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FINAL REPORT

URBAN ENVIRONMENTAL RISK ASSESSMENT

Information Systems for Rehabilitation and Policy-Making in Marginalised Peri-Urban Communities of Luanda, Angola

to

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

Regional Office for Southern Africa

Luanda – February 2000

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ABREVIATIONS

DW	Development Workshop
ELISAL	Empresa de Limpeza e Saneamento de Luanda
GIS	Geographical Information System
GPS	Global Positioning System
IDRC	International Development research Centre
IGCA	Instituto de Geodesia e Cartografia de Angola
INAROEE	Instituto Nacional de Remoção de Objectos e Engenhos Explosivos
INE	Instituto Nacional de Estatística
NIZA	Nethelands Institute for Southern Africa
PAM	Programa Alimentar Mundial
SCSP	Sustainable Community Services Programme
SIG	Sistema de Informação Geográfica
UCAH	Unidade de Coordenação para Assistência Humanitária
UTM	Universal Transversal Mercator
INOT	Instituto Nacional de Ordenamento Teritorial

ENVIRONMENTAL RISK ASSESSMENT

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1 INTRODUCTION:

The Development Workshop has undertaken the Environmental Risk Assessment project in a pilot district in peri-urban Luanda. This is the first project of its type in Angola, applying geographic information systems (GIS) tools in an urban / peri-urban area of Angola. The project is supported by the International Development Research Centre's Southern Africa Regional Office and by Ranger Oil a Canadian petroleum exploration company working in Angola.

The project was initiated in the second quarter of 1998 and was planned to be executed in two phases. The first phase was extended from 15 to 21 months and is complete at the present time. The second phase overlaps with the present project and integrates it into a major three year Sustainable Urban Services Project funded by the British Department for International Development (DFID) as a monitoring component.

A project evaluation was undertaken in June 1999 by a GIS expert.who recommended some modifications in the programme strategy and a refocusing of some of the project objectives with the aim of directing the project toward producing practical more immediate outputs.

2 PROJECT OBJECTIVES:

2.1 General Objective:

To develop Angolan capacity for 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.

2.2 Specific Objectives:

1. To develop a set of assessment tools for measuring the inter-relationship between environmental factors, well-being and health of the communities in the project area.

2. To develop a database of appropriate environmental health indicators for a significant, representative area of peri-urban Luanda which taken together map the changing state of the environment and of the well-being and health of the people.

3. To develop a team of nationals capable of using environmental assessment tools to evaluate risks and monitor the impact of project interventions on communities.

4. To subsequently develop an ongoing monitoring capacity using key indicators to accompany the evolution of programmes and interventions which impact on the environmental health and well being of peri-urban communities. (principal objective of phase II of project)

2.3 Revised Objectives:

1. Provide immediately usable geographic information which DW and partners can use in its programmes.

2. Use the GIS as a tool for improved planning and monitoring of DW's community services and infrastructure projects.

3 OUTPUTS:

3.1 Planned Outputs:

1. Base line of environmental health indicators within the project area for project design purposes.

2. Data collection and dissemination system established linking government and non-government institutions. Environmental health data ie on diarrhoea and malaria will be drawn from routine reports compiled by bairro level health posts and disaggregated from Provincial Department of Public Health statistics (ie mortality data). Information on maternal mortality provides an indication of health service effectiveness and data on weight at birth provides an excellent indicator of general community well-being and level of nutrition. DW's and partner NGO's network of community committees provide a potential ongoing source of information on incidence of diarrhoea in children and adults and information on maternal mortality.

3. Identification of data gaps which can be researched in the second phase of the project.

4. National technicians capable of carrying out environmental assessment studies. This team, drawn from DW and co-operating partner organisations, such as ADRA, INPF, INE and DPSP will form the basis of a monitoring network upon which the second phase of the project will depend.

5. In the second phase, a monitoring facility established and functioning to process data and monitor key indicators on an ongoing basis.

3.2 Revised Outputs:

1. Base maps produced for DW programmes and local government to build staff and partner knowledge of and interest in the GIS.

2. Detailed planning indicators for the community services programme (SCSP) activities are to be articulated. These are identified as part of DW's general monitoring and evaluation approach

4 PROGRAMME EXECUTION:

4.1 Training of Project Team:

The Geographic information Systems (GIS) is a new technology in Angola. Very few institutions are using it yet in this field. The present project is therefore a pioneering experience in this country. The project has given first priority to the training of technicians. Training has been extended through the lifetime of the project. Training focused on the use of several software packages including ArcView, ArcInfo (two products from ESRI, the Environmental Systems Research Institution) but later settled on to the use of MapInfo (a programme more compatible with Microsoft Office).

The training was carried out in two stages: the first was “on-the-job-training” with the accompaniment of a Canadian expert in GIS. This stage lasted eight months. In this stage the project took the opportunity of associating itself with another initiative to introduce GIS technology into a national demining database, for mapping information on landmines. Development Workshop contributed to the mines database though a senior GIS technician (expatriate) who acted as a trainer to develop the skills of national technicians. DW further arranged the secondment of a woman (professional Geographer) from the National Institute for Territorial Planning (INOT) as a counterpart trainee to work along side the senior GIS technician. The national counterpart had no previous GIS training, and during a pre-project period, was trained in-country through a series of part-time courses in basic computer literacy and the use of Microsoft Office programmes (Word and Excel). The national counterpart was subsequently trained on-the-job in various aspects of GIS hardware and software operation.

