

**ASSESSMENT OF GIS PROJECTS
FOR DEVELOPMENT WORKSHOP ANGOLA**

draft version

**Expert mission for NIZA
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CONTENTS

1.	INTRODUCTION	1
2.	DEVELOPMENT WORKSHOP ANGOLA	3
3.	CONTEXT	4
3.1	General situation in Angola	4
3.2	GIS in Angola	4
4.	PROJECT DESCRIPTIONS	5
4.1	Luanda Urban Environmental Risk Monitoring / Sustainable Community Services Programme	5
4.2	Creation of a Geographic Information Processing Unit, Huambo Province	6
5.	GENERAL ASSESSMENT	7
5.1	Appropriateness of GIS tool for DW	7
5.2	Assessment of project proposals	8
5.2.1	Luanda Urban Environmental Risk Monitoring / Sustainable Community Services Programme	8
5.2.2	Creation of a Geographic Information Processing Unit, Huambo Province	8
6.	DETAILED ASSESSMENT OF KEY ISSUES	10
6.1	GIS capacity at DW	10
6.2	Data availability	10
6.3	Data management within DW	11
6.4	Information exchange and dissemination	12
6.5	Institutional aspects	13
6.6	Hardware / software	13
7.	ACTION PLAN	16
7.1	Short term	16
7.2	Mid / long term	17
ANNEX I:	Resumo português da avaliação e do plano de actividades	A- 1
ANNEX II:	Revised Terms of Reference of the mission	A- 5
ANNEX III:	Itinerary of the mission	A- 6
ANNEX IV:	List of people met	A- 8
ANNEX V:	List of documents consulted	A- 9
ANNEX VI:	Terms of Reference for proposed DBMS / GIS mission	A-10
ANNEX VII:	Overview of slides used in GIS presentation	A-12

LIST OF ABBREVIATIONS

ADRA	Acção para o Desenvolvimento Rural e Ambiente
CBO	Community Based Organisation
DBMS	DataBase Management System
DW	Development Workshop
ELISAL	Luanda Sanitation Company
EPAL	Luanda Water Company
GIS	Geographical Information System(-s)
GPS	Global Positioning System
IGCA	Instituto de Geodesia e Cartografia
IIA	Instituto de Investigação Agrícola
INAROOE	Instituto Nacional de Remoção de Obstáculos e Engenheiros Explosivos
INE	Instituto Nacional de Estatística
INOT	Instituto Nacional de Ordenamento Territorial
NGO	Non Governmental Organisation
NIZA	Netherlands Institute for Southern Africa
NPA	Norwegian Peoples Aid
PAM / WFP	World Food Programme
PRA	Participatory Rapid Appraisal
SCSP	Sustainable Community Services Programme
UCAH	União de Coordenação de Actividades Humanitárias
UN	United Nations
VAM	Vulnerability Assessment and Mapping

1. Introduction

This report is the result of an expert mission on GIS for Development Workshop Angola, on funding arranged by NIZA, Netherlands.

The main objective of the mission was to assess DW proposals for the introduction of Geographic Information Systems within their offices in Luanda and Huambo.

The mission stayed in Angola from 22 June to 7 July 1999. A scheduled visit to Huambo (on the central plateau) had to be cancelled for security reasons, so the mission has remained in Luanda throughout the whole period. Most work was carried out at DW's Luanda office, with visits to relevant organisations, and one field trip to the peri-urban areas where most of DW's activities take place.

In general terms, the mission has focused on:

1. A general assessment of the appropriateness of GIS technology in the context of DW's development strategy and its intervention activities in peri-urban Luanda and Huambo, taking into consideration the very specific political and socio-economic situation in Angola.
2. A more detailed assessment of both projects proposals, in particular the feasibility of the proposed applications.
3. A needs assessment in terms of technical and human resources, and the institutional set-up.

In consultation with DW, the original Terms of Reference have been somewhat adapted to cope with the following facts:

- It was originally planned to work at least half of the time in Huambo, but the deteriorating security situation has made it impossible for the mission to go there (airport closed).
- The original TOR and supporting documentation referred to only 1 GIS project (with 2 component pilots), whereas in fact it concerns 2 distinctively different project proposals (one for DW Luanda, one for DW Huambo)

In the new TOR (annex II), a more clear distinction has been made between the two proposals. Where relevant, this distinction will be made throughout this report.

The quality of the assessment of the Huambo GIS proposal has undoubtedly suffered from the fact that on-site assessment of the situation was not possible. It has also meant that the mission has focused more than originally planned on the GIS proposal for DW Luanda.

The mission's itinerary can be found in annex III. It has been based on the following considerations:

- It is important to know what the foreseen GIS applications are, even though at this stage it will be difficult to tell whether all the information needed for these applications is or will be available.
- It is important to know what will be done with results from the GIS: who will benefit from it, how will the information be shared with partners. DW has good ideas on this, and the mission has tried to build on those ideas.
- Well-structured data management within an organisation is vital for a GIS and this issue has to be addressed right from the start, both in terms of design of a data management system as in terms of capacity building within the organisation
- Detailed knowledge of available spatial data is necessary, because these data are fundamental to the creation of the GIS at DW, since there won't be much capacity to do

detailed (topographic) surveys.

- Hardware/software choices are less fundamental to the success of a GIS.

This report starts with some background information on Development Workshop Angola (chapter 2), the context in which it is working (chapter 3), and a short description of the two GIS proposals (chapter 4).

This is followed by a general assessment of the appropriateness of GIS for DW and the feasibility of the proposed applications (chapter 5), and a more detailed assessment of key issues involved in setting up a GIS (chapter 6). The report ends with a list of actions considered necessary for the successful introduction of GIS within DW's programmes in Luanda and Huambo.

2. Development Workshop Angola

Development Workshop has been in Angola since the 1980's. From the mid-1980's onwards it has been involved in projects in the peri-urban zones of Luanda (musseques) and, starting in 1997, in Huambo on the central plateau.

DW Angola is an international NGO, and was in fact for many years the only NGO in Angola. With the political changes in Angola in 1990 (allowing the emergence of associations and NGO's) DW shifted its focus from technical support to the Angolan Government towards projects in which it worked directly with the communities in the musseques.

The current Angola programme focuses on support for upgrading social infrastructure and basic services in peri-urban communities in Luanda and Huambo, where these services and infrastructure are virtually non-existent, and in war-affected provinces. The emphasis on peri-urban areas is due to the rapid growth of such areas in Angola and their relative neglect in rehabilitation and development programmes.

The main domains of intervention of DW are:

- water supply in peri-urban Luanda and Huambo
- improved sanitation in peri-urban Luanda and Huambo
- solid waste management in peri-urban Luanda
- community initiatives programme in peri-urban Luanda
- community publishing project in Huambo
- women's enterprise development in Luanda
- community based rehabilitation and shelter programme (several provinces).

DW's approach is based on the understanding that it is not possible to separate technology from institution and capacity building with other stakeholders. Projects typically start with a pilot phase, which addresses the interrelated issues of technology (i.e., the technical intervention), social mobilisation (i.e., organising communities or stakeholder groups to act on the problem, developing the appropriate institutions) and financial sustainability (i.e., cost recovery). If the pilot project is successful, scaling-up takes place involving other partners (community, NGO, local government), but with DW supervision and monitoring.

Most activities use community mobilisers to work within the community. They are often recruited from the community they work in, and form the essential link with local government, grassroots organisations and individuals. As such, they play an important role in the information exchange between DW and its target groups and development partners.

The eventual goal of the programmes is to gradually pass responsibility to local partners after robust solutions have been developed. Partners include local NGOs, community-based organisations (CBOs) and government. Although developing partnership with local levels of government is seen as vitally important, the ultimate aim is to help community organisations to develop partnerships with local government.

The long-time presence of DW in Angola, in combination with the continuity of service of its staff, has allowed DW to build up its knowledge of peri-urban areas and develop an extensive institutional memory. That, and its extensive network of relationships, allows DW to play an important role in lobbying for political changes.

