is a severe shortage of GISc professionals.

CGIS aims to address these needs by being an internal platform for GISc at UP, by facilitating multi-disciplinary GISc research collaborations and by being a partner to the geoinformation industry of South Africa. Apart from our ongoing activities and research, 2012 was a year in which the foundations for achieving the CGIS vision were laid:

- Five research focus groups were initiated in January: Forensic geography; GISc Education and Training; Open source and data for geospatial; Space geodesy, earth and atmospheric observation; and Spatial data infrastructures.
- The amended CGIS constitution was approved by the UP Senate in May.
- The first ICA-OSGeo Lab was established in October. It is one in a network of 24 all over the globe and puts us into contact with leading international researchers in the field of open source geospatial software and data.
- Members of the Advisory Board were appointed in December. We are honoured to have them on the CGIS Team!

Finally, a sincere word of thanks to colleagues and students involved in CGIS in 2012. CGIS exists through your support and collaboration. Together we can achieve more!

Dr Serena Coetzee
CGIS: Acting Director

April 2013

2. Strategy

The amended CGIS constitution was approved in May 2012. The new CGIS vision and mission are included here. The full constitution is included in Annex A.

2.1 Vision

In its vision the Centre for Geoinformation Science strives to be:

- An internal platform at UP from where the excellence of UP individuals and teams involved in GISc research, education and training, professional development and community engagement is supported and strengthened.
- A facilitator of UP GISc research collaborations, education and training and professional alliances within South Africa and abroad.
- A partner to the South African geoinformation industry in support of GISc research, education and training, professional development, community engagement.

2.2 Mission

The Centre for Geoinformation Science aims to achieve the vision statements by the following mission actions:

- Engaging in research, education and training, professional development, community engagement and capacity building, in line with the overall strategy of UP.
- Obtaining funding for GISc research, education and training, professional development and community engagement by establishing new partnerships and alliances, as well as strengthening those already in existence.
- Creating high-level human resource capacity by involving students in GISc research, education and training, professional development and community engagement projects.
- Transferring knowledge and expertise through conferences, seminars, training, training events (e.g. workshops and short courses), publications and other appropriate avenues.
- Communicating and coordinating with other UP departments on GISc research, education and training, professional development and community engagement.
- Collaborating with other UP departments, universities and research institutes on GISc research, education and training, professional development and community engagement.

3. The CGIS team

The CGIS team comprises the Advisory Board, Management Committee and postgraduate students.

3.1. Advisory Board

The first Advisory Board members were appointed at the end of 2012 and we are looking forward to working with them. The Board will provide strategic direction and advice regarding marketing, as well as the research, education and training, professional development, community engagement, and capacity building in CGIS; it will also advise on operational decisions, review the annual budget and review the realization of the vision and the execution of the mission.

3.1.1 Chairperson



Prof Anton Ströh

Chairperson: CGIS Advisory Board

Dean: Faculty of Natural and Agricultural Sciences, University of Pretoria

3.1.2 Representatives of key stakeholders



Dr Herman Booyesen

Past National Chair: Geo-information Society of South Africa (GISSA)



Dr Derek Clarke

Vice-President: International Cartographic Association (ICA)



Mr Adri de la Rey

GIS Manager, Technology, Eskom



Mr Gavin Fleming

Chair: OSGeo Africa and
Managing Director: Afrispatial



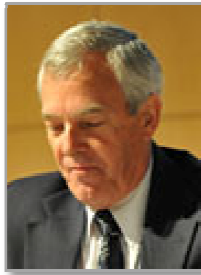
Mr Ashwell Jeneker

Deputy Director-General:
Statistical Support and
Informatics, Stats SA



Dr Pat Manders

Group Manager:
Institutional Planning, CSIR



Mr Paul Marshall
President: South African
Council for Professional and
Technical Land Surveyors
(PLATO)

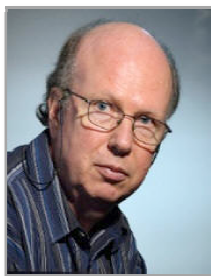


Mr Magnus Rademeyer
Managing Director, AfriGIS



Ms Chenay Simms
Esri Education, Esri South
Africa

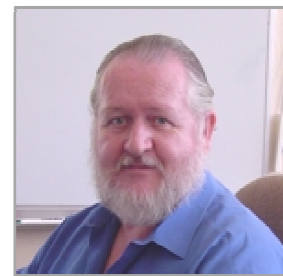
3.1.3 Heads of collaborating departments and schools



Prof Theo Bothma
Chair: School of Information
Technology, University of
Pretoria



Prof Andries Engelbrecht
Head: Department of Computer
Science, University of Pretoria



Prof Pat Eriksson
Head: Department of Geology,
University of Pretoria

3.1.4 Ex officio members



Prof Hannes Rautenbach
Head: Department of Geography,
Geoinformatics and Meteorology,
University of Pretoria



Dr Serena Coetzee
Acting Director: CGIS, Senior Lecturer and Coordinator:
Geoinformatics, Department of Geography, Geoinformatics
and Meteorology, University of Pretoria

3.2 Management Committee

In 2012, Geoinformatics staff members (see below) were involved in a first planning workshop of the Management Committee. The Management Committee has the responsibility to coordinate CGIS research, education and training, professional development and community engagement activities; evaluate and make input into the strategic and business plan of CGIS; and identify opportunities to further the vision and mission of CGIS.