4.1.1 National GIS Technician Training

In the first phase of the GIS on-the-job training, the national counterpart gained knowledge of;

GIS theory and principals,
Map Scanning using an AO size scanner,
Geo-referencing and co-ordinating map matrixes
Operation of GIS workstation
Software for scanning and basic GIS applications and tools

The second phase was an intensive period of formal training at MapInfo’s Training Centre in Lisbon. The senior project technician was able to complete both the Introductory Course Module as well as the Advanced MapInfo programme. She became the principal GIS technician for the project after the departure of the expatriate technician. She continued to work on the project on secondment from INOT to DW.

4.1.2 GIS Map Scanning Technician Training:

Three national technicians from the National Cartographic Institute were trained as GIS map scanning technicians. This training was undertaken by the senior expatriate GIS technician assisted by the national counterpart.

4.2 Choice of GIS Tools

Acquisition of equipment for the Geographic Information System unit:
The GIS Project has acquired

a) 1 scanner of format A3 of BJC-Canon model
b) 1 scanner of format A3 of model HP DeskScan II
c) 1 colour printer of format A3 of BJC-Canon model
d) HP5L Laser printer
e) 1 computer - Pentium II 233Mhz,
   - Hard Disk: 8 GB
   - Memory: 96 Mb Ram
f) 1 computer – Pentium III 450 Mhz,,
   - Memory 128 Mb Ram,
   -Hard Disk 12 Gb
g) Software for GIS:
   MapInfo 4,1
   MapInfo version 5,0 in Portuguese
   MapInfo Professional 5.5
   ArVIEW 3,0
   Adobe photoshop L.E

Imaging Windows 95
GeographiTRANSFORMER V3

h) 1 Zip drive Iomega Zip
i) 1 Wide Carriage Xerox Plan Printer machine of A1 size

4.3 GIS Mapping

4.3.1 Cartographic Material Acquisition:

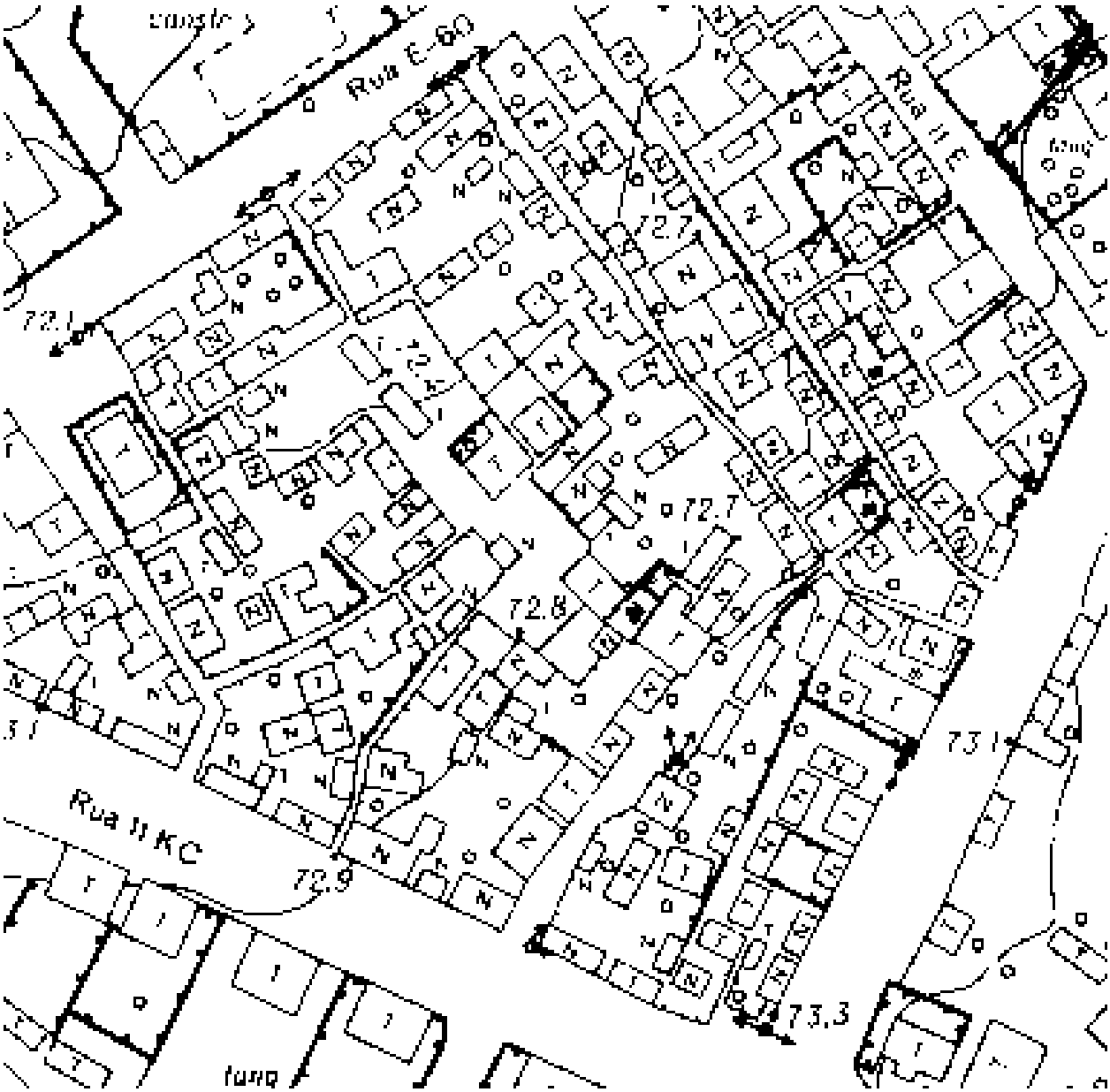
The maps necessary to serve of base for the project were acquired with some difficulty. Maps of Luanda have been produced from aerial surveys which have been made date back to 1968 (maps in scale 1/100000) and 1985 (map in 1/2000 and 1/5000) and map sets were published for the respective surveys in 1973 and 1988. In 1980 the 1/100,000 map set of the whole country was produced including 4 maps covering the province of Luanda. The fact that there does not exist a current updated survey of Luanda means that for some peripheral parts of the city the maps do not reflect the current reality. The configuration of some urban districts has changes with some streets having been blocked by informal sector anarchic construction.