3. Context

3.1 General situation in Angola

The context in which DW Angola is operating is one of continuous conflict, which has brought about the displacement of large parts of the rural population. Urbanisation has been rapid and probably irreversible: the percentage of the population living in urban areas is estimated as about 50%, compared to only 14% in 1970 and 11% in 1960.

Luanda 'musseques' are still growing at an alarming rate (conservative estimates put the growth rate at approx. 7%). Until recently there has been an implicit assumption that at least some of this urbanisation would be reversed with the end of war, but it is now becoming clear that this is not necessarily the case, and that few newly-urbanised people are making immediate plans for return to rural areas.

The Huambo area is one of the most war-affected areas. With the renewed fighting which started in December 1998, the situation has rapidly deteriorated. The city and airport are now under constant threat from shelling, and travel outside the city has become very difficult. At the same time, the influx of 'deslocados' continues, and will continue as long as the rural areas are under continuous threat of conflict, making it impossible for the population to cultivate their fields.

One of the major consequences of the unstable situation is the fact that the government's role in providing public services has shown a continuous decline, and at present there appears to be little political will to develop such services. Lower levels of government are usually cash-strapped and have difficulty providing even the most basic services. NGOs such as DW have stepped in to help fill the gaps in public service provision. These organisations now have more knowledge and information available about the peri-urban areas than does the government.

It is unlikely that this situation will change anytime soon. Urbanisation is expected to continue, both in Luanda and Huambo, and local authorities and public service companies will, on the whole, not be able to deliver the level of services required. NGOs will continue to play a vital role in improving the living conditions in peri-urban areas.

3.2 Geographic Information Systems in Angola

Geographical Information Systems are not yet widely used in Angola (apart from those set up by mining and oil companies).

Within government, several ministries and institutions (amongst them INE, Obras Públicas) are developing plans for the use of GIS. However, current capacity at these institutions is very limited, and a real operational GIS can not be expected in the near future.

So far, it is mainly the United Nations that is using GIS technology. They have a fairly advanced system within the demining project INAROOE, which is mapping the occurrence of mines and the progress of the demining operations. The system was set up with help from the Norwegian NGO NPA. They also have a basic GIS within the World Food Programme, which is used for vulnerability assessment mapping.

In the NGO community, GIS is not yet being used (apart from DW's own efforts so far). One has to bear in mind though that NGOs are in fact a fairly new phenomenon in Angola, since local NGOs have only been allowed since 1990, and only few international NGOs were involved in Angola before that date. So far however, concrete plans to set up a GIS do not

seem to exist outside DW.

4. Project descriptions

This chapter briefly describes the 2 GIS project proposals and their current status. For detailed descriptions of these projects, the reader is referred to the original project proposals.

4.1 Luanda Urban Environmental Risk Monitoring / Sustainable Community Services Programme

The project proposal for use of GIS in the Luanda programme was written in July 1998, and focuses on using the GIS tool for urban environment risk assessment. General objective of the project is 'to develop Angolan planning for national reconstruction through improved capacity for data collection and assembly, use of GIS and monitoring of key indicators; and development of environmental health assessment tools'.

The proposal proposes a two-phase approach. The first is a phase of developing tools, training a national team, building a database and selecting key indicators. The second phase is to contribute to DW's programme strategy which aims at the creation of an environmental assessment network for peri-urban Luanda.

The essential research question of the project is whether a relationship can be demonstrated between interventions that affect the physical environment of the intervention area (standpipes, latrines, waste removal), and the indicators of public health of the population. It is based on the hypothesis that health is largely determined by environmental factors, which have a spatial dimension and that therefore, a spatial analysis tool like GIS can be used for monitoring the impact of interventions.

Current status

Local capacity building, important aspect of the first phase, had in fact already started in November 1997 (before the proposal was written), when DW arranged on-the-job-GIS-training (supervised by a local and an expatriate GIS-expert) of a senior technician from the INOT, who subsequently started working with GIS at DW Luanda's office. In September 1998 she participated in a course on the GIS software MapInfo in Portugal. She is currently working full-time at DW Luanda and is in the process of setting up the spatial database, using the MapInfo GIS software.

In the meantime, DW has developed a more integrated approach to its interventions in peri-urban Luanda. This has culminated in a new programme called the Sustainable Community Services Programme (SCSP), which integrates all interventions in water supply, on-site sanitation and solid waste removal. In line with DW's approach of passing over responsibility to local partners once robust solutions have been developed, the SCSP puts a major emphasis on building partnerships with CBOs, NGOs, and service companies such as EPAL and ELISAL, and local government.

The GIS project on environmental risk monitoring has also been included in this new programme. The GIS component of SCSP can therefore be seen as the continuation of the Luanda Urban Environmental Risk Monitoring project.

The basic objective of the use of GIS has remained the same, namely to apply it as a tool for monitoring the environmental impact of interventions in the peri-urban areas of Luanda.

Funding for the SCSP has been secured, and as from 1st July 1999 the programme has officially started, meaning that all activities in peri-urban Luanda in the domain of water supply, sanitation, waste removal, and also GIS, now take place within the framework of the SCSP.

4.2 Creation of a Geographic Information Processing Unit, Huambo Province

This proposal for a GIS project in Huambo was drawn up in January 1998. Whereas the overall objective focuses on the rehabilitation of the central highlands region, the project purpose is to increase capacity of geographic information processing by research/education institutions, contributing to motivating and retaining their staff. This increased capacity will have an impact on development agencies' planning capacity and on the quality of their interventions.

The project distinguishes 4 phases: a preparation phase (phase 0), the setting up of the GIS unit (phase 1, 6 months), a case study on forestry (phase 2, 6 months), and a training and extension phase (phase 3, 1 year).

The setting-up of the GIS unit is to be done by local technicians with experience in cartographic work. It involves making an inventory/catalogue of existing spatial data for the Huambo region, and introducing these data into the GIS.

The case study on forestry is justified in the proposal by underlining the problems currently related to forest management:

- major loss of forest cover in zones of concentration of displaced people, because of high needs for fuel and construction materials
- soil erosion problems related to the accelerated deforestation
- problem of falling groundwater levels.

The case study is to contribute to a better understanding of these problems, and help in building a coherent action plan for sustainable reforestation.

The study would integrate data from various sources: maps, aerial photos, satellite imagery, but also from fieldwork, including PRA's.

Current status

Although not yet officially approved and funded, the project has already started activities for the first phase. In the beginning of 1999 DW has employed a technician from the IIA, who has started working on the inventory of existing spatial data for Huambo. This activity is still ongoing and should result in a catalogue (in spreadsheet format) of available maps, aerial photos, etc.

The same technician is also working on an inventory of schools, health posts, water points, etc. for Huambo and its peri-urban areas. These data are also stored in spreadsheets. The idea is to add spatial reference (coordinates) to these data to be able to use them in the GIS (DW's Huambo office has an old version of MapInfo installed on one of its computers).

The technician is supervised by the coordinator for DW's Huambo programme, who himself has some basic knowledge of databases and GIS, but no official qualifications in these domains.

5. General assessment

5.1 Appropriateness of GIS tool for DW

DW collects and processes large amounts of information related to their project activities. Information on stand posts, latrines, solid waste removal, etc. are collected by the project teams in the field, and are usually stored in simple spreadsheets and subsequently used in the reports on project activities. At the time of writing in June 1999, no central database management system exists and each project component has developed its own data processing mechanisms. Visualisation of the spatial component of the activities (that is, their location) is not well developed, nor internally, nor in the dissemination of information to its development partners.

In principle, the development of a Geographic Information System within DW can greatly improve this situation. The possibility to map data and perform spatial analysis can be of great importance for a better internal monitoring of its core activities, and, eventually, for impact assessments. DW's staff has well developed ideas on these issues, even though they might at times be too ambitious.

