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THE CADASTRAL INFORMATION SYSTEM IN THE REPUBLIC OF SOUTH AFRICA

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IN THE

REPUBLIC OF SOUTH AFRICA

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SUMMARY

Over centuries a cadastral system, based on the graphic representation of each piece of land and the title deed describing the rights in this piece of land, has been developed and maintained in the Republic of South Africa. The documentation of all these surveys, based on a common geodetic reference system, is maintained in the offices of the Surveyors-General. The ultimate goal of the Cadastral Information System, presently introduced at the offices, is to make these vast amounts of information available to the user at the push of a button on a computer screen.

1. AIMS OF THE CADASTRAL INFORMATION SYSTEM

1.1 Cadastral information must be available in digital format:
The information stored in the offices of the Surveyors-General is contained in three distinct sets of records which are continuously updated.

(a) Cadastral Documents: These documents represent the graphic definition of each piece of land and of each real right in land. Documents such as diagrams (defining one distinct piece of land), general plans (representing a multitude of pieces of land) and sectional title plans (showing the extent of individual rights in a building) make up this first set of records. Any registration of a real right in land in an office of a Registrar of Deeds refers to the representation of that right on a cadastral document.

(b) Cadastral Maps: The relative position of all pieces of land and all real rights in land are shown on cadastral maps. Commonly referred to as cadastral compilations or noting sheets, they cover the whole country. However, these maps also contain additional information required by a wide variety of users: Boundaries of towns and cities, roads and road names, major powerline and pipeline servitudes are depicted.

(c) Reports: The information contained in these records enables the user to accurately place each piece of land and each real right in land (Survey Records) and tabulations of properties provide for easy access to the required information.

The Cadastral Information System (CIS) envisages to make all this information available in digital form.

1.2 The processes at the offices of the Surveyors-General must be computerized: Once the information stored in the offices is taken up into the various databases, this information must be kept up-to-date. This makes it necessary that the processes followed in these offices must be computerized to a very large degree, to avoid duplication of effort and provide for the semi-automated process of updating the information.

2. ORGANIZATION OF THE CADASTRAL INFORMATION SYSTEM

All matters pertaining to rights in land are administered on a national level in South Africa. Accordingly the co-ordination and development of the Cadastral Information System is entrusted to the Office of the Chief Surveyor-General in Mowbray, while the maintenance of the data is done at the offices of the Surveyors-General, depending on the region of the country for which they are responsible.

2.1 Surveyors-General's office: This is where the day-to-day work of building up and maintaining the databases of the Cadastral Information Systems is undertaken. Workstations connected via a local area network to a local server are utilized for these purposes. Between all the offices of the Surveyors-General, as well as the office of the Chief Surveyor-General, a wide area network connects all these servers.

2.2 Office of the Chief Surveyor-General: System development, user support and networking services are undertaken in this office. Co-ordination of all activities related to the CIS as well as the standardization of the processes followed in the offices of the Surveyors-General is directed from here, ensuring uniformity of the data stored in the various offices.

2.3 Ultimately the information contained in the CIS will be available not only at the offices of the Surveyors-General but could be accessed via the Internet from anywhere in the country.

3. DATABASES OF THE CADASTRAL INFORMATION SYSTEM

The three distinct sets of records stored and maintained in the offices of the Surveyors-General, namely cadastral documents, cadastral maps and reports result in the three databases developed for the CIS:

3.1 Document Imaging Database: This database contains the scanned images of all cadastral document. All new document that are received by the offices are scanned, the images of existing documents affected by any changes are updated and the new versions of the images are made available to the public. Once all the existing documents have been scanned this database will contain the images of the documents of well over 10 Million properties and real rights in land, while the process of scanning of new documents will continue.

3.2 Cadastral Map Database: Each land parcel and real right in land is shown in its position relative to other land parcels and real rights and is connected to the national geodetic control network. This spatial database, created by digitizing existing cadastral maps, capturing of accurate positions of beacons and boundaries from cadastral documents or the capturing of the numeric data on newly received documents and transformation into the existing spatial framework, is updated whenever newly created land parcels or real rights in land necessitate changes to the data stored in this database. In addition, this databases also contains information on boundaries, roads etc as well as the names of such features.

3.3 Alpha-numeric Database. This database represents the heart of the CIS. The unique name for each and every land parcel and real right in land is allocated here, the consistency of the data is ensured through processes for the checking, validation and verification of data and the links to the other databases are established.

4. AN INTEGRATED CADASTRAL INFORMATION SYSTEM

Although the CIS stores its data in three distinct databases, each with its unique processes and datasets, the user will be unaware of the inner working of the system. When information is requested, the system accesses the necessary data wherever it is stored and, utilizing image processing software, geographic information system software and a data base management system, this information is processed and presented to the user. The output could thus be in the form of a print of the image of a cadastral document, a plot of an extract from the cadastral map, a printed report or a combination of these. Although there are no restrictions on any user to obtain cadastral information from the CIS, the cost of the supply of such information will generally be recovered from the user.