The project encountered difficulties in locating a complete set of 1/2,000 scale maps of the city of Luanda. Even the Luanda Provincial Government (GPL) did not have a complete map set. Furthermore, in a country which has experienced a chronic state of war for almost four decades, maps and geographic information in general are generally considered to be sensitive information for security reasons. The National Cartography Institute is in fact a branch of the Ministry of Defence and all maps carry a printed “Secret” designation. Despite these constraints, the project team was able to develop relationships of trust with key agencies and eventually was able to assemble a complete set of base maps. It was necessary although to search widely and become involved in lengthy negotiations to secure a sufficient selection of maps to meet the projects needs. The project was able to purchase a selection of maps which were otherwise not available from partners, but gave priority to borrowing maps for several days at a time, sometimes for only a few hours, providing the project technician enough time to do the scanning. The project acknowledges the support of the following agencies in loaning maps to be scanned: Luanda Provincial Government GPL, ELISAL, EPAL, Ministry of Planning, INE, INOG, University of Agostino Neto, Science Faculty and INAROE.

With the support of the World Bank and the technical intervention of a company South African AOC Holdings (PTY) the National Statistics Institute (INE) had undertaken to produce an updated cartographic aerial survey and produce base maps for Luanda and later on for the other urban centres Lubango, Namibe, Lobito, Benguela and Catumbela. The project was originally also to include Huambo, but it was removed from the list due to the war situation. While the whole project should have been finished in 1999, according to the INE the Luanda work is only 3 - 4 months away from completion. Unfortunately all World Bank funded projects have been frozen since early 1999, and at the time of reporting, there is no indication when the project will be resumed.

The Ministry of Public Works also plans to carry out an aerial survey and publish a map set with the assistance of the Japanese Government, employing a Japanese company, but work on the project has been suspended for reasons that we are unaware of.

At the present time the project is employing the most up-to-date map base available. The project team has taken every opportunity to update information on the map-base with information they have gathered from field observation. At the time of writing high resolution satellite imagery has been ordered for Luanda but has not yet been delivered.



Example of a RASTER Image taken from 1:2,000 scale map of the pilot project área.

4.3.2 Creation of the cartographic database

The creation data-base consisted of the scanning of cartographic maps of different scales that cover the areas of the project to be implemented. These maps are the following:

11 maps in the scale 1/25,000, that cover the city of Luanda and its outskirts

462 maps in the scale 1/100,000 that cover the whole of the national territory

30 maps in the scale 1/5,000 that cover part of the periphery of the city of Luanda, Cacuaco and Viana

-266 in scale 1/2000 that all urban zone of Luanda

The related maps have been acquired through loans and purchases from various institutions such as the University's Faculty of Sciences, the Provincial Government, Elisal, IGCA.

Within this task the project team has executed the following subtasks:

- Scanning of the maps

Maps were scanned in order to transform graphic information from paper maps into a computer readable digital format. The project technician used a wide carriage Canon A0 scanner using equipment belonging to INAROE at the national Cartographic institute.

The maps had been introduced in the computer using ESRI scanning software which produced "RASTER" (computer readable images) corresponding to the original graphic images.