DW has an open eye for new technology that might improve the quality of its activities and reporting, which is demonstrated for example by its extensive use of digital cameras, and the setting up of a computer network within their Luanda head office. Establishing a GIS fits well within this approach of using appropriate (advanced) technology.

Within DW's approach of building partnerships with other NGOs, CBOs and local authorities, information exchange is of vital importance. As DW works mainly in peri-urban areas, with a relatively complex spatial structure, the possibility to produce and disseminate high quality maps can be a great asset, and will contribute to a better 'digestion' and hence comprehension of the information offered.¹ This in turn should allow DW and its partners to improve on their development planning and will also help them present their problems and solutions at forums, higher government levels, etc., thus improving their lobbying capacity.

Considering furthermore the specific context in which DW is working, in particular the very limited role that government is currently playing in the planning and implementation of basic infrastructure provision, it can be concluded that the use of GIS technology is an appropriate means for DW to improve the quality of its programmes. By actively implicating/motivating local authorities and government institutions, the GIS can also help promote that these institutions start assuming their role in the development process.

It has to be stressed though that some major problems have to be dealt with, in particular in the field of capacity building, and improved data management (see ch. 6.3). Although these do not constitute insurmountable obstacles, they have to be addressed in the first stages of the development of the GIS to assure that the output of the GIS, be it straightforward maps or the result of more complex analysis, has a high degree of accuracy. Maps are powerful tools in lobbying, awareness building and planning, and should therefore be based on reliable base information!

5.2 Assessment of project proposals

1 For interventions in a more rural setting, the added benefit of GIS is often far less obvious, simply because the amount of information to be analysed and visualized is so much smaller. That's why GIS, or rather desktop mapping, has its roots in urban planning.

5.2.1 Urban Environmental Risk Monitoring / Sustainable Community Services Programme, Luanda

The urban environmental risk-monitoring project, linked with the Sustainable Community Services Programme, focuses on the use of GIS for impact monitoring (impact of DW interventions on health of the population).

Although a valid objective, the project proposal it does not sufficiently appreciate the complexity of this application of GIS technology. It might well prove very difficult to get any added value of the GIS for impact assessment and identification of health indicators, on the one hand because health of the population is influenced by many factors (not only project interventions), on the other because the available data on health are very limited (and probably often unreliable).

Although the project is in fact set up as a research project, the mission feels that it should put more emphasis on practical applications that will more directly benefit both DW and its development partners. This is important both in terms of justifying the GIS effort, and of stimulating all implicated DW staff in making use of the technology.

Therefore the mission proposes to initially focus more on:

1. Providing base maps which DW can use internally, and be made available to its partners.
Although no real GIS (more so-called desktop mapping, because there is no specific data analysis involved), this is a very good first step and one that is necessary to build up knowledge of and interest in the GIS.
2. Using the GIS for improved planning and monitoring of DW's activities (construction progress, outputs, quality, use that is made of the structures,..), rather than on monitoring of impact. To do so, detailed planning indicators for the SCSP programme activities will have to be available. Although that is not yet the case, these will be identified as part of DW's general monitoring and evaluation approach.

Once the GIS has been properly established, and it is able to provide a reliable and systematic input/output for the above applications, it can expand to more complex analysis work, such as trying to identify verifiable, spatially related, indicators for impact assessment, and, eventually, building an environmental assessment network.

Providing an exact timetable for the different phases of the implementation is difficult, since the functioning of the GIS depends on many factors, many of which are not directly related to the system itself (identification of planning indicators, entering information into the central database, exact information needs of development partners, etc.). However, based on experiences elsewhere, it is estimated that it will take a minimum of 1,5 - 2 years for the GIS to become a fully functional, reliable tool that can be used on a permanent basis for the planning, monitoring and evaluation of DW's activities.

As mentioned earlier, whatever the application, the very first steps of the GIS project have to focus on capacity building and improving the data management.

5.2.2 Creation of a Geographic Information Processing Unit, Huambo Province

The GIS proposal for Huambo is based on two complementary objectives: contributing to a better insight in the forestry problems in the Huambo area, and at the same building local

GIS capacity with the aim of motivating and retaining staff at research/education institutions in Huambo.

In its present form, the proposed forestry study seems very ambitious for a first GIS application. It is understood that the forest study has no direct relation with DW's current and (medium term) future activities, nor with planned interventions from other organisations (including the government). The objective of better management of natural resources in the central highlands remains therefore a very long-term one. In itself this does not have to be seen as a problem, but as a starting point for the introduction of GIS, the proposed case-study is too far out of the scope of DW's activities, and its relative complexity bears the risk of not producing satisfactory results, thereby undercutting the objective of motivating and retaining local staff.

As has already been mentioned in the assessment of the Luanda proposal, it is important for the GIS to produce tangible results, which will more directly benefit DW and its partners. It is therefore proposed that the Huambo GIS project initially follows the same approach as the Luanda project, that is, focusing on the production and dissemination of base maps, and subsequently using the GIS for improved monitoring and planning of DW's core activities in Huambo. As for Luanda, this implies that the GIS will be used as a permanent tool that provides information that will contribute to the improvement of DW's programmes. Again, as for Luanda, it also means that planning indicators have to be identified for all activities.

In a later stage, once the GIS has been properly set up and staff is confident in using it and produces reliable and concrete results, the Huambo GIS could expand towards applications in the field of natural resources management.

Still, rather than a complex forestry study involving satellite images, field data through PRA, etc., it is advised to start with more DW-related studies, such as for example assessment of the erosion situation around natural springs, with mapping of the possible sites for the construction of erosion control works.¹

More than Luanda, Huambo will have a problem with setting up the spatial database, because of lack of reliable large scale data (see 6.2). In the first phase of the project, it will have to put a major effort in searching for available spatial data, in order to piece together a sufficiently detailed and reliable map of Huambo and its peri-urban areas.

1 A note of caution: although the mission has tried to assess the forestry case study and to identify alternative GIS applications, this work has been severely hampered by the fact that the visit to Huambo had to be cancelled.

6. Detailed assessment of key issues

6.1 GIS capacity at DW

At the Luanda office, a senior technician of INOT (full-time seconded to DW) is in charge of the GIS effort (GIS operator). She has a background in geography and has received on-the-job-training in ArcView at the demining project INAROOE (5 months) plus a 3-week MapInfo course in Portugal.

She does not yet have a thorough understanding of the major GIS concepts, but seems both willing and capable to learn them. She has no experience in the design and use of databases (neither in relation with GIS, nor separately). A major asset is the fact that she has a good network of contacts within government and other institutions (UN programmes), who are dealing with GIS.

The work done so far has been mainly in the domain of geo-referencing raster images, a job well done, although it is unfortunately based on a local coordinate system (making referencing of GPS data impossible). She is currently in the process of doing on-screen-vectorisation of these maps.

The Huambo office has recently employed a technician from the IIA (on secondment). He has no background in computer applications, and thus no experience with GIS. Assessment of his capacities has been impossible due to the fact that the planned visit to Huambo had to be cancelled. He is currently in the process of collecting and storing data (in Excel) on availability of maps and aerial photos, and on DW's water/sanitation/rehabilitation activities.

Other staff at DW have in general a basic knowledge of computer use (Word, Excel), but no database or GIS skills, the main exception being the new financial controller in Luanda, who has a thorough knowledge of Microsoft Access, and the recently arrived coordinator of the water/sanitation programme for Huambo, who has been involved in development of an Access database for DW office in Canada.

Staff members do have valid ideas on how GIS could contribute to their activities.

The coordinators of the GIS projects in Luanda and Huambo both have a basic understanding of GIS, but little practical experience.

The mission concludes that a considerable training effort is still needed to set up and maintain a reliable GIS within DW. Although it has not been possible to assess the capacity of the team in Huambo, the mission is of the opinion that no new permanent staff will be needed to operate the GIS. One qualified operator in Luanda and one in Huambo should be enough to maintain and update an established GIS, although in both offices at least one additional staff member should be sufficiently trained in GIS to avoid a situation in which the whole functioning of the GIS depends on one person.