5. CONCLUSION

The development and implementation of the Cadastral Information System in South Africa will fundamentally alter the way the offices of the Surveyors-General are operating. Instead of being stores of vast amounts of information contained in paper documents and only accessible by skilled users, the offices will be transformed into suppliers of cadastral information contained in databases, instantly accessible by large number of users anywhere in the country and capable of providing the users with services far beyond of what could be imagined for the manual system. This age of the Cadastral Information System in South Africa has begun.

NINTH UNITED NATIONS REGIONAL CARTOGRAPHIC CONFERENCE FOR AFRICA

DIGITAL TOPOGRAPHIC INFORMATION

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1. INTRODUCTION

The lack of information is often given as one of the reasons for the failure of development projects. The lack of information can be regarded as information that is not timeously accessible, is out of date and not relevant to the application. It is information that is required as an integral part of the planning and decision making process. Without good information projects will not be well planned and poor decisions will be taken.

Spatially related information is a most important type of information required, because most projects are spatial in nature. Spatial information has for many years best been conveyed on printed maps. The situation has changed recently with more and more planners and decision makers using computer-based information systems. Their demands are for digital spatial information. Topographic information makes up a major part of spatial information and therefore there is a growing demand for digital topographic information.

The national mapping organisation of South Africa has been working towards providing digital topographic information. The main components of this are a national topographic information database, digital elevation models, and digital orthophoto images.

2. NATIONAL TOPOGRAPHIC INFORMATION DATABASE

The national topographic information database is a continuous (seamless) digital spatial database, which is basically scale and map projection independent. The database is a vector database of individual topographic and man-made features (not layers). The data has been captured from two main sources at present, namely the 1:500 000 and the 1: 50 000 maps of the national map series.

Initially the 23 maps of the 1:500 000 map series were converted into digital form. The cartographic map separates were scanned using a cartographic drum raster scanner, then vectorised using raster-to-vector conversion (Scitex), and then feature classified and topologically structured (true GIS structures). Complete coverage of the country is available from this data source.

Subsequently a start was made to the conversion of the 1:50 000 map series in to digital form. The procedure followed is similar to that followed for the 1:500 000 except that the vectorisation process used the line-following technique (LaserScan VTRAK). At present approximately 65% of the country is covered by digital data at this scale. It is expected that the conversion of the major features on the maps will be completed by April 1997, with the remaining work completed in 1998.

This work has made available in a relatively short time digital topographic information to any users. There are no restrictions on the supply of this data, except for copyright, and already a large numbers of users are being supplied with this information. The database is a ReGIS system but the information can be supplied in a number of different formats.

The database has been built initially from the 1:500 000 maps but once all of the 1:50 000 maps have been converted into the database, the 1:500 000 information will be removed from the database. This will provide for only one database to be maintained. If information is required at a smaller scale then it can be generalised upon extraction from the database. The database has also been built from cartographic material implying that it is essential a cartographic database, with the usual cartographic artifacts. However, with the revision and updating of the information, which is already taking place, the main source of the information is from aerial photography using photogrammetric methods. The accuracy of the database is therefore being improved continuously into a topographic database of best inherent scale.

3. DIGITAL ELEVATION MODELS

Although the contours are being captured as part of the national topographic information database it was required from users to also have digital elevation models. Digital elevation models lend themselves well to use with a number of computer terrain modelling applications. Two distinct digital elevation models exist in South Africa, namely the 400metre/200metre grid and the 50metre grid digital elevation models. In both cases the source of the information is photogrammetrically measured elevations from aerial photography.

The 400metre/200metre digital elevation model is one data set providing a grid spacing of 200 metres in the metropolitan and more mountainous areas of the country and a grid spacing of 400 metres in all other areas. The absolute height accuracy is approximately 10 metres in both cases. The source was 1:150 000 aerial photography. There is complete national coverage of this information.

The 50 metre digital elevation model has been produced primarily as a by-product of the 1:10 000 orthophoto mapping programme, using 1:30 000 aerial photography. The absolute height accuracy is approximately 2.5 metre. At present only the major metropolitan areas and a few growth areas are covered, but this data set is being extended.