4.3.3 Geo-Referencing of the maps of Luanda at scales of 1/2,000, 1/25,000 &1/100,000

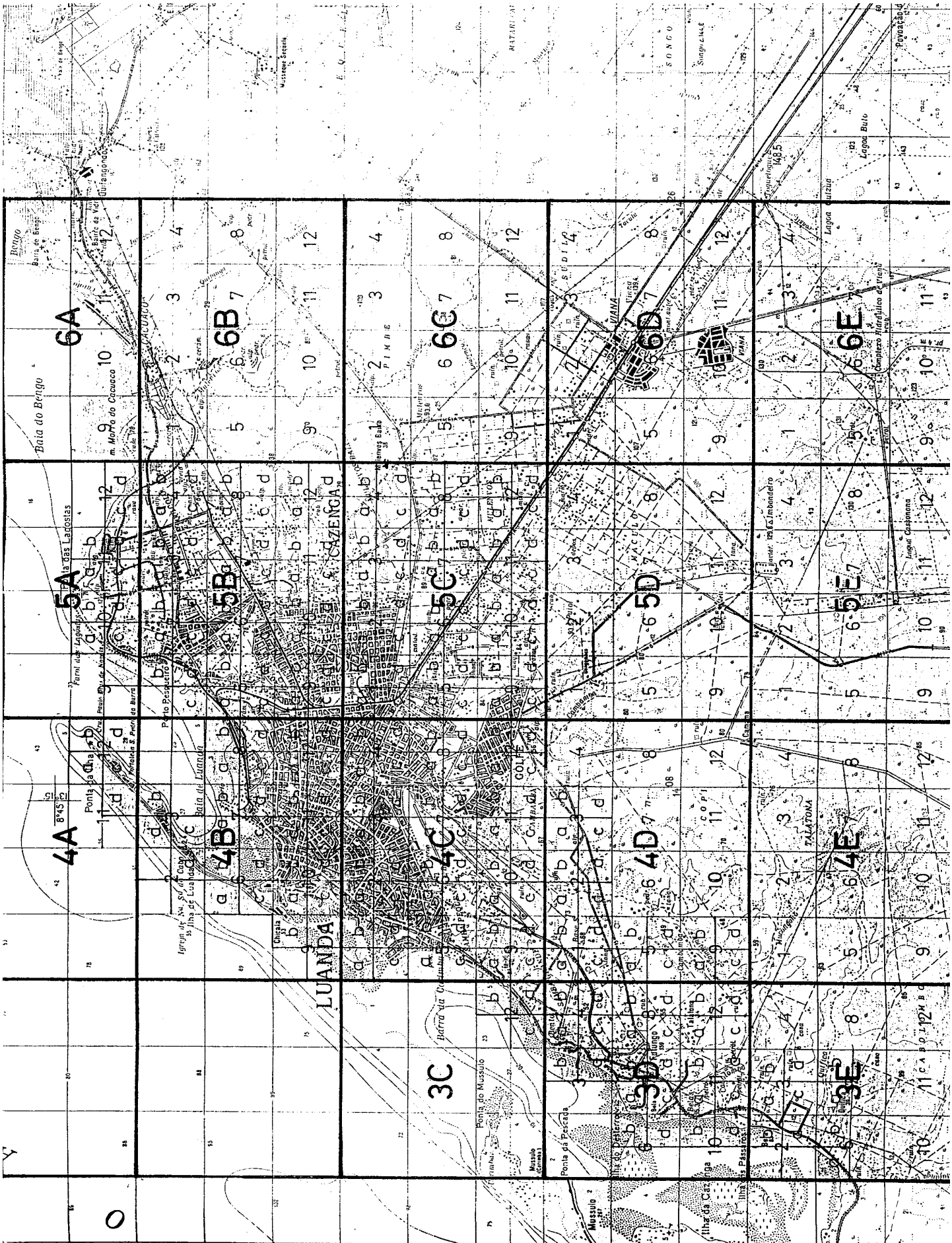
Geo-referencing links individual maps together to produce a continuous or "seamless" map of the whole city of Luanda. The geo-referencing process also involves linking the maps to a referencing grid on an X – Y axis. The task consisted of identifying control points with values of known geographic co-ordinates from the original image. The geo-referencing was done on the basis of a "Non-earth projection" in meters, since the letters have the system of local co-ordinates.

The 1/100,000 scale maps - use the UTM projection system, zone 33 of the south hemisphere was used here. The Ellipsoid WGS84 projection is the most often used system in the southern region of Africa. The fact that Angola uses a different map projection system than other countries in the region may introduce some further complexity into the analysis of geographic data.

Because of the large number of maps that had to be geo-referenced and the labour intensive nature of the task, a priority was given to completing the geo-referencing of the all of the small scale maps for the city of Luanda and the large scale maps (1/2,000 scale) for the project target area of Sambizanga, Cazenga and Cacuaco.

An example of the RASTER IMAGE of a 1:2,000 scale map showing a "quaterao" in Hoje-Ya-Henda Comuna