To create this in-house GIS capacity, relatively long-term support (minimum several months) from a GIS expert will be needed. This expert will have to organise the GIS database, train the operators in advanced GIS techniques, and train other programme staff in basic GIS usage.

6.2 Data availability

The mission has put a major effort in trying to get an overview of the available spatial data and their quality, because these data are fundamental to the GIS and cannot (all) be created by DW.

For Luanda suitable maps at scale 1:2000 and 1:5000 are available, although not very recent (1988). New 1:2000 maps are expected to be available by the end of this year (through an INE project). The currently available maps (all scanned) should permit the Luanda project to execute the proposed applications, although continuous updating will be necessary. Once the new maps will be available, the system can update to those maps (assuming they are of high quality).

For Huambo, the situation is less positive. The large-scale 1988 maps do not exist for Huambo. They are currently using the 1:100.000 maps (also 1988), but they are too small-scale for peri-urban mapping. These maps also have a fundamental problem in that they are based on a datum (a mathematical description of the earth's shape and orientation) called Camacupa, of which the parameters are as yet unknown. Linking GPS survey data with these maps is therefore currently not possible, since differences of up to 500 meter occur.¹ Other maps exist, such as a map of the sewage system, but so far no maps of scale larger than 1:10.000 have been found. However, the IGCA informed the mission that it has originals of old maps (1973?) at scale 1:2500 available. Unfortunately, the mission hasn't had a chance to see those maps, but if they indeed exist, they could provide good base information. Using GPS, the maps could then be updated to show relevant new information. Two projects had actually planned to produce new large scale maps of Huambo (the town and surrounding area), but due to the deteriorating security situation one project has removed Huambo from its list (INE), and the other has stopped altogether (Obras Publicas).

For GIS applications in the field of urban planning, which work with large scale maps (typically 1:2000 to 1:25000)² and detailed spatial information such as locations of stand posts, network of sewage pipes, etc., satellite imagery can only be of very limited use. Their limited resolution does not permit accurate identification and mapping of objects smaller than approx. 15- 20 meters. Also, real image processing requires specialised skills and software, and as such is not considered a viable option for DW. However, in the absence of recent aerial photos, hardcopies of satellite images (colour composite photos, panchromatic b/w photos) could assist the GIS staff in mapping general characteristics of the intervention zones such as the current outer boundaries of the peri-urban areas of Luanda and Huambo.

6.3 Data management within DW

Currently, data management is not centrally organised. Each project collects its own data, and processes it for monitoring purposes and reporting. For quantitative data, staff uses Excel rather than Access to store and process the data.

For GIS to become a success, this situation will have to change drastically. Although GIS programme such as MapInfo can access Excel-files, they are designed to work with real databases, on which they can perform combined spatial and non-spatial data queries.

1 The mission has found information concerning this problem on the Internet, which suggests that the problem can be solved, although this still has to be tested and confirmed

2 To avoid confusion about the terminology of map scales:
Large scale maps are maps that show more detail than small scale maps, because their representative fraction (i.e. 1/25.000) is larger than those of small scale maps (i.e. 1/500.000). Usually, maps with a scale larger than 1:50.000 (i.e. 1:10.000, 1:2000) are called large scale maps, those between 1:50.000 and 1:250.000 are called maps with intermediate scale, and maps with a scale smaller than 1:250.000 are called small scale maps

It is therefore of the utmost importance that DW starts with the design and implementation of a central (relational) database of non-spatial (attribute) data, which will then be available (through geocoding) for mapping and for combined spatial and attribute data analysis. The input of a DBMS expert³ will be needed to design this database. This expert will also have to train the GIS operators in database maintenance, and the other programme staff in usage of the system.

DW has chosen Microsoft Office as its standard software, which means the database will be designed using Microsoft Access. Two staff members (one stationed in Luanda, the other (to be) stationed in Huambo) are experienced Access users and should be able to provide technical backstopping to the GIS operators on a permanent basis.

Eventually, all quantitative data produced by the various DW programmes should follow the same data standards (to be developed by the expert) and should be integrated in the Access database. This integration of all data in one database is even more important now that DW is developing a more integrated approach to their work in the intervention zones. It also means that a good design and maintenance of the database is not only crucial for the GIS, but for all work of DW, in both Luanda and Huambo.

6.4 Information exchange and dissemination

Partnership is an integral part of DW's intervention strategy in Angola. Sharing information is an important component of this partnership. The SCSP programme in particular puts much emphasis on mechanisms of information exchange and dissemination, such as the use of newsletters, organisation of urban forums, etc. These are very good ideas, to which the GIS could provide an important input, since visualising data on maps greatly improves the accessibility and comprehension of the data. Strangely enough, the logical framework of the SCSP only mentions the use of GIS tools for the output 'Increased opportunity for using information in planning cycle'. If the GIS is going to be used as proposed in chapter 5.2.1, then its results can be used in other outputs as well, such as Public Education and Reinforced Role for Local NGOs.

During the field visit to peri-urban Luanda it became clear that local authorities are very much interested in good maps for their areas. The administrator of one of the comunas (Sambizanga) showed great interest in maps which would show details such as stand post, refuse collection sites, quality of roads, etc. He also made clear that they themselves have no capacity whatsoever for the production of such maps.

In line with this interest, and to promote a more permanent information dissemination the mission suggests looking into the possibilities of establishing small 'information centres' within the DW intervention areas. GIS generated information in the form of maps and associated data could then be made available to the target groups (population, local NGOs, local authorities) on a more permanent basis. This would fit in well with the plans of DW Luanda to establish some sort of offices at the administration centres in the various comunas.

Such an information centre/office could include other services such as a small library, a reading corner, brochures on water, sanitation, etc.

In Huambo the same approach could be followed. Huambo being a much smaller city, a publicly accessible information centre could be set up in schools for example. It could incorporate GIS generated maps, but also results from the Community Publishing Project. In line with the Huambo project purposes, maps should also be made available to other institutions in the field of research/education /provision of public services.

Sharing information with other NGO's such as ADRA is currently not formally organised. ADRA itself produces a regular newsletter, and has its own website. DW contributes regularly to this newsletter, and to those of other organisations, but has no plans to develop one of its own. A website is in the making though, and maps could be made available on that site for downloading.

Whatever their purpose, all maps and associated data to be produced by the GIS should be thoroughly checked for consistency and reliability, before dissemination to third parties.

6.5 Institutional aspects

In countries with a strong government, a GIS focusing on basic services infrastructure should normally be set up within the relevant government bodies, usually the technical departments involved, and the ministry/department for planning. In Angola, a strong government does not exist. Basic services provision is mainly provided by NGOs, with DW being the largest of them. Its outstanding reputation and detailed knowledge of peri-urban Luanda and Huambo make it the logical focus point for information collection, analysis and dissemination.

The active policy of establishing partnerships with the government and the civil society assures the best possible accessibility to data for these groups.

DW is currently redesigning its internal organisation. It is important that GIS (and the database system) are not seen as a separate programme, but as a support service for all other programme activities. This should be clearly reflected in the new organigramme.

DW is not the only organisation that is interested in GIS. One of its main partners, ADRA, is also looking at ways to improve their data management. They are thinking along the same lines as DW (using Access rather than Excel for data storage and processing), and have expressed a strong interest in collaboration in this field. Although they have no specific GIS plans, the coordinator of the Centro de Informação e Documentação is very much interested in the possibilities of using it to improve the quality of the information that they publish.