4. DIGITAL ORTHOPHOTO IMAGES

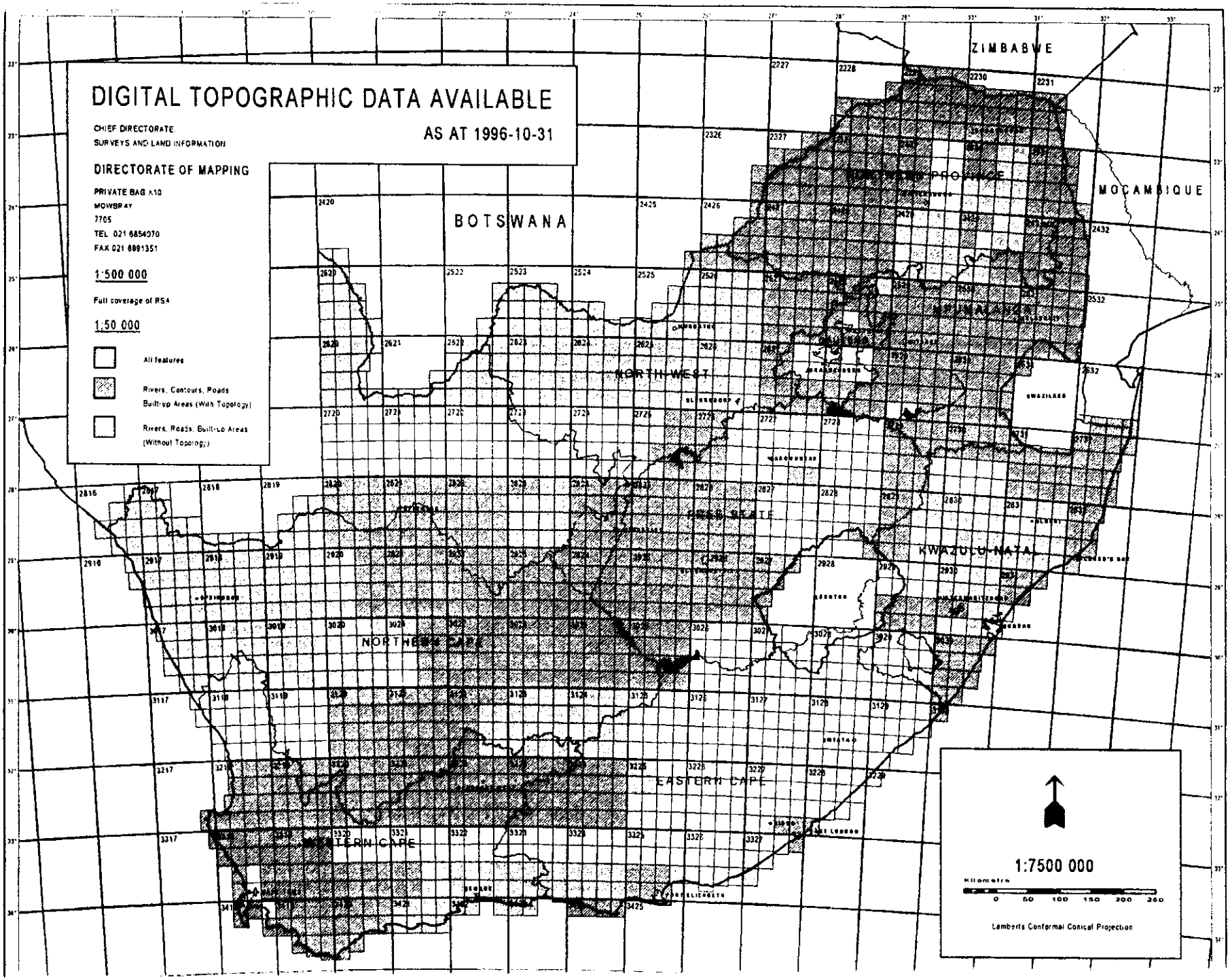
The Chief Directorate: Surveys and Land Information, as the national mapping organisation, has since 1972 being producing orthophoto images and maps. The process of producing the orthophoto images was changed recently to a digital process. The images are now produced by scanning the aerial photography negative film on an aerial film scanner at 25 microns resolution, and then rectifying the digital image using rigorous algorithms. The rectification is done using the photo co-ordinates captured in the aerial triangulation process and the digital elevation data from the digital elevation model.

The digital orthophoto images are used to produce the orthophoto map digitally, or for the updating of the topographic information using digital monoplotting procedures. There is a growing demand from users for the digital orthophoto images and these are supplied as TIFF files.

5. CONCLUSION

The national mapping organisation in South Africa has made significant advances in creating digital topographic information databases so that the many users of this information can have timeous access to the information they need in the most convenient format for their applications. It can then be said that in South Africa much effort has been put into overcoming the problems experienced in many developing countries where the lack of information hinders development.

The provision of this information is not the end of the road. It will be a crime against the people of the country if the information is not continuously kept up to date. To achieve this, with limitations of government funding, will not be easy, but the government must realise that this information is a valuable national resource and that such an asset must be maintained to serve its full purpose.


DIGITAL TOPOGRAPHIC DATA AVAILABLE
AS AT 1996-10-31
CHIEF DIRECTORATE
SURVEYS AND LAND INFORMATION
DIRECTORATE OF MAPPING
PRIVATE BAG X10
MOWBRAY
7705
TEL 021 6854070
FAX 021 6891351
1:500 000
Full coverage of RSA
1:50 000
All features
Rivers, Contours, Roads
Built-up Areas (With Topology)
Rivers, Roads, Built-up Areas
(Without Topology)
ZIMBABWE
MOCAMBIQUE
BOTSWANA
NORTH-WEST
FREE STATE
KWAZULU-NATAL
NORTHERN CAPE
EASTERN CAPE
WESTERN CAPE
1:7500 000
Kilometre
0 50 100 150 200 250
Lamberts Conformal Conical Projection