BASE MAP MATRIX OF LUANDA SHOWING MAP REFERENCING SYSTEM

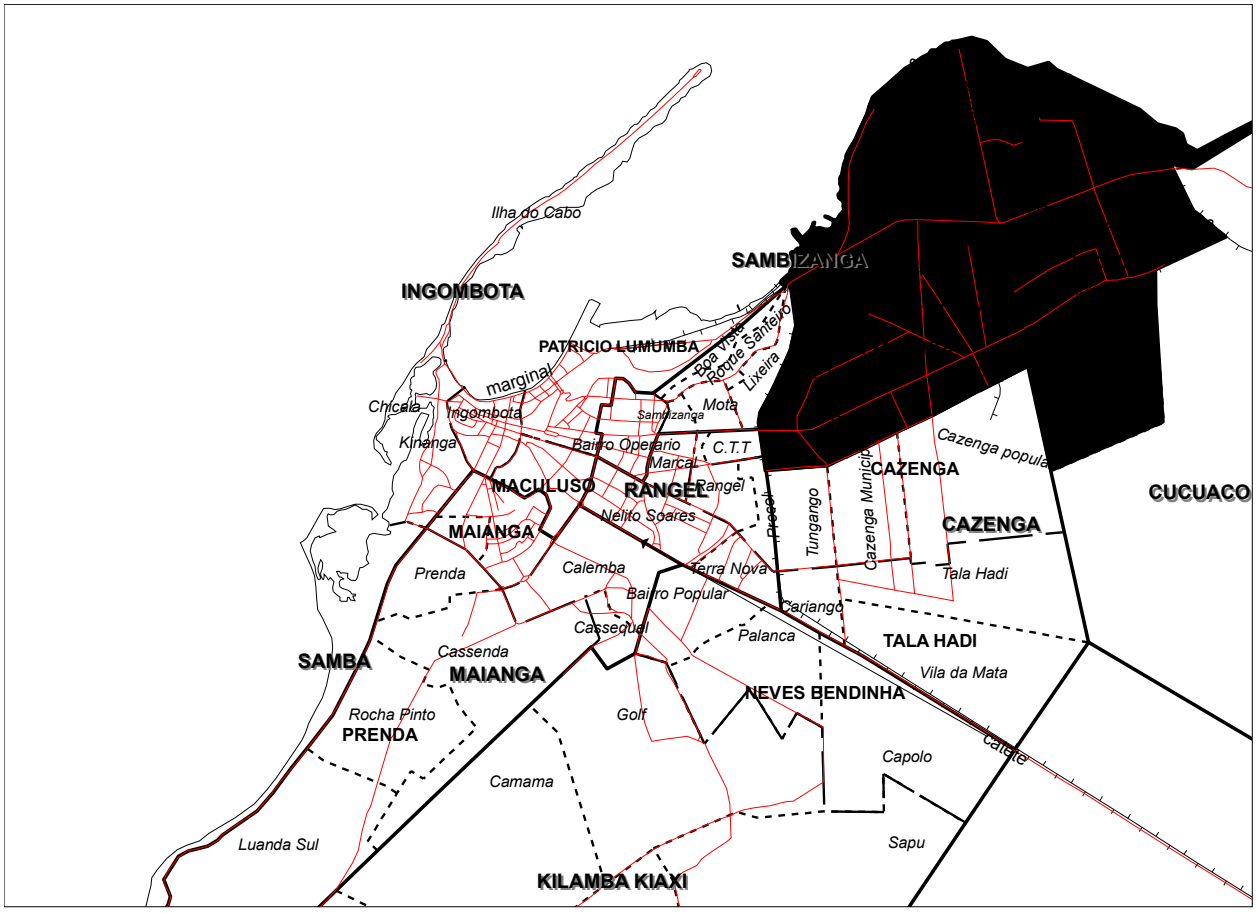


4.3.4 Vectorisation of the map set of Luanda

Vectorisation is a process of projecting data such a lines, points or areas over the image based Raster graphic data.

This task involved using the geo-referenced 1/25,000 scale Raster maps as a base to trace the following information. This information is recorded in vector layers over the Raster base map. Each layer of information is recorded as a separate graphic data file.

the coastal shoreline of the city
the limits of the urbanised zones and the outskirts of the city
the principal streets, roads and railway lines
the administrative divisions including municipal and comuna boundaries.
location information for project interventions carried through for the DW.
water project information in the form of standposts
the principal zones of vegetation and limits of agricultural land use in the peripheral areas of the city[1]



Vectorised map of the City of Luanda showing:

1. *Coastline*
2. *Municipal Boundaries*
3. *Comunal Boundaries*
4. *Principal Roads*
5. *Names of Administrative Districts*

4.4 Data Collection and Processing:

[1] the information was obtained from the book by Diniz Chestnut "Characteristicas Mesologicas de Angola", that deals with the agricultural zones and land use, chapters 7 & 8 on coastal zones of Luanda and chapter 12 – on suburban Luanda.

4.4.1 Collection of Statistical Environmental Health Data

Much of the data available from official sources such as the National Statistics Institute and the Ministry of Health is in an aggregated form, that being data from a wide area such as the Province of Luanda, is averaged together in order to produce provincial statistics or indicators. For information to be useful to the present project, the data must have a spatial component or linked to a place. In order to produce date of use to the current project it is often necessary to go back to the original survey questionnaires in order to discover if the particular survey contains a component that can be used as a geographical locator that can then be linked to a GIS database.

The lack of existing data sources in a geographical relational format severely limited the scope of data collection in the current project. The project was able to, have access to an important set of data, previously made available to Development Workshop by the Luanda Provincial Department of Public Health (DPSP). This database supplied information on an annual basis for the two principal environmental health indicators of mortality due to Malaria and Diarrorial diseases. The indicators were published as annual statistics which indicated developing trends. In its published form it was of little use in the GIS context. The DPSP was able to provide DW with the original source of data, being death certificates from Luanda's two cemeteries. Death Certificates always contain the previous place of residence of the diseased and therefore a "locational field" could be developed for the data base. With the help of technicians from the DPSP the statistics were disaggregated to produce information in the form of a relational database that could be linked to the GIS.

The manual disaggregation of survey data that does not already exist in a relational database is an extremely time consuming and labour intensive activity. The above exercise with the DPSP demonstrated to the Ministry of Health the value of collecting information in a relational database format containing geographical fields. It is hoped that in the future this information will be readily available.

4.4.2 Collection of Community Health Data:

Development Workshop has developed an extensive network of partnerships with local community organisations, NGOs and local levels of government in the Pilot Project Area. By supporting local initiative projects of these organisations DW has built up capacity and has developed community level institutional linkages. Through a network of Health Posts and Health extension programmes the project is able to have access to health statistics collected at the community level. A data collection check list is provided to local partners who are encouraged to collect data on a regular basis.