Other GIS users in the (semi-)public sector in Angola include the United Nations (INAROOE, PAM, UCAH), INE, Ministerio de Geologia e Minas, and Obras Publicas . The mission has spoken with several of these, and they all show a strong interest in collaboration, or at least information exchange. Early attempts to set up a GIS users group have not been followed up. DW can play an active role in revitalising this idea. Such a user group can address topics such as standardisation of map projections and symbols, of names and codes for common data (e.g. village names), formats for data exchange, sources for population data, etc. It is also a good forum for presentation of the GIS work done at the various institutions.

6.6 Hardware/software

DW has already acquired hardware and software for its GIS.

Hardware

In Luanda the current GIS hardware configuration consists of:

- Pentium 233 MHz MMX computer with 96 MB RAM, CD-ROM, floppy drive
- 4 hard disks of 1.99 Gb, 1.86 Gb, 1.86 Gb and 1.02 Gb respectively, giving a total of 6.73 Gb hard disk space

- Sony 17" monitor
- ZIP drive
- printer Canon BJE4650 A3 colour inkjet
- scanner HP ScanJet IIcx colour A4

This set up satisfies basic GIS needs in terms of computing power and memory needs.

The original idea of DW was to use this computer as their central computer (server) for their network, using 1 hard disk for programmes, 1 for GIS mapdata, 1 for the database and for project files. It is strongly advised not to use one and the same computer as network server and GIS workstation. When DW upgrades its network (as envisaged in the near future), it should install a dedicated network server, and use the current GIS hardware exclusively for GIS. A second computer within the DW office should also have the GIS software installed, to allow other programme staff to access the GIS as end-users.

Exact procedures for the right to access and/or change data in the GIS and central database will have to be developed by the expert mission.

To complete the GIS hardware configuration, the mission advises the procurement of the following additional equipment:

- A2 digitizer for accurate digitising of important map features (like roads, administrative boundaries) to assure accurate maps and analysis results. Vectorisation with a digitizer is faster and more accurate than on-screen-digitising using scanned maps.
- a A2 colour inkjet printer (currently only available from EPSON), for output of medium-size maps.

A second computer should be equipped with MapInfo to allow other DW staff to access the MapInfo maps and attribute data. The exact set-up will depend on DW's plans for the upgrading its computer network.

For the scanning and printing of large maps, very expensive equipment is required (A0 scanner, A0 plotter). The INAROOE project has this equipment and allows third parties to use this equipment against material costs, which is an ideal solution for DW.

DW's office in Huambo uses the following equipment for their GIS:

- Pentium 166Mhz MMX with 16Mb RAM, CD-ROM, floppy drive
- 2 hard disks of 1 Gb each
- 21" monitor
- Zip drive
- CD-recorder
- HP 2010 NT b/w laser printer

In terms of processing power this configuration is good enough, but in terms of memory capacity the system will have to be upgraded with:

- extra RAM to get a total of at least 64 Mb
- extra hard disk of at least 2 Gb

The following additional equipment will also be needed to complete the configuration:

- A2 digitizer
- A2 colour inkjet printer
- Scanner (preferably larger than A4, but this type of equipment is relatively expensive)

Software

As far as GIS software is concerned, DW has already acquired two packages: ArcView and MapInfo. Initially, ArcView was chosen for the Luanda project, but continuous problems with the programme (apparently caused by bugs) have prompted DW to start working with MapInfo.

The following table provides a basic comparison of these 2 packages (the more 'pluses', the better the score):

	Ease of use	Mapping options	Linking with Access database	Analysis options	Import/Export	Other users in Angola	Price
MapInfo	+++	+++	+++	++	+++	+	++
ArcView	++	+++	++	+ ¹	++	++	+

1. Extra spatial analysis module available for 5000 USD

Based on this comparison, the mission proposes to continue using the MapInfo package, mainly because it provides ease of use, sufficient analysis options and, very importantly, a good link with Access databases (ArcView has the best link options with dBase format). The latest version of MapInfo (as installed at DW Luanda) includes an extensive import/export utility, which allows for easy exchange of map data with other GIS programmes, including ArcView.

Currently, DW has only one license for this latest version of MapInfo. Three more licenses should be purchased, to allow for two MapInfo installations at both Luanda and Huambo.

Other packages used in Angola include ArcInfo (used at INAROOE in combination with ArcView) and IDRISI (used at WFP). The former is a very powerful, but very user-unfriendly and complex GIS programme, whereas the latter is a raster-based GIS, strong in satellite image processing, but not in the type of analysis that DW needs. The mission sees no need for these 2 packages.

The linking of field data with the GIS will have to be done with GPS. A first test revealed that use of 1 GPS without base station does not provide enough accuracy for accurate mapping of latrines, roads, etc. A differential GPS will be needed to provide this accuracy. Details on such a system (exact equipment needed, price) are not yet available, but the cost should not be too high, since it basically involves the installation of a fixed GPS (base station) on an accurately known position.

7. Action plan

7.1 Short term (1- 6 months)

1. Adapt the GIS component of the SCSP-programme along the lines proposed in chapter 5.2.1.
Revise the Huambo project proposal along the lines proposed in chapter 5.2.2.
2. Based on the revised Huambo proposal, the adapted SCSP proposal and this assessment report, procure funding for the recruitment of an expert on DBMS and GIS for a period of 4 months, with 2 follow-up missions of 1 month (month 8 and month 12). The main tasks of this expert will be:
 - set up central Access databases for the Luanda and Huambo programmes
 - (re-)organise the GIS spatial databases and set up the linkages with the central programme databases
 - set up and test the differential GPS system
 - train GIS staff in maintenance and use of the database and the GIS
 - train programme staff as end-users of the database and the GIS

Detailed TOR and profile can be found in annex V.

DW should consult with ADRA to see if there is scope for close collaboration (joint funding, joint training) on this issue, in particular where it concerns the set up of and training on Access database.

3. Prepare for the expert mission mentioned under 2:
 - prepare a clear overview of the type of data collected by the projects, the way they are stored, type of analysis performed, etc.
 - procure differential GPS equipment (Luanda and Huambo)
 - procure A2 digitizer and A2 colour inkjet printer (Luanda and Huambo)
 - procure additional MapInfo licenses
4. Awaiting the expert mission, the GIS efforts currently underway should continue with a focus on:

Luanda:

- production of base and thematic maps for DW and other partners; this work will give the GIS operator some hands-on experience with basic GIS work, such as on-screen-digitising and geocoding (relating the spatial database to the attribute database, see annex VI).¹
- prepare a list of possible applications involving mapping and analysis of data related to DW's core activities, in collaboration with programme staff (GIS operator to contact all programmes on this).
- follow-up on contacts with other GIS users, with the aim of revitalising GIS users group (a first meeting could involve presentation of current DW GIS efforts plus future plans)
- continue inventory of spatial data (maps and aerial photos) available for Luanda

Huambo:

- continue with the inventory of available spatial data (maps and aerial photos)

1 This work should basically be seen as training. It is likely that after the expert mission part of this work will have to be revised or updated.
As far as on-screen-digitizing is concerned, the GIS operators should use as guiding principle that the digitizing is done on the most detailed maps available, to assure highest accuracy.

- available for Huambo (part of this work will have to be done in Luanda!)
- combine information from different sources to make a base map for Huambo and surrounding areas
 - production of base and thematic maps for DW and other partners
 - prepare a list of possible applications on core activities and mid/long term future DW activities
 - liaise with Luanda GIS to avoid duplication of efforts (Luanda GIS is currently also doing work on the Huambo area)

7.2 Mid/long term (after the first 4-month expert mission)

1. Employ technician to do detailed surveys of DW's activities in Luanda and Huambo using the differential GPS.
2. Enter all data on programme activities in the Access database.
3. Revise and update GIS base maps with new (GPS) data and through linkage with Access data.
4. Start using GIS on a permanent basis for analysis and monitoring of DW's activities
5. Maintain a detailed logbook with all problems encountered in using the GPS, the database and the GIS, as preparation for the 2 follow-up missions.
6. Include GIS results on a regular basis in reports, newsletters, urban forums, etc (Luanda).
7. Make GIS data available to development partners on a more permanent basis, through information centres, website,...
8. Set up environmental assessment network in collaboration with development partners (Luanda). This should eventually lead to a GIS, which is accessible to all partners of the network.
9. Assure functioning of GIS users group (Luanda).
10. Expand GIS use towards natural resources management (Huambo).