Ms Yvette Bevis
Cartographer, Unit for
Geoinformation and Mapping



Dr Joel Botai
Senior Lecturer and Departmental Coordinator: Earth
Sciences, Group leader: CGIS research focus group on *Space
geodesy, earth and atmospheric observation*



Ingrid Booyesen
Senior Cartographer, Head: Unit
for Geoinformation and Mapping



Prof Ludwig Combrinck
Extraordinary professor, Affiliation: HartRAO



Mr Antony Cooper
Extraordinary Lecturer,
Affiliation: CSIR



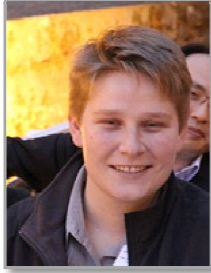
Ms Sanet Eksteen
Lecturer, Group Leader: CGIS research focus group on *GISc
Education and Training in Africa*



Mr Joos Esterhuizen
Lecturer



Ms Erika Pretorius
Technical Assistant



Victoria Rautenbach
PhD Geoinformatics student
CGIS student representative



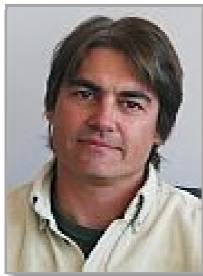
Dr Peter Schmitz
Extraordinary Senior Lecturer, Group Leader: CGIS research
focus group on *Forensic geography*, Affiliation: CSIR



Mr Philemon Tsela
Junior Lecturer



Mr Fritz van der Merwe
Senior Lecturer



Dr Konrad Wessels
Extraordinary Senior Lecturer,
Affiliation: CSIR

3.3 Postgraduate students

In 2012, ten Masters and six doctoral students were associated with CGIS through their research and that of their supervisors. Note that degrees are conferred by the respective departments, schools and faculties.

3.3.1 Masters students

Nondimizo Dlamini, MSc Geography

Supervisors: Dr Joel Botai and Dr Moses Cho (CSIR)

Research: Investigating the characteristics of expansive soils through remote sensing and in situ measurements

Nicole Govender, MSc Computer Science

Supervisors: Dr Serena Coetzee and Prof Derrick Kourie

Research: Open source geospatial education

Samy Katumba, MSc Geoinformatics

Supervisor: Dr Serena Coetzee

Research: Spatial data discovery using general purpose web search engines

Jacob Modiba, M IT

Supervisor: Serena Coetzee

Research: Towards the design and implementation of a spatial online analytical processing (SOLAP) methodology

George Moyo, MSc Geoinformatics

Supervisors: Dr Peter Schmitz

Research: Effectively managing GIS projects in the Eastern Cape provincial government

Cilence Munghemzulu, MSc Geography

Supervisors: Prof Ludwig Combrinck and Dr Joel Botai

Research: Space Geodesy technique and geological knowledge to calculate the velocity fields of sub-continental plates of Africa to support the African Geodetic Reference Frame (AFREF) project

Victoria Rautenbach, MSc Geoinformatics

Supervisor: Dr Serena Coetzee

Research: Orchestrating standard web services to produce thematic maps in a geoportal of a spatial data infrastructure

Daniel Sebake, M IT

Supervisor: Dr Serena Coetzee

Research: Assessing the motivators and barriers of interorganizational data sharing for address data in South Africa

Noh Tewolde, MSc Computer Science

Supervisor: Dr Serena Coetzee

Research: Using address ontologies for address standard interoperability

Dinao Tjia, MSc Geoinformatics

Supervisor: Dr Serena Coetzee

Research: A profile of the land administration domain model for South Africa

3.3.2 Doctoral students

Abiodun Morakinyo Adeola, PhD Geoinformatics

Supervisors: Dr Joel Botai and Dr Jane Olwoch

Research: Malaria Early Warning System (MEWS) for South Africa

Christina Botai, PhD Meteorology

Supervisor: Prof Ludwig Combrinck

Research: Evaluation of Earth gravity field models used for precise satellite orbit determination through applications of satellite laser ranging data

Antony Cooper, PhD Computer Science

Supervisors: Dr Serena Coetzee and Prof Derrick Kourie

Research: Volunteered geographic information (VGI) for spatial data infrastructures (SDI)

Jeofrey Ditsela, PhD Computer Science

Supervisor: Dr Serena Coetzee

Research: Address assignment schemes

Edward Kurwakumire, PhD Geoinformatics

Supervisor: Dr Serena Coetzee

Research: Value chain dynamics of geographic information in spatial data infrastructures

Wiafe Owusu-Banahene, PhD Geoinformatics

Supervisor: Dr Serena Coetzee

Research: Integrating linked data into a thematic geospatial web service

4. Summary of 2012 activities

Activities in 2012 contributed towards the CGIS vision described in the newly amended constitution: striving to be an internal platform for GISc at UP, a facilitator of UP GISc research collaborations and a partner to the geoinformation industry of South Africa. A summary of the 2012 activities is provided in this section. Some of the activities are ongoing and it must be noted that despite CGIS being dormant in the past, some of these activities have been ongoing for a long time.

4.1 Marketing and operations

4.1.1 Planning workshops

Two planning workshops were held on 1 December 2011 and 27 February 2012, respectively. Activities for 2012 were planned and the research focus groups and their leaders were identified:

- Forensic geography (Dr Peter Schmitz)
- GISc education and training in Africa (Sanet Eksteen)
- Open source and data for geospatial (Dr Serena Coetzee)
- Space geodesy, earth and atmospheric observation (Dr Joel Botai)
- Spatial data infrastructures (Dr Serena Coetzee)

After the workshop, information about the research groups was added to the website and activities within the groups commenced.

4.1.2 Website

The CGIS website has been up and running at www.up.ac.za/cgis since April 2011. Amongst others, the website has information about the CGIS constitution, the research focus groups, current projects, CE at UP short courses, and people involved in CGIS. News items about CGIS activities are published regularly on the website. The website is maintained by the CGIS student representative, Ms Victoria Rautenbach.

4.2 Internal platform at UP

4.2.1 Unit for Geoinformation and Mapping (UGM)

For many years already, the UGM, under the leadership of Ms Ingrid Booyesen, has been delivering GIS software, geographic data and general cartographic support to students and staff from various faculties and departments at UP. One full-time and two part-time GIS assistants (12 hours a week) assist Ms Booyesen in the UGM. UGM staff members assist, educate and train staff and students so that they can analyse and visualise their research results with GIS.

UGM provides GIS software support to students on a variety of GIS software products, including ArcGIS and QGIS. UGM also prepares maps for staff and postgraduate students on request, e.g. compiling site maps with aerial photography and satellite imagery as backdrop and specified attributes.

UGM liaises and administers the ArcGIS and ENVI software for UP's site licence. ArcGIS is installed in a number of labs for GIS practical work. Installations and

Esri support are available to all staff and postgraduates for educational and training purposes. UGM coordinates the Esri Virtual Campus Courses, which are free to all academics.