Some of the key indicators collected at the community level are as follows:

Types ->	Sources ->	Where to obtain
Diarrhoea cases <5 yrs	Health Posts	Routine reports[2]
Dysentery cases >10 yrs	Household visits	Community groups[3]
Malaria cases[4]	Health Posts	Routine reports
Birth Weight[5]	Health Posts	Routine reports
Maternal Mortality[6]	Household visits	Community Group

[2] Routine reports: indicate that data is already collected by government district (comuna and municipal) health posts and is reported to the Provincial Public Health Department.

[3] Community Groups or Committees: exist in some areas within Development Workshop project areas such as Val Saroco and Hoje ya Henda. Some data is currently collected and a potential exists for monitoring of health indicators.

[4]Malaria is the major cause of death and diarrhoea is the second cause of death in peri-urban Luanda

" Malarial Cases:
Malarial cases are the single major cause of absenteeism from work.

[5] Birth Weight: is a good indicator of community health and well-being.

[6] Maternal Mortality: is an indicator of health service effectiveness.

A sample of the community health database and corresponding indicators can be found in Annex III.

4.5 Geo-Positioning Field Data Collection using GPS unit:

Survey of exact geographic co-ordinates of water points and some schools in Luanda, with aid of the GPS apparatus. The GPS or geographical positioning system uses a network of fixed positioned satellites which transmit their locational information. A small hand-held GPS receiver is used to determine the exact geographical co-ordinates of the receiving unit.

The field data collection process normally involves the operator taking GPS readings from the site in the field and recording this data either digitally or in a log-book. This data is then transferred to a data base and then geo-linked using the GIS programme. Exact map references and point locations on the GIS map can then be obtained.

This task was carried with the objective of facilitating the exact location of these project facilities within the map base. The task included locating and recording of the co-ordinates of 59 standposts in Luanda and a small number of schools as part of a testing phase.

However, the process of the launching of the data collected in the cartographic base did not give exact results. A certain discrepancy was noticed, for the reason that the maps in the scales of 1/100,000 and 1/25,000 employ a datum co-ordinate base not recognised universally that being a system called “Datum de Camacupa”.

The maps of the 2,000 series on the other hand use a system of common co-ordinates that being UTM. It was therefore necessary to make the survey of co-ordinate of some points with aid of the GPS and do the geo-referencing from the co-ordinates collected in the field. An experiment was made using maps of the 1/5000 and the 1/2000 series and produced results having a discrepancy of more or less 20 meters.

5 ON-GOING PROGRAMME MONITORING:

In July 1999 DW initiated the Sustainable Community Services Project (SCSP). The present project has run concurrently with the SCSP in an attempt to integrate the GIS and environmental assessment techniques into the monitoring activities of the programme. The SCSP is an integrated urban development project and provides an ideal opportunity to put the GIS tools into action.

The purpose of the programme is to develop, test and demonstrate community orientated models of meeting the needs and priorities of the peri-urban poor in Luanda for basic services. Access is promoted to basic public health services such as water supply, on-site sanitation and solid waste removal. The programme aims to develop and promote the application of sustainable, appropriate and replicable models of service provision for public health services and to enhance the capacity of municipal authorities to provide and/or regulate public health services in an integrated model of service provision. Policy constraints are being identified through the programme and lessons learnt will contribute to influence pro-poor policy development in the sector of public health provision in Angola.

This programme builds on Development Workshop’s previous project interventions in peri-urban Luanda in community orientated models of service provision. The previously implemented Luanda Peri-urban Water Programme (1997 -1998) builds on the experience of the earlier Luanda Water Programme (1995 - 1996), both of which grow out of the Sambizanga Community Development Project (1989 – 1994).

Development Workshop conducts on-going beneficiary and stakeholder assessments. The most recent major assessment was completed in March and April of 1998. The assessment included 2,207 household questionaires and 36 focus groups in four municipal areas of Luanda where this programme will be implemented. The principal themes addressed in the survey were:

a) areas with priority need for basic service interventions
b) willingness to pay for services and acceptable models of cost recovery
c) mechanisms to enhance community participation and accountability of service mechanisms
d) the roles of community groups and local authorities in service provisions, supervision and management.

Information from this assessment has been incorporated into the programme design. Specifically, the information emerging on community organisation, user willingness to pay and on popular attitudes to local government structures and service provision agencies have greatly influenced the programme design. Similarly, on-going monitoring of the social mobilisation component of the water and sanitation programmes currently being implemented by DW provides feedback from users (beneficiaries) and the other stakeholders e.g. ELISAL, EPAL and local government. GIS and mapping materials have become essential tools for communicating project plans and feeding back to both community and government partners.