Table 7.1 Action plan and time table

DW Luanda	DW Huambo	Responsible staff member(-s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 >
Adapt GIS component of SCSP	Revise project proposal for GIS	Coordinators	■																	
Procure funding for DBMS / GIS expert		Ccoordinators		■	■															
Prepare overview of type of data collected and stored per		All staff		■	■	■														
Procure hardware and software		Coordinators		■	■	■														
Produce base maps and thematic maps for DW and partners		GIS-operator	■	■	■	■														
Prepare list of possible GIS applications for activities of SCSP		GIS-operator to coordinate with staff		■	■	■														
Revitalize GIS users group		GIS-operator/ coordinator			■	■														
	Continue inventory of available spatial data (in Huambo and Luanda)	GIS-operator	■	■	■	■														
	Produce base maps for Huambo area at scale > 1:10.000	GIS-operator			■	■														
	Prepare a list of possible GIS applications related to DW core activities	GIS-operator to coordinate with staff		■	■	■														
DBMS / GIS expert mission								■	■	■										
Detailed GPS surveys in intervention zones		GIS-operators / GPS technician										■	■	■	■	■	■	■	■	■
Data entry in database		All staff										■	■	■	■	■	■	■	■	■
Maintain logbook of problems / questions with regard to		GIS-operators										■	■	■	■	■	■	■	■	■
First follow-up mission															■					
Start using GIS for		GIS-operator/ coordinator													■	■	■	■	■	■
Use GIS results in		GIS-operator/ coordinator													■	■	■	■	■	■
Second follow-up																			■	
Expand GIS to impact assessment	Expand GIS use towards Nat. Res. Man.	GIS-operator/ coordinator																		■

ANNEX I

Resumo português da avaliação geral e do plano de actividades

1. Avaliação geral

1.1 Adequação do instrumento GIS para DW-Angola

DW recolha e processa volumes grandes de informação relativa as actividades dos projectos. Informação sobre chafarizes, redes de água, latrinas, remoção de lixo solido, microcredito e o seu impacto social são recolhidos para os equipas de terreno. Actualmente, esta informação é introduzido em folhas de calculo simples e utilizado para o posterior preparação dos relatórios para os projectos. Não existe nenhum base de dados centralmente gerido, mas cada projecto tem desenvolvido o seu próprio sistema de recolha e manuseamento de dados. A visualização do componente espacial dos dados (a sua localização) não é bem desenvolvido, nem internamente, nem na disseminação dos dados aos parceiros.

Em principio, o desenvolvimento de um Sistema de Informação Geográfica dentro de DW poderá melhorar significativamente esta situação. A possibilidade para mapear e analisar dados pela localização geográfica poderá servir para melhorar a monitoria interna das actividades, para melhor disseminação da informação aos parceiros e eventualmente para avaliação de impacto das intervenções.

As ideias do pessoal de DW são bem desenvolvidos nestes assuntos, todavia ambiciosas em certos aspectos.

DW é sensível à potencial de novas tecnologias adequadas que poderão contribuir à melhorar a qualidades das actividades implementadas e dos relatórios apresentados. Esta abertura à oportunidades dados é demonstrada pela utilização extensiva das maquinas digitais para fotografia e para montagem da rede para computadores no escritório de Luanda. A utilização de GIS enquadra-se bem neste abordagem de utilização da tecnologias adequadas.

DW trabalha em zonas peri-urbanas das cidades principais de Angola, onde as estruturas espaciais são relativamente complexos. Mapas duma qualidade boa são importantes nestes condições comparadas às zonas rurais, onde desenhos simples poderão representar a informação necessitada.

A missão concluiu que o instrumento GIS é um instrumento adequado para que DW melhorasse os programas, tomando em conta o contexto no qual DW trabalha, particularmente pensando no papel muito limitado desempenhado pelo governo no planeamento e implementação de programas de aprovisionamento das infra-estruturas básicas. Utilizando uma estratégia de promoção da participação activa das autoridades locais e as instituições do governo no programa, poderá contribuir a estimular que estes mesmas instituições assumissem um papel mais pro-activa no processo de desenvolvimento.

Realça-se que existe uns problemas importantes que necessitam soluções, particularmente nas áreas de capacitação do pessoal e melhoria de gestão de dados recolhidos nos programas. (ver 3.1). Ambos problemas tenham soluções mais é imperativo que sejam abordados na fase inicial de integração de GIS nos programas de DW afim de assegurar que os resultados, sejam elas mapas ou analyses mais complexos são correctos e fiável. Mapas são instrumentos poderosos para os fins de lobbying, sensibilização e planeamento e deverão ser baseados em informações de base que são fieis.

1.2 Avaliação dos propostas para projectos.

1.2.1 Monitoria dos riscos ambientais urbanas em Luanda

A Monitoria dos Riscos Ambientais Urbanas em Luanda (GIS) iniciou a sua primeira fase em 1998. Apartir de Julho 1999, o trabalho com GIS será integrado no programa de Serviços Comunitários Sustentáveis (SCSP). Como o projecto inicial incluía mais detalhas, a avaliação baseia-se nas informações apresentadas em ambas as propostas em cima mencionadas.

O objectivo principal do GIS é para assegurar os inputs necessários afim de avaliar o impacto das intervenções de DW, nos sectores de água e saneamento, na saúde da população beneficiária. A pressuposta de base do trabalho é que a saúde da população é em parte determinada pelas condições ambientais que tenham por sua parte dimensões geográficas.

A introdução do instrumento GIS neste projecto deverá beneficiar directamente as actividades centrais dos programas a serem implementados em Luanda. Este justifica por si as esforços necessários para introdução da tecnologia do GIS e contribuirá a estimular outro pessoal de DW, trabalhando em outros programas, a adoptar a utilização do instrumento GIS.

Apesar que o objectivo em si deste primeiro projecto seja válido, a proposta não demonstra uma apreciação da complexidade de um tal aplicação do instrumento GIS. Poderá provar-se difícil conseguir qualquer valor adicionado pela utilização de GIS afim de fazer avaliações de impacto e identificar indicadores de Estado de saúde da população. Este porque, de um lado a saúde da população é influenciado por muitos factores além das intervenções feitas no contexto dos projectos e de outro lado a informação acessível sobre a saúde da população é limitado a informação sobre as populações que procuram utilizar os serviços de saúde que muitas vezes é pouco fiel.

Esta primeira proposta é concebida como um projecto de pesquisa. A missão acha que será mais indicado, numa fase inicial, concentrar-se em aplicações práticas, de utilidade imediato para os programas de DW e os seus parceiros em desenvolvimento.

Assim, a missão recomenda que foca-se inicialmente

1. na elaboração de mapas de base que poderão servir para os equipas de DW e para os seus parceiros
2. na monitoria directa das actividades de DW (construção, resultados, qualidade, utilização, operacionalidade) em vez de tentar avaliar o impacto dos projectos.

Quando a utilização de GIS tem sido correctamente estabelecida afim de fornecer informações fiéis e sistemáticas sobre as actividades em cima mencionados, poder-se-ia considerar a realização do trabalhos mais complexos como a identificação de indicadores para avaliação de impacto que são espacialmente atribuível e mais tarde contribuir à uma rede de avaliação ambiental.

Enfatiza-se, que seja que for a aplicação, os primeiros passos para estabelecer uma competência na utilização do GIS será a capacitação do pessoal e a melhoria na gestão geral de dados dentro da DW.

1.2.2 Criação de uma unidade de processamento de informação geográfica no Huambo

A proposta para utilização de GIS no Huambo é baseado na visão de um objectivo global de

melhorar a gestão de recursos naturais no PlanAlto. O projecto visa a capacitação do quadros locais para processamento da informação geográfica.