UGM assists students and staff from various (other than our own) departments on a daily basis, amongst others, the Departments of Architecture, Landscape architecture, Town and Regional Planning, Geology, Civil Engineering, Plant Sciences, Veterinary Sciences, Zoology and Entomology, Wildlife Management, Historical Studies, Archaeology and Tourism Management.

UGM is involved in a number of projects, both internally for UP, as well as for external clients. A number of these are listed below.

Centre for Environmental Studies and Department Zoology & Entomology (Faculty of Natural and Agricultural Sciences)

The Afromont project (livelihoods of mountain communities in Africa). Internet research on identifying Africa's mountain areas, acquiring spatial and attribute data. Also spatially analysing and presenting results on maps. Very limited resources for base information.

Contact: Dr Saliou Niassy

Department of Construction Economics (Faculty of Engineering, Built-Environment and Information Technology)

A trans-disciplinary and multi-departmental study of traditional settlement patterns and associated traditions of people of the Limpopo River drainage area. The study involved the Indigenous Knowledge Systems (IKS) of two key population groups, namely the Bahananwa of the Blouberg area and the Vhavenda Dynasty of the Sibasa-Thohoyandou area. Various in-depth maps for journals were developed.

Contact: Prof Chris Cloete and Prof Andrie Meyer (part-time researcher)

Department of Consumer Science (Faculty of Natural and Agricultural Sciences)

Karoo Lamb Project: Consumer perception and food traceability of Karoo lamb.

Contact: Dr Gerrie du Rand

Department of Consumer Science (Faculty of Natural and Agricultural Sciences) and the UP Institute for Food, Nutrition and Well-being

Food, nutrition and the socio-cultural aspects of food. A GIS analysis, GIS mapping and graphical representation of results were done.

Contact: Dr Annemarie Viljoen and various of her students and research papers

Department of Geology (Faculty of Natural and Agricultural Science) and the Water Research Commission (WRC)

The Hydrological Heritage Overview project, on the Fountains (ground)water supply over a period of 150 years. This artesian water source is unusually strong, consistent (delivering 40 Ml/day) and of extremely good quality – the only water source for Pretoria from 1855 until 1935.

Contact: Matthys Dippenaar

Department of Historical & Heritage Studies (Faculty of Humanities) and the ATKV

Contact: Prof Fransjohan Pretorius

Department of Statistics (Faculty of Natural and Agricultural Sciences) and the Pretoria Urology Hospital

Patient analysis result portrayal.

Contact: Solly Millard and Dr Frans Kanfer

Department of Veterinary Tropical Diseases (Faculty of Veterinary Sciences)

GIS mapping was provided for various research results in the African tropical diseases field. Spatial and attribute data for the Mnisi Area and the Hluvukani Animal Clinic is being compiled.

Contact: Jacques van Rooyen (Research Coordinator: Mnisi Community Programme at the Hans Hoheisen Wildlife Research Station) and Dr Dayo Fasina (African tropical diseases)

Heineman Publishers (external)

GIS Mapping: School Atlas for Secondary Schools

OMNIA (external company)

Database development.

SANParks (external)

- Maps on Kruger National Park geology and geosites and various other themes have been developed since 2007.
- Various information panels with maps are already displayed in five camps in the Park. The project includes maintenance of exhibits and guidance on datasets and representation. Ultimately, a 'Scientific Guide' on the interrelationship between biotic and abiotic aspects in the Park will be published.

Contact: Prof Morris Viljoen (WITS) and Vanessa Strydom, Manager Conservation Interpretation and Support

4.2.2 Graduate and postgraduate teaching

There is extensive 'cross-lecturing' between departments on undergraduate level where students from one department and/or faculty enrol for modules in another. For example, undergraduate GIS modules presented by the Department of Geography, Geoinformatics and Meteorology Students are attended by students enrolled for degrees in the Faculties of Education, Humanities and Engineering, Built Environment & Information Technology, as well as students from 'neighbouring' departments in the Faculty of Natural and Agricultural Sciences. In turn, the curriculum for BSc Geoinformatics includes modules from the Faculties of Economic and Management Sciences, Law, Engineering, Built Environment & Information Technology, as well as a number of departments in the Faculty of Natural and Agricultural Sciences, such as Mathematics and Statistics.

The Honours module, *COS 787, Spatial databases*, is presented jointly between the Department of Computer Science and the Department of Geography, Geoinformatics and Meteorology. There is also collaboration on the *COS 326, Database systems*, module presented by the Department of Computer Science, for which Dr Coetzee presents an introduction to spatial databases.

4.3 Facilitator of UP GISc research collaborations

4.3.1 Establishment of the ICA-OSGeo Lab in Africa

In 2011, the International Cartographic Association (ICA) signed a Memorandum of Understanding (MoU) with the Open Source Geospatial Foundation (OSGeo) with a view to develop global collaboration opportunities for academia, industry and government organisations in the field of open-source GIS software and data. The MoU aims to provide expertise and support for the establishment of open-source geospatial laboratories and research centres across the world to support the development of open-source geospatial software technologies, training and expertise. The first ICA-OSGeo Lab in Africa was established within CGIS in 2012.

The official launch was celebrated on 5 October 2012. Reports appeared in the [local GIS industry news](#), on the [UP website](#) and in the December issue of the faculty's newsletter. The ICA-OSGeo Lab is one in a network of 24 all over the

globe and puts us into contact with leading international researchers in the field of open source geospatial software and data.

4.3.2 Research projects

In 2012 CGIS members were involved in a number of research projects, listed below.