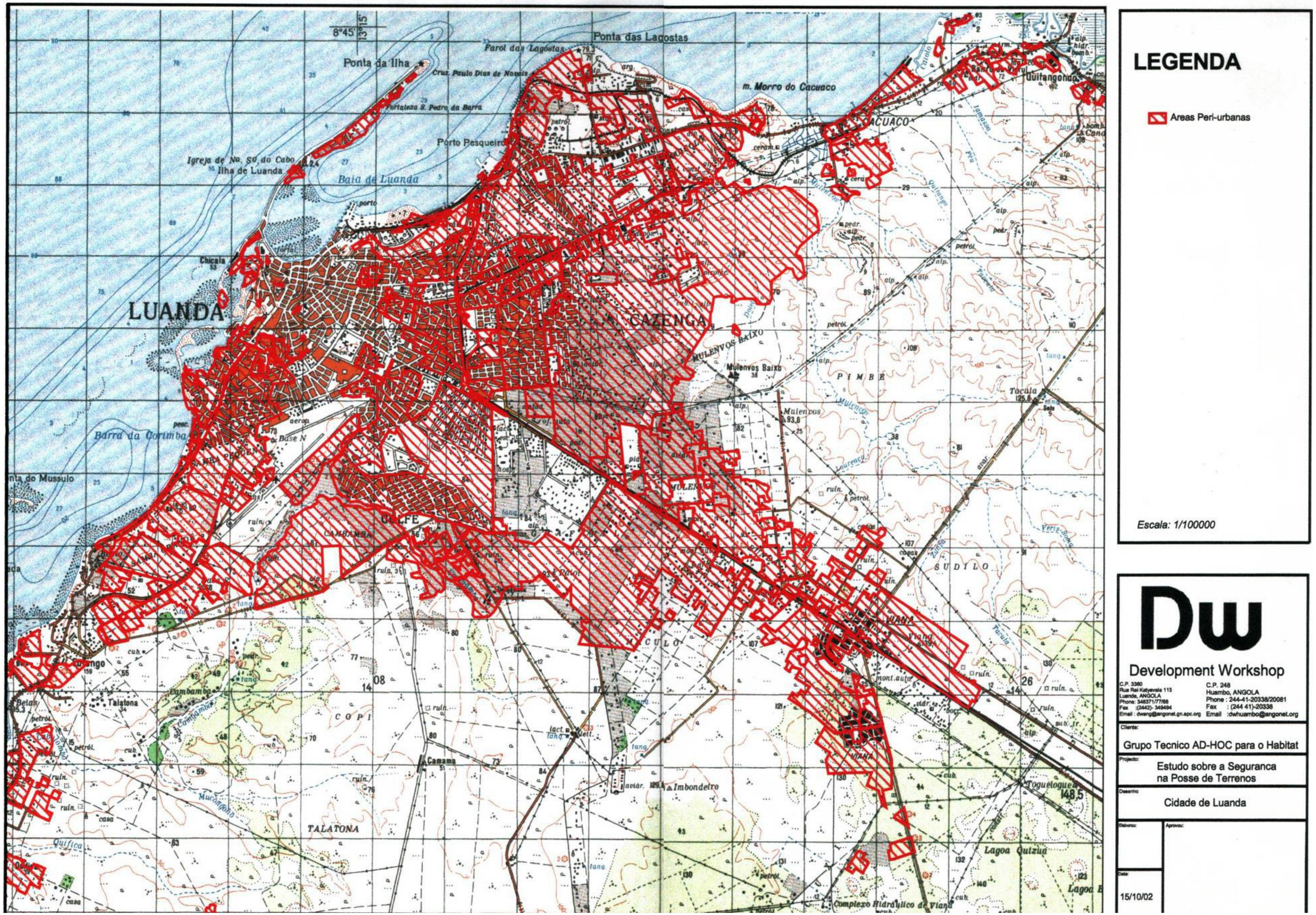
Development Workshop has already integrated the GIS monitoring and impact assessment unit into the SCSP to accompany public health and infrastructure interventions. The unit has set up channels of information exchange with INE in the Ministry of Planning and provincial government departments. It will attempt to bring together available information from the different executive agencies in Luanda, namely the department of public health, local government authorities, the service provision agencies ELISAL and EPAL and governmental and non-governmental project interventions, in order to produce information from the level of bairro upwards.

Emphasis is placed on on-going monitoring, analysis of data, feedback and discussion with the participating institutions.

The monitoring and impact assessment activities link with all of the municipal authorities. DW concentrates its sectoral interventions in municipal areas where the potential for service provision and local government interest combine to ensure a sustainable context for programme continuity. It is in these areas that the programme is developing strategies and instruments for working with community service departments and user group representation.

SUSTAINABLE COMMUNITY SERVICES PROGECT FRAMEWORK

DESIGN COMPONENT	WATER SUPPLY	SOLID WASTE	LATRINES
Technology	tested model	primary removal tested with Urbana 2000 secondary removal systems to be tested	improved dry pit latrine appropriate for families test models for public latrines low cost emptying techniques
Social Mobilisation	support of user groups support for Residents Committees where appropriate health and user education via radio and community theatre	support of user groups support for Residents Committees where appropriate health and user education via radio and community theatre	support of user groups support for Residents Committees where appropriate health and user education via radio and community theatre
Cost Recovery	cost recovery model tested and applicable engagement of service providers and local government	cost recovery not possible at the moment government subsidy via Urbana 2000	50% to 70% user contributions to family latrines testing viability of micro-credit for family sanitation programmes
Local NGOs Community Groups	strengthen role in social mobilisation promote role in user representation	strengthen role in social mobilisation promote role in user representation	strengthen role in social mobilisation promote role in user representation
Private Sector	construction contracts for small scale construction companies	local government contracts with Urbana 2000 contract management and supervision	management of public patrines as a micro-enterprise
Community Services Local Administration	strengthen contract management and supervision capacity training of inspectors	training and support for inspectors	training and support for inspectors and public health officers
Advocacy and Policy	create integrated mechanisms for information exchange and analysis at provincial level feed into policy making at national level support decentralised management of service provision	create integrated mechanisms for information exchange and analysis at provincial level feed into policy making at national level support decentralised management of service provision	create integrated mechanisms for information exchange and analysis at provincial level feed into policy making at national level support decentralised management of service provision
Monitoring	Monitoring and Impact Assessment Unit. use of GIS liaise with INE, municipal governments and ministeries	Monitoring and Impact Assessment Unit. use of GIS liaise with INE, municipal governments and ministeries	Monitoring and Impact Assessment Unit. use of GIS liaise with INE, municipal governments and ministeries