Na sua forma actual, o projecto parece ambiciosa para uma primeira aplicação de GIS. Além de mais, a missão entendeu que o estudo de floresta proposta não corresponde a outras actividades nos programas de DW, programas actuais ou previstos num futuro médio, nem com intervenções planejados para outras organizações, incluindo o Governo. Assim, considera-se que o objectivo para melhorar a gestão dos recursos naturais no PlanAlto actualmente mantenha-se ao nível teórica. Todavia, o consultor concorda com o objectivo de capacitar quadros locais e mante-los dentro da estrutura do Estado. O consultor opina que as actividades propostas nas fases 1 e 2 não são os mais adequadas para realizar este objectivo. Assim, proponha-se alinhar a proposta para Huambo com a proposta de GIS para Luanda, focando a intervenção proposta em actividades realizáveis que são relacionados com as actividades dos programas de DW, actualmente e no futuro, que irão contribuir a melhoria do processo de planeamento e a qualidade das actividades de DW.

Bem montado e estabelecido, o programa de GIS no Huambo poderá expandir-se para o sector de gestão de recursos naturais em Huambo. Recomenda-se iniciar com estudos relacionados com as actividades de DW como a avaliação de erosão nos arredores das cacimbas naturais e mapeamento de possíveis intervenções afim de controlar a mesma.

Huambo terá mais problemas para montar um base de dados espacial como não existe mapas fieis numa escala grande para Huambo. Na primeira fase do projecto, será precisa procurar os dados necessários afim de elaborar uma mapa ^aaccurate de Huambo e as suas zonas peri-urbanas.

2. Plano de actividades

2.1 Curto Prazo (1 - 6 meses)

1. Adaptação da parte GIS da proposta de SCSP Luanda
Revisão da proposta de Huambo como sugerido na secção 1.2.2
 2. Com base na revisão da proposta de Huambo, na proposta SCSP e neste relatório de avaliação, procura financiamento para o recrutamento de um perito, especializado em gestão de base de dados e GIS para um período inicial de quatro meses, seguidos por duas missões de follow-up e supervisão de um mês cada (mês 08 e mês 12). As tarefas para este perito serão:
 - Montar um base central de dados em Access para Huambo e Luanda
 - Reorganizar o base de dados em GIS e ligar a mesmo com o base de dados central dos programas
 - Montar e testar o sistema diferencial do GIS
 - Treinar o pessoal de GIS na manutenção e utilização do base de dados e do GIS
 - Treinar o pessoal dos programas como utilizadores-consumidores do base de dados e do GIS.
- DW deverá consultar ADRA para identificar as possibilidades para colaboração neste projecto de GIS e gestão de base de dados com ênfase especial no montagem e formação para utilização de dados em Access.
3. Preparação necessário para a missão técnica em cima referida
 - a) preparação de informação por projecto sobre a informação recolhida, na maneira que é registado e as análises feitas.
 - b) Adquirir equipamento para GIS diferenciado para Luanda e Huambo
 - c) Adquirir A2 digitizer e A2 color inkjet impressora. (Luanda e Huambo)

4. Aguardando esta missão técnica as actividades com GIS deverão proceder na seguinte maneira:

Luanda:

Produção de mapas de base e mapas temáticas para DW e os seus parceiros
Preparação de uma lista dos possíveis aplicações, utilizando mapeamento e análise de dados relacionados com os trabalhos de DW em colaboração com o staff para os programas.

Revitalizar o grupo de contacto com outros utilizadores de GIS – a primeira reunião poderá começar com a apresentação do actual trabalho de DW com perspectivas para o futuro.

Continuar a inventariar a informação espacial disponível para Luanda (mapas e fotografias aéreas).

Huambo:

Continuar a inventariar as mapas espaciais referindo à Huambo (mapas e fotografias aéreas). Uma parte do trabalho terá de ser feito em Luanda
Juntar a informação dispersa afim de criar uma mapa de base para Huambo e os arredores de Huambo

Produção de mapas de base e mapas temáticas para DW e para os seus parceiros.

Preparação de uma lista dos possíveis aplicações, utilizando mapeamento e análise de dados relacionados com os trabalhos de DW em colaboração com o staff para os programas.

Colaborar estreitamente com Huambo para evitar duplicação de esforços.
(Actualmente, faz-se trabalhos em Luanda, referindo à Huambo).

2.2 Médio à Longo Prazo (após a primeira missão de quatro meses)

1. Contratar um técnico para fazer um levantamento detalhado de Luanda e Huambo, utilizando os instrumentos diferenciados de GPS
2. Dar entrada de todos os dados provenientes dos programas em Access
3. Revisar e actualizar todas mapas de GIS com os novos dados de GPS e a informação registado em Access.
4. Começar a utilizar GIS numa base de rotina para análise e monitoria das actividades dos projectos
5. Manter um livro de registo, constatando todos problemas encontrados com o GPS, o GIS e o acesso a informação em Access, em preparação para as duas missões de follow-up.
6. Incluir a informação GIS numa base regular nos relatórios, boletins e informações para os residentes dos bairros.
7. Facilitar acesso à informação de GIS para os parceiros através de centros de informação, website.
8. Manter o grupo de utilizadores de GIS em Luanda
9. Criar um rede de grupos de trabalho para avaliação ambiental. Eventualmente este deverá tornar-se numa rede de GIS acessível a todos.

10. Expansão do trabalho GIS na direcção de gestão de recursos naturais.

ANNEX II

REVISED TERMS OF REFERENCE OF THE MISSION

TOR for the Luanda Urban Environmental Risk Monitoring project

1. To evaluate the ongoing GIS activities (specifically the data used) in terms of their appropriateness for the proposed project and make recommendations on possible adaptations.
2. Review and refine the proposed design for the GIS geographic and attribute databases.
3. Make recommendations for the institutional set-up of both the pilot project and the proposed environmental assessment network.
4. Evaluate the capacity of the GIS project team and make recommendations on training if appropriate.
5. Assess training needs for the future end-users of the GIS (staff of DW and other NGOs and of (local) government).
6. Assess characteristics of hardware/software acquired and make recommendations on procurement of additional equipment.

TOR for the project Creation of a Geographic Information Processing Unit in Huambo.

1. Review the project design and make recommendations on the appropriateness of the tools and methods for the intended application.
2. Make recommendations on the phased implementation of the project and corresponding timetable, taking into account the set-up and timetable for the Luanda Risk Monitoring project.
3. Evaluate the capacity of the GIS project team and make recommendations on training if appropriate.
4. Assess the characteristics of the equipment acquired and under consideration with a view to maximising the use of equipment purchased for this project and purchases for the Community Publishing Project.