AnimalChange, an European Union (EU) funded project on the integration of mitigation and adaptation options for sustainable livestock production under climate change

CGIS involvement in 2012: Dr Joel Botai

Applied Centre for Climate and Earth System Studies (ACCESS), a DST NRF Centre of Excellence for Climate and Earth System Science

CGIS involvement in 2012: Dr Joel Botai, Ms Malebo Dlopho and Mr Adeniyi A Adeodayo

Atmospheric Research in Southern Africa and the Indian Ocean (GDRI ARSAIO), an international research group of an atmospheric environment observatory network together with research teams from various institutions in South Africa and France

CGIS involvement in 2012: Dr Joel Botai

Desktop study to assess the availability of spatial information for power planning in sub-Saharan Africa, November 2011 - March 2012, funded by Eskom

CGIS involvement in 2012: Dr Serena Coetzee, Mr Samy Katumba

Developing a framework for South African SDI education and training, funded by a GSDI small grant, 2012, funded by a GSDI small grant

CGIS involvement in 2012: Ms Victoria Rautenbach, Dr Serena Coetzee, Ms Sanet Eksteen, Mr Antony Cooper, Mr Wiafe Owusu-Banahene

Improving institutional address data with volunteered geographic information (UP RDP project), 2010-2012, funded by the University of Pretoria

CGIS involvement in 2012: Dr Serena Coetzee, Mr Noh Tewolde

Modelling a national health spatial data infrastructure for Namibia (bilateral South Africa/Namibia project), April 2012 – March 2014, funded by the National Research Foundation (NRF)

CGIS involvement in 2012: Dr Serena Coetzee, Mr Antony Cooper, Mr Wiafe Owusu-Banahene, Ms Victoria Rautenbach, Mr Kisco Sinvula (from Namibia)

Quantifying Weather and Climate Impacts on Health in Developing Countries (QWECI), an EU funded project

CGIS involvement in 2012: Dr Joel Botai, Mr Adeola Abiodun

Prediction of Climate Variations and its Applications in the South Africa Region, funded by the Science and Technology Research Partnership for Sustainable Development (SATREPS), a Japanese government program

CGIS involvement in 2012: Dr Joel Botai

Volunteered geographical information (VGI) for spatial data infrastructures (SDIs) and geoportals (bilateral South Africa/Poland project), April 2010 – March 2012, funded by the National Research Foundation (NRF)

CGIS involvement in 2012: Dr Serena Coetzee, Mr Antony Cooper, Mr Wiafe Owusu-Banahene, Ms Victoria Rautenbach, Mr Noh Tewolde

4.3.3 Research seminars

In order to exchange research information and provide opportunities for students to get experience in presenting, a series of research seminars were held during lunchtime on Thursdays in the first semester of 2012. GISc postgraduate students presented about their research projects:

16 February, presentations by Cilence Munghemzulu and Erika Pretorius
15 March, presentations by Sanet Eksteen and Victoria Rautenbach
19 April, presentations by Philemon Tsela and Abiodun Adeola
17 May, presentations by Dinao Tjia and Wiafe Owusu-Banahene

Seminar invitations were published campus-wide on the CGIS website, in the campus news, and on the student web. Email invitations were also sent to a list of industry contacts, maintained by Ms Eksteen.

4.4 Partner to the geoinformation industry of South Africa

CGIS members are actively engaged in the South African geoinformation industry through the presentation of short courses, involvement in the Geo-Information Society of South Africa (GISSA) and South Africa's Committee for Spatial Information (CSI), guest lectures by industry representatives and student visits to organizations in the geoinformation industry. We consider the interaction with the geoinformation industry as important, amongst others, because the Geoinformatics degrees offered by the Department of Geography, Geoinformatics and Meteorology were accredited in 2012 to comply with the academic requirements for professional registration with the South African Council for Professional and Technical Land Surveyors (PLATO).

4.4.1 CE at UP courses

The seven courses listed below were presented in 2012. In response to requests and feedback from industry, an additional course on *GIS Professional Practice* was designed for presentation in 2013. Many applicants for professional registration with PLATO comply with most of the academic requirements, except this one.

Certificate Course in Introductory Geographic Information Systems

Course leader: Ms Sanet Eksteen

Dates: 8 February 2012 – 31 August 2012

Certificate Course in Advanced Geographic Information Systems

Course leader: Ms Sanet Eksteen

Dates: 8 February 2012 – 26 October 2012

Introduction to Geoinformation Standards

Course leader: Dr Serena Coetzee

Dates: 16-17 July 2012

Short course in GIS Maintenance (custom course for the CSIR)

Course leader: Sanet Eksteen

Dates: 17 September – 20 September 2012

Short Course in GIS Analysis (custom course for the CSIR)

Course leader: Sanet Eksteen

Dates: 20 August – 22 August

Spatial databases with PostGIS

Course leader: Dr Serena Coetzee

Dates: 25-29 June 2012

The Basics of GIS

Course leader: Ms Sanet Eksteen

Dates: 11-13 July 2012

4.4.2 Geo-information Society of South Africa (GISSA)

GISSA represents the geoinformation community of South Africa as a national, unified, representative body to promote and protect the interests of its members on all forums. CGIS members were involved in GISSA in 2012 in various ways.

GISSA Ukubuzana 2012 Conference

Apart from their conference and workshop presentations, CGIS members were involved in the organization of the GISSA Ukubuzana 2012 conference:

- Dr Serena Coetzee chaired the academic committee, responsible for the peer-reviewed proceedings of the conference. Mr Antony Cooper and Mr Wiafe Owusu-Banahene were members of the committee. CGIS members also assisted with reviewing papers for the academic committee.
- Mr Antony Cooper was the chair of the general track committee that reviewed the abstracts for the general track and prepared a schedule for the conference. Dr Serena Coetzee and Mr Wiafe Owusu-Banahene were members of this committee.
- A number of UP students provided IT support at the conference and in return were allowed to attend the conference free of charge.

GISSA Gauteng Annual General Meeting (AGM) on campus

The GISSA Gauteng Annual General Meeting (AGM) was hosted on campus on 16 March 2012. The meeting was attended by approximately 200 delegates from industry, including a record number of 30 UP students from third year to PhD level. CGIS encourages students to register with GISSA by paying 50% of their annual registration fees.

GISSA student competition

At the 2012 GISSA general meeting, held at the Kyalami Raceway and Conference Centre on 30 November 2012, the [winners of the GISSA annual student competition](#) were announced. CGIS students won the top three places in both categories of the competition.