ANNEX III

ITINERARY OF THE MISSION

TUESDAY 22 JUNE

Morning: flight Maputo - Johannesburg - Luanda
Afternoon: Introduction to DW staff
Briefing with Allan Cain, director of DW

WEDNESDAY 23 JUNE

Morning: Reading project proposals
Presentation of GIS proposals background by Allan Cain
Afternoon: Rewriting of the TOR
Discussion of TOR with Allan Cain
Reading documentation on GIS software

THURSDAY 24 JUNE

Morning: Work session with GIS operator Katuzolo Sanza Paulina (Katú)
Afternoon: Elaboration of mission program
Assessment of MapInfo GIS software

FRIDAY 25 JUNE

Morning: Visit to INAROOE (Instituto Nacional de Remoção de Obstáculos e Engenhos Explosivos), with Katú
Afternoon: Discussion with DW staff members on possible GIS applications
Discussion with Allan Cain on Luanda project proposal

SATURDAY 26 JUNE

Morning: Inventory of spatial data (maps) available at DW
Afternoon: Briefing on DW-Huambo by Carlos Figueiredo (Figas), responsible for Huambo programme

SUNDAY 27 JUNE

Morning: Review of work of the first week
Afternoon: Writing of first preliminary conclusions / recommendations

MONDAY 28 JUNE

Morning: Second visit to INAROOE to discuss database details; with Katú
Visit to IGCA (Instituto de Geodesia e Cartografia); with Katú and Figas
Afternoon: Discussion with Figas on Huambo GIS project proposal

TUESDAY 29 JUNE:

Morning: Field visit to intervention areas of DW Luanda: Hoji ya Henda, Samizenga, Cacuaco:
- visit project activities (latrines, standpipes, waste removal)
- discussion with DW field staff on information collection and dissemination
- discussion with local authorities (administrador Samizenga) on information needs
- GPS test measurements
Afternoon: Work session with GIS operator Katú

WEDNESDAY 30 JUNE:

- Morning:** Visit to Centro de Informação e Documentação de ADRA (Acção para o Desenvolvimento Rural e Ambiente)
Afternoon: Assessment of quality of map data at DW

THURSDAY 01 JULY:

- Morning:** Discussion with Mary Daly (deputy director) on data management and GIS applications
Visit to INE (Instituto Nacional de Estatística); with Katú
Afternoon: Work session with GIS operator Katú

FRIDAY 02 JULY:

- Morning:** Visit to WFP/VAM (World Food Programme/Vulnerability Assessment and Mapping)
Afternoon: Presentation of Access database development for DW's financial administration, by Tony.....
Writing of draft report

SATURDAY 03 JULY:

- Morning:** Writing of draft report
Afternoon: Idem.

SUNDAY 04 JULY:

- Morning:** Preparation of GIS presentation
Afternoon: Idem
Discussion with Figas on Huambo GIS options

MONDAY 05 JULY:

- Morning:** Discussion of draft report with Allan Cain, Mary Daly, Figas and Katú
Afternoon: GIS presentation for DW staff:
- explanation of GIS
- presentation of work done at DW (by Katú)
- presentation of conclusions and recommendations

TUESDAY 06 JULY:

- Morning:** Discussion with Allan Cain/Katú on work program for GIS
Assessment of GIS hardware
Afternoon: Work session with Katú

WEDNESDAY 07 JULY:

- Morning:** flight Luanda - Johannesburg
Afternoon: flight Johannesburg - Maputo

ANNEX IV

LIST OF PEOPLE MET

Name	Organisation	Position
Allan Cain	DW Angola	Director
Mary Daly	DW Angola	Deputy Director / coordinator Luanda programme
Carlos ✎Figasü Figueiredo	DW Angola	Coordinator Huambo programme
Katuzolo ✎Katúü Sanza Paulina	DW Angola	GIS - operator Luanda
Mark Evans	DW Angola	Manager water/sanitation programme Luanda
Jonathan	DW Angola
Hernani	DW Angola
Salvador Ferreira	DW Angola
Haile	DW Angola	Manager water/sanitation programme Huambo
Tony.....	DW Angola	Financial controller
Pedro Ribeiro	INAROOE	GIS / database officer
Sara Sekkenes	INAROOE	Technical Assistant Mines Survey
Conny Vaklin	INAROOE	Technical Assistant Database
Domingos Armando Kabyby	IGCA	Technical director
Santos António Nunes	Samizenga Comuna	Administrator
Ramos Buta	ADRA	Director of Information and Documentation Centre
Walter Cavero	INE	Advisor of research project on family income and expenses
Edmundo Joaquim Roumundo	INE	Cartographer
Bernardino Domingos Francisco	INE	Cartographer
Paulo Filipe	WFP	Assistant VAM officer

ANNEX V

LIST OF DOCUMENTS CONSULTED

Nr	Title	Type of document	Author / organisation / year
1.	Urban Environmental Risk Monitoring; The impact on Vulnerable Communities in Luanda	project proposal	DW Angola, 1998
2.	Creation of a Geographic Information Processing Unit, Huambo Province, Angola	project proposal	DW Angola, 1998
3.	Sustainable Community Services Programme	project proposal	One World Action, 1998
4.	Profile Development Workshop Angola	organisation profile	Paul Robson, 1998
4.	SIMA, the central landmine database	project report	INAROOE Angola, 1998
5.	INAROOE, UNDP Minefield database evaluation	evaluation report	J. Sawatsky, for CIDA, 1998
6.	Mapinfo Professional 5.0 User Manual	user manual	Mapinfo Corp., 1998
7.	Using ArcView GIS	user manual	ESRI, 1996
8.	Principles of Geographical Information Systems for Land Resources Management	monograph	P.A. Burrough, 1988

ANNEX VI

TERMS OF REFERENCE FOR PROPOSED DBMS / GIS MISSION

Main objective:

To assist DW Angola in setting up their database management and Geographic Information systems in Luanda and Huambo, and to develop DW's capacity to maintain and use these systems.

Short background

Over the years, Development Workshop has accumulated an enormous amount of information on their intervention zones and their activities within these zones. Up to now, no structural approach for the management of these data has been developed. The various programmes/projects have all used their own methods for storing, analysing and presenting their data. Most use spreadsheets (Excel, Lotus) for this purpose, rather than dedicated databases. Exchange of information between the programme components remains fairly limited, which is a serious drawback in the light of the more integrated approach that DW is pursuing.

The GIS tool (MapInfo) has been introduced about a year ago in the Luanda office, and somewhat later in Huambo. For both zones, project proposals exist that outline the ideas for the use of this GIS. These proposals were assessed by a technical mission in June/July 1999.

The main conclusion of the mission was that GIS could be a useful tool for DW Angola, but that it would need a considerable effort in terms of improving data management and of capacity building within DW. This led to the recommendation to recruit a DBMS/GIS expert for a period of 4 months, with two follow-up missions of 1 month (3 and 6 months after the initial 4 months period).

Main tasks

All of the following tasks will have to be executed both in the Luanda and the Huambo offices of DW:

- make an inventory of all the project-related data available at DW
- make an inventory of the current and future information needs of all programmes/projects
- design a central relational database in Microsoft Access in which all project data can be stored, including provisions for new data/tables which might be added in the future.
- develop basic Access forms, queries, reports and modules, in line with projects' needs for entering and retrieving data.
- assess the quality of the spatial data already entered in the GIS and make recommendations on which maps and map projections to use.
- advise DW on procurement of additional spatial data such as satellite images and aerial photos.
- (re-)organise the MapInfo spatial databases (including its physical organisation on disk) and set up the linkages with the central Access database
- assure that the design of both the Access database and the GIS spatial database are optimised for the monitoring of activities, results and project-induced change (impact).
- train DBMS/GIS staff of DW (and possibly other partners) in maintenance and use of the

database and the GIS

- train program staff as end-users of the database and the GIS
- set up the differential GPS system which is to provide the link between field surveys and the spatial database.
- train technicians in GPS surveying; train DBMS/GIS staff in linking GPS with GIS.

- produce detailed documentation on the design of the Access database and the GIS
- develop procedures for the right to access/change/update the GIS spatial database and the Access central database
- advise DW on back-up procedures for all data stored in the database and the GIS
- organise a workshop on GIS for DW and collaborating institutions

The follow-up missions are included to allow DW to gain experience with the DBMS/GIS and identify problems and additional needs.

Profile of the expert:

- academic degree in GIS / DBMS, or in a related discipline (urban planning, development planning, natural resources management, computer science)
- extensive experience in setting up databases and GIS, preferably in the context of development work in Africa
- experience in training people of other cultural backgrounds in complicated technical subjects
- strong ability to collaborate effectively with people of different educational levels
- fluent in English, and able to communicate in Portuguese or Spanish

Time, place and duration:

The mission is to start as soon as possible, and will take place in both Luanda and Huambo. The total duration of the mission is 6 months, divided in 1 period of 4 months, and two periods of 1 month (3 and 6 months respectively after the end of the first mission)