Category: Geoinformation science:

1. **Jacob Modiba**, M IT, University of Pretoria: *Towards the design and implementation of a spatial online analytical processing (SOLAP) methodology*
2. **Samy Katumba**, MSc Geoinformatics, University of Pretoria: *Spatial data availability for renewable energy planning*
3. **Dinao Tjia**, MSc Geoinformatics, University of Pretoria: *Land administration domain model: application to the City of Johannesburg land information system*

Category: GIS application:

1. **Lusapho Samela**, BSc (Hons) Geoinformatics, University of Pretoria: *Integrating GIS tools as a decision support for Retail Supply Chain Management*
2. **Christo Gouws**, BSc (Hons) Geoinformatics, University of Pretoria: *Analysis of expansive soils using remote sensing in the North West of Pretoria*
3. **Nitha Serfontein**, BSc (Hons) Geoinformatics, University of Pretoria: *Implementation of GIS in the national school curriculum*

4.4.3 Committee for Spatial Information (CSI) of South Africa

The South African Spatial Data Infrastructure Act was promulgated in 2003 (Act 54 of 2003) and the Committee for Spatial Information (CSI), as described in the Act, was established in 2010. Amongst the objectives of the SDI Act are the establishment of the South African Spatial Data Infrastructure (SASDI) and an electronic metadata catalogue. CSI consists of a principal committee, established according to the Act, and six sub-committees on Data, Systems, Standards, Policy and legislation, Education and training, and Marketing.

Dr Serena Coetzee and Ms Victoria Rautenbach are members of the sub-committee on Education and Training. They have contributed to the work of the committee through workshops and also by obtaining funding from the Global Spatial Data Infrastructure (GSDI) Association for an associated project for developing a framework for South African SDI education and training.

4.4.4 Guest lectures

As part of the module in advanced GIS theory, practice and applications (GIS 310), Sanet Eksteen arranged a number of guest lectures by speakers from industry at UP. The lectures give students the opportunity to meet people in the industry and to get updated on state-of-the-art GIS applications. Invitations were published campus-wide on the CGIS website, in the campus news, and on the student web. Invitations were also distributed to and attended by a number of contacts in the GIS industry. In 2012, guest lectures were presented on Fridays (9:30 – 10:20) as listed below.

Date	Topic
24 February	<i>The battle against rhino poaching, has it reached the point of no return?</i> Dr Corne Eloff, Built Environment, CSIR
2 March	<i>Geographic Profiling and Crime Analysis</i> Dr Peter Schmitz, Built Environment, CSIR
9 March	<i>The use of GIS to organize the London Olympic Games</i> Dawn Newman
13 April	<i>Using Imagery to Analyse Urban Change</i> Stuart Martin, GeoTerraImage
20 April	<i>Standards and GIS: So why don't they write more songs about standards?</i> Johan Eksteen, Microsoft
4 May	<i>Live dynamic GIS systems</i> Adrian Roos, Security Government and Infrastructure, Intergraph Systems Southern Africa
11 May	<i>The use of Lidar Data in GIS</i> Michael Breetzke, GeoSpatial Solutions
16 May	<i>CityEngine Demonstration</i> Carl Bester, Esri South Africa
18 May	<i>Collaboration towards more informed Service Delivery, Planning and Reporting</i> Andre Brand, Geography - Project Coordination, Statistics SA

4.4.5 Industry visits by first year students

In 2012, students in GIS 120, *Geoinformatics*, visited Statistics SA, the Independent Electoral Commission (IEC) and the Council for Geoscience of South Africa, respectively. During the 90-minute visit at each organization, students received a presentation and tour of the GIS operations at each of the organizations. The majority of these students are enrolled for degrees in Geoinformatics, Meteorology and Geology.

4.5 Attendance at conferences, workshops and meetings

CGIS members visited conferences, workshop and meetings on five continents in 2012. Funding was provided by a variety of sources, which are acknowledged in the relevant research publications.

March

SABS Academic Day, Pretoria, South Africa, 1 March 2012

Serena Coetzee presented a discussion paper co-authored with Antony Cooper.

May

GSDI-13, Quebec, Canada 14-18 May

Serena Coetzee presented a peer-reviewed paper co-authored with Dinao Tjia. Francis Harvey from the University of Minnesota (USA) presented a paper co-authored with Adam Iwaniak, Serena Coetzee and Antony Cooper.

International Conference on Education in Standardisation (ICES) 2012 and WSC Academic Day, Bali, Indonesia, 9-11 May 2012

Antony Cooper presented a paper co-authored with Serena Coetzee and Geoff Visser from the SABS.

June

34th Plenary week of ISO/TC 211, Geographic information/Geomatics, Toulouse, France, 4-8 June 2012

Attended by Antony Cooper (Head of the South African delegation), Serena Coetzee and Victoria Rautenbach, who contributed to the meetings in various ways.

July

GSDI workshop: Developing a framework for South African SDI education and training, Pretoria, South Africa, 18-20 July 2012

The workshop was arranged by CGIS and attended by Serena Coetzee, Victoria Rautenbach, Sanet Eksteen, Wiafe Owusu-Banahene and Antony Cooper.

August

XXII ISPRS Congress 2012, Melbourne, Australia, 25 August – 1 September 2012

Ms Victoria Rautenbach presented a peer-reviewed paper co-authored with Dr Serena Coetzee and our Polish collaborators.

October

GISSA Ukubuzana 2012, Kempton Park, South Africa, 2-4 October 2012

Peer-reviewed papers were presented by Abiodun Adeola, Antony Cooper, Sanet Eksteen, Samy Katumba, Wiafe Owusu-Banahene, Victoria Rautenbach, Peter Schmitz and Dinao Tjia,

The conference was attended by Yvette Bevis, Ingrid Booysen, Serena Coetzee, Sean Cullen, Joos Esterhuizen, Lauren Hankel, Melissa Hankel, Erika Pretorius, Noh Tewolde and Albert van Niekerk

Dr Coetzee and Mr Cooper were invited onto two discussion panels at the conference, Mr Cooper chaired one of them.

Ms Rautenbach arranged an SDI workshop at which Dr Coetzee presented.

November

Second SA/Namibia project workshop, Namibia, Windhoek 19-23 2012

Serena Coetzee, Antony Cooper and Victoria Rautenbach attended the workshop, hosted by our Namibian collaborators at the University of Namibia, Martin Hipondoka, Kisco Sinvula and Emma Nangolo. A one-day workshop with stakeholders of the Namibian SDI produced results that were later analysed, described and accepted for publication.

Service-Oriented Mapping 2012, Vienna, Austria, 22-23 November 2012

Peter Schmitz presented a peer-reviewed paper.

December

UPU Addressing Group, Jeddah, Saudi Arabia, 6 December 2013

Serena Coetzee contributed to the work of the UPU Addressing group in her capacity as project lead of the international address standardization work, ISO 19160, Addressing.

35th Plenary week of ISO/TC 211, Geographic information/Geomatics, Jeddah, Saudi Arabia, 8-12 December 2013

Attended by Serena Coetzee (Head of the South African delegation and Victoria Rautenbach, who contributed to the meetings in various ways.

4.6 CGIS visitors

In 2012, CGIS hosted a number of visitors from South Africa, as well as international visitors from Austria, Canada, Namibia, Poland and Zimbabwe.

January/February

SA/Poland workshop, Pretoria, South Africa, 23 January – 1 February 2012

The workshop was attended by three Polish collaborators, Prof Adam Iwaniak, Prof Tomasz Kubik and Ms Iwona Kaczmarek, as well as Prof Derrick Kourie from the Department of Computer Science Department (UP).

July

GSDI workshop: Developing a framework for South African SDI education and training, Pretoria, South Africa, 18-20 July 2012

The workshop was arranged by CGIS and attended by representatives from industry and academia: Serena Coetzee (CGIS), Victoria Rautenbach (CGIS), Antony Cooper (CGIS and CSIR), Sanet Eksteen (CGIS), Wiafe Owusu-Banahene (CGIS), Adri de la Rey (Eskom), Thandi Msibe (Eskom), Gerbrand Mans (CSIR), Heindrich du Plessis (National Geospatial Information), Julian Smit (University of Cape Town), Brendon Wolff-Piggott (University of Cape Town), Garth Stephenson (Stellenbosch University), Alwyn Geysler (Stellenbosch University), Hester Marais (Municipal Demarcation Board), Ivan Muzondo (Tshwane University of Technology) and David Njike (Midlands State University, Zimbabwe).

September

David Mayer, Masters student, Institute of Geodesy and Geophysics, at the Vienna University of Technology

David is a Masters student in Geodesy and Geophysics. His visit was arranged by Prof Ludwig Combrinck from HartRAO (who is also an Extraordinary Professor in the department) and his supervisors in Vienna, Prof Johannes Boehm and Prof Harald Schuh. David's research is related to identifying and evaluating suitable sites for Very Long Baseline Interferometry (VLBI) telescopes, of which there is only one in Africa, at HartRAO. David arrived in September 2012 and has a desk in the CGIS postgraduate laboratory. He will stay until July 2013.

October

Jeff McKenna, President of the Open Source Geospatial Foundation (OSGeo), Canada

He visited CGIS for the official launch of the first ICA-OSGeo Lab in Africa (see also 4.3.1). At the occasion he presented a free three-hour MapServer workshop.

Gavin Fleming, Charter Member of OSGeo and actively involved in OSGeo activities in South

Africa

He visited CGIS for the official launch of the first ICA-OSGeo Lab in Africa (see also 4.3.1). At the occasion he presented a workshop on a variety of OSGeo products.

SA/Namibia workshop, Pretoria, South Africa, 8-10 October 2012

The workshop was attended by three Namibian collaborators, Martin Hipondoka, Kisco Sinvula and Emma Nangolo, and we progressed on the project's research objectives. During his visit, Martin Hipondoka was introduced to Peter Schmitz and Paul Sumner. They subsequently submitted a joint proposal on the geography of rhino poaching.

5. Research output

CGIS members were involved in a number of research publications published in 2012. Names of authors who are involved in CGIS are in bold in the lists below.

5.1 Peer-reviewed journal articles

Cooper AK, Moellering H, Hjelmager J, Rapant P, Delgado T, Laurent D, **Coetzee S**, Danko DM, Düren U, Iwaniak A, Brodeur J, Abad P, Huet M & Rajabifard A. A spatial data infrastructure model from the computational viewpoint. *International Journal of Geographical Information Science*, in press. DOI:10.1080/13658816.2012.741239.

Tshiala MF, **Botai OJ**, Olwoch J (2012). Leafminer agromyzid pest distribution over Limpopo province under changing climate. *African Journal of Agricultural Research*, 7(48): 6515 - 6522.

Wessels K, Van den Bergh F and Scholes R (2012). Limits to detectability of land degradation by trend analysis of vegetation index data. *Remote sensing of the environment*, 125: 10-22.

Botai CM and **Combrinck L** (2012) Global geopotential models from Satellite Laser Ranging data with geophysical applications: A review. *South African Journal of Science*. 108(3/4): 1-10.

Van Niekerk AF and **Combrinck L** (2012) The use of civilian-type GPS receivers by the military and their vulnerability to jamming. *South African Journal of Science*. 108(5/6): 4 pages.

Coetzee S and **Eksteen S** (2012). Tertiary education institutions in Africa: Cloudy with a chance of GISc education in some countries. *South African Journal of Geomatics*,1(2): 119-132.

Sebake MD and **Coetzee S** (2012). Results of three case studies for assessing motivators and barriers of address data sharing in South Africa. *South African Journal of Geomatics*, 1(1): 32-43.

Coetzee S (2012). Reference model for a data grid approach to address data in a dynamic SDI. *Geoinformatica*, 16:111-129.

5.2 Papers presented at refereed conferences

Schmitz PMU (2012). Crime Mapping as Service-Oriented Mapping (SOMAP 2012). *Service-Oriented Mapping 2012*, Vienna, Austria, 22-Nov-2012 - 23-Nov-2012.

Cooper AK, **Coetzee S** and Kourie D (2012). Assessing the quality of repositories of volunteered geographical information. *GISSA Ukubuzana 2012*, Ekurhuleni, South Africa, 2-4 October 2012, 8 pages.

Tjia DE and **Coetzee S** (2012). Land administration domain model: application to the City of Johannesburg land information system, South Africa. *GISSA Ukubuzana 2012*, Ekurhuleni, South Africa, 2-4 October 2012.

Sinvula K, **Coetzee S**, **Cooper AK** and Hipondoka M (2012). Exploring the potential suitability of an SDI model in context of the National Spatial Data Infrastructure of Namibia. *GISSA Ukubuzana 2012*, Ekurhuleni, South Africa, 2-4 October 2012, 7 pages.

Schmitz PMU (2012). Voting patterns for the 2004 and 2009 national and the 2006 and 2011 local elections. *GISSA Ukubuzana 2012*, Ekurhuleni, South Africa, 2-4 October 2012, 17 pages.

Katumba S, **Coetzee S** and **de la Rey A** (2012). An assessment of spatial data availability for renewable energy planning in sub-Saharan Africa. *GISSA Ukubuzana 2012*, Ekurhuleni, South Africa, 2-4 October 2012, 8 pages.

Eksteen S, **Coetzee S** and Grundling C (2012). Tertiary GISc education at African universities: Is the sun shining in South Africa? *GISSA Ukubuzana 2012*, ISBN 978-0-620-52913-6, Ekurhuleni, South Africa, 2-4 October 2012, 9 pages.

Rautenbach V, **Coetzee S**, Smit J, Muzondo I and du Plessis H (2012). Identifying the target audiences, media and messages for SDI education and training in South Africa. *GISSA*

Ukubuzana 2012, ISBN 978-0-620-52913-6, Ekurhuleni, South Africa, 2-4 October 2012, 9 pages.

Owusu-Banahene W and **Coetzee S** (2012). An evaluation of the suitability of open source web map servers for setting up a geospatial thematic web map service. *GISSA Ukubuzana 2012*, Ekurhuleni, South Africa, 2-4 October 2012, 12 pages.

Simpson L, **Botai OJ**, de Coning E, Venkataraman S (2012). Extended study comparing lightning polarity and cloud microphysical properties over regions of high ground flash density in South Africa. *South African Society for Atmospheric Sciences 28th Annual Conference*, Cape Town, South Africa, 26-27 September 2012.

Dlamini L, Venkataraman S, **Botai OJ** (2012). Analysis of biomass burning and the relative cause to vegetation based on remote sensing data. *South African Society for Atmospheric Sciences 28th Annual Conference*, Cape Town, South Africa, 26-27 September 2012.

Rautenbach V, **Coetzee S**, Iwaniak A, and Strzelecki M (2012). Results of an evaluation of the orchestration capabilities of the ZOO project and the 52^o North framework for an intelligent geoportal. *XXII ISPRS Congress 2012*, Melbourne, Australia, 25 August – 1 September 2012, 6 pages.

Tjia DE and **Coetzee S** (2012). Towards a profile of the land administration domain model (LADM) for South Africa. *GSDI-13*, Quebec, Canada, 14-18 May 2012, 12 pages.

5.3 Chapters in books

Combrinck L (2012). *General Relativity and Space Geodesy*. In: *Sciences of Geodesy – II*, edited by Xu, Guochang, ISBN 978-3-642-27999-7.

Coetzee S (2012). *Standardization guidelines for national address infrastructures, based on ISO 19160, Addressing*. In: *Universal Postal Union White Paper on Addressing*, edited by P Vivas and J Lux, ISBN 978-92-95025-27-1, Universal Postal Union, Switzerland, 13 pages.

Harvey F, Iwaniak A, **Coetzee S** and **Cooper AK** (2012). *SDI past, present and future: a review and status assessment*. In: *Spatially Enabling Government, Industry and Citizens: Research and Development Perspectives*, edited by Rajabifard A, Crompvoets J, Kalantari M and Kok B, GSDI Association, 2012, pp23-38, ISBN 978-0-9852444-1-5.

Cooper AK, **Coetzee S** and Kourie DG (2012). *An assessment of several taxonomies of volunteered geographic information*. In: *Discovery of Geospatial Resources: Methodologies, Technologies, and Emergent Applications*, edited by L Diaz, C Granell and J Huerta, ISBN 978-1-466-60945-7, IGI Global, Hershey, USA, pp21-36.

Eksteen S, **Pretorius E** and Breetzke G (2012). *GIS in secondary schools in South Africa: Three case studies and some comments*. In: *International Perspectives on Teaching and Learning with GIS in Secondary Schools*, edited by Milson AJ, Demirci A and Kerski JJ. ISBN 978-94-007-2120-3, Springer.

5.4 Theses, dissertations and Honours reports

CGIS members were involved in the supervision of postgraduate students graduating in 2012. The titles of student's research projects are listed below.

5.4.1 PhD theses

None in 2012.

5.4.2 Masters dissertations

Daniel Sebake (2012). *Assessing the motivators and barriers of interorganizational GIS data sharing for address data in South Africa*. M IT dissertation, supervised by Serena Coetzee.

5.4.3 Honours reports

Du Plooy N (2012). *Assessment of OpenStreetMap data quality across different urban hierarchic levels: A comparative study*. Honours project report, supervised by Antony Cooper.

Gouws C (2012). *Analysis of expansive soils using remote sensing to the north west of Pretoria*. Honours project report, supervised by Joel Botai.

Grundling C (2012). *The current state of GIS at tertiary institutions in South Africa*. Honours project report, supervised by Sanet Eksteen.

Hankel L (2012). *Assessment of the quality of OpenStreetMap data in Woodhill, Kameeldrift and Mamelodi for the use of location-based services*. Honours report supervised by Serena Coetzee.

Samela L (2012). *Integrating geographic information system tools as a decision support for retail supply chain management*. Honours report supervised by Peter Schmitz.

Serfontein N (2012). *A study of the current status of geographic information systems in the secondary schools of the City of Tshwane*. Honours project report supervised by Sanet Eksteen.

6. Funding

There were two main sources of funding from which CGIS day-to-day operations were covered in 2012: an annual budget allocation from the faculty and profit allocations from CE at UP courses.

Our research activities were supported by grants from the National Research Foundation (NRF), as well as other organizations, including Eskom, the European Union, Global Spatial Data Infrastructure (GSDI) Association, the South African Bureau of Standards (SABS), the Science and Technology Research Partnership for Sustainable Development (SATREPS) and the University of Pretoria (UP).

Annex A: Constitution of the Centre for Geoinformation Science (CGIS)

University of Pretoria

Constitution

Centre for Geoinformation Science (CGIS)

Article 1 – Definition of Terms

- a) Advisory Board - As in Article 4
- b) CGIS - Centre for Geoinformation Science
- c) CGIS Director - Director of the CGIS, as in Article 6
- d) Dean - Dean of the Faculty of Natural and Agricultural Sciences
- e) Department - Department Geography, Geoinformatics and Meteorology
- f) GISc - Geographic Information Science (GISc)
- g) HOD - Head of the Department Geography, Geoinformatics and Meteorology
- h) Management Committee - As in Article 5
- i) Student representative - As in Article 5
- j) UP - University of Pretoria

Article 2 – Vision

In its *Vision* the UP CGIS strives to be:

- An internal platform at UP from where the excellence of UP individuals and teams involved in GISc research, education and training, professional development and community engagement is supported and strengthened.
- A facilitator of UP GISc research collaborations, education and training and professional alliances within South Africa and abroad.
- A partner to the South African geoinformation industry in support of GISc research, education and training, professional development, community engagement.

Article 3 – Mission

The UP CGIS aims to achieve the *Vision* statements by the following *Mission* actions:

- *Engaging* in research, education and training, professional development, community engagement and capacity building, in line with the overall strategy of UP.
- *Obtaining funding* for GISc research, education and training, professional development and community engagement by establishing new partnerships and alliances, as well as strengthening those already in existence.
- Creating high-level human resource capacity by *involving students* in GISc research, education and training, professional development and community engagement projects.
- *Transferring knowledge and expertise* through conferences, seminars, training, training events (e.g. workshops and short courses), publications and other appropriate avenues.
- *Communicating and coordinating* with other UP departments on GISc research, education and training, professional development and community engagement.
- *Collaborating* with other UP departments, universities and research institutes on GISc research, education and training, professional development and community engagement.

Article 4 – Advisory Board

- The Advisory Board is responsible for
 - providing *strategic direction and advice* regarding marketing, as well as the research, education and training, professional development, community engagement and capacity building in CGIS;
 - giving *advice* on operational decisions;
 - reviewing the annual *budget*; and
 - *reviewing* the realization of the vision and the execution of the mission of the UP CGIS.
- The Dean is the Chairperson of the Advisory Board.

- The Advisory Board consists of the Dean, HOD, the UP CGIS Director (ex officio), the heads of collaborating departments, representatives of key stakeholders as identified from time to time by the CGIS Director in consultation with the Chairperson.
- The Advisory Board meets at least once a year.

Article 5 – Management Committee

- The Management Committee consists of the CGIS Director; selected members of the Department and the Department's Unit for Cartography; a student representative as appointed by the CGIS Director; and one member per collaborating department.
- The Management Committee is responsible for:
 - coordinating CGIS research, education and training, professional development and community engagement activities;
 - evaluating, and making inputs into, the strategic plan of the CGIS;
 - evaluating, and making inputs into, the business plan of the CGIS;
 - identifying opportunities to further the vision, mission of the CGIS.
- The CGIS Director is the Chairperson of the Management Committee.
- The Management Committee meets at least once every six months.
- A quorum for the Management Committee is half of the members plus one.

Article 6 – Appointment, powers, functions and duties of the CGIS Director

The CGIS Director is appointed in terms of prevailing regulations of the University for the appointment of Directors.

- The CGIS Director is responsible for
 - preparing the annual strategic plan of the CGIS;
 - preparing the annual business plan of the CGIS;
 - preparing the annual financial report of the CGIS;
 - organising meetings as provided for in this Constitution;
 - marketing the CGIS outside and within UP;
 - fundraising for the CGIS;
 - initiating discussions with potential donors and funders;
 - financial and budget management;
 - information management; and
 - ensuring the realisation of the research, education and training, professional development activities and community engagement mandate of the CGIS.
- The CGIS Director reports to the Dean.

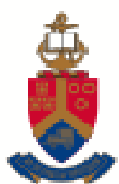
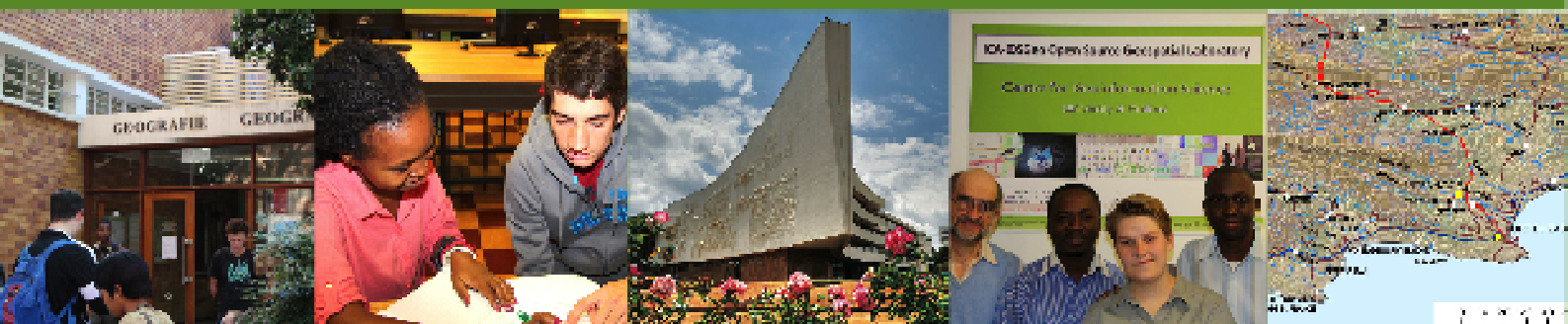
Article 7 – Duties of the Department

The Department will provide

- administrative support for meetings as provided in this Constitution; and
- administrative support for the operational and financial management of the CGIS.

Article 8 – Approval and amendments

The Senate Committee for Research of the University of Pretoria is responsible for the approval of this Constitution and any amendment thereof.



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Natural and Agricultural Sciences