LEGENDA
Areas Peri-urbanas
Escala: 1/100000
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LUANDA
CAZENGA
Ponta das Lagostas
Ponta da Ilha
Farol das Lagostas
m. Morro do Cacuaco
Porto Pesqueiro
Baia de Luanda
Ilha de Luanda
Chicala
Barra da Corimba
Mulenvos Baixo
PIMBE
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SUDILO
VIANA
TALATONA
COPI
Camama
Imbondeiro
Lagoa Quizua
Complexo Hidraulico de Viana
Toguetogue
Talatona
Cambamba
Tacula

6 LESSONS LEARNED FOR PROGRAMME DEVELOPMENT

6.1 Appropriateness of Research Methods:

6.1.1 Validity of the Research Hypothesis:

The "Hypothesis" presented in the original proposal document has proved to be a sound one in the context of the present project. On the other hand the "Key Research Question" remains partly unanswered.

Original Hypothesis:

Health is largely determined by environmental factors which have a spatial dimension. A spatial computer model (GIS), demonstrating a range of environmental influences on the health and well-being of an identified peri-urban district, can be employed as a useful monitoring and planning tool for the development of policies and the feasibility of physical upgrading interventions.

Key Research Question:

The research will address the question, whether a relationship can be demonstrated between interventions that affect the physical environment of the study area and the indicators of public health of the resident population.

It has not proven possible within the time frame of the project to demonstrate conclusively that project interventions such as the building of standposts and latrines have yet impacted positively on the public health of the targeted population. This can only be proved as a fact if the indicators established in the project can be monitored over a period of a number of years and a control group, without access to these services is monitored as well. The project evaluator raised the issue that there are many factors outside of the framework of the project that may have an impact on health of the population that can not be measured by the present GIS model[7], (such as epidemic disease, civic strife etc).

On the other hand the GIS map projection of "Mortality due to Environmentally Related Diseases" , projected in an overlay format on areas of the city of Luanda having varying levels of public services (access to piped water and basic sanitation services) demonstrates a clear correlation between level of service access and public health[8].

6.1.2 Appropriateness of the Strategy:

The strategy presented in the original proposal has been modified to some extent during the execution of the project. The GIS tools and skills developed through the project proved to be very appropriate and useful in the context of the project, DW's and partner's programmes and generally in the present Angolan context. The consultant carrying out the interim evaluation of the project recommended a modification in the programme's objectives. He questioned the value in the early stages of the Geographic Information Systems development of attempting to extract definitive environmental health indicators which would require a much longer time frame than the project permitted to prove conclusive. His recommendations suggest that the project should focus on providing base maps and information appropriate for DW's and partner's projects and that GIS tools be developed for direct monitoring of project activities (construction progress, outputs, quality, use), rather than on impact assessment.

[7] See ANNEX II Programme Evaluation, June 1999

[8] See ANNEX __

DW has subsequently adapted the GIS tools within it's project monitoring strategy and has focused on developing databases on community service provision that will give information immediately useful for ongoing programmes. The monitoring of environmental health impacts of these interventions still remains a long term objective of the GIS programme, and data continues to be collected.

> ***Original Strategy:***
> *The first, for which IDRC assistance is requested, is a phase of developing tools, training a national team, building a data-base and selecting key indicators Development Workshop proposes to employ environmental mapping tools together with qualitative and quantitative information gathering techniques to produce a graphic/geographic base line environmental assessment. Existing data, statistics and demographic information will transformed into graphic format which can be projected onto spatial maps of the project region. Project teams, trained in qualitative research will provide supplementary community information.*
>
> ***Consultant's Recommendations on Strategy:***
> *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 consultant mission feels that it should put more emphasis in its early stages on practical applications which will more directly benefit both DW and its development partners.*

6.2 Information exchange and dissemination[9]

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. GIS tools can be used for providing information for project planning but its results can also be used in public education and reinforcing the role for local partners throgh the provision of mapped information.

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.

Sharing information with other NGO`s such as ADRA is a useful strategy within the project. ADRA itself produces a regular newsletter, and has its own website. DW contributes regularly to this newsletter, and to those of other organisations. 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.

[9] See ANNEX II Programme Evaluation, section 6.4 , June - July 1999

6.3 Institutional aspects[10]

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 co-ordinator 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 (INAROEE, 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 through by INE who was to co-ordinate it. 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.

[10] See ANNEX II Programme Evaluation, section 6.5, June - July 1999

7 PROJECT ACHIEVEMENTS:

Actual Achievements against Planned and Modified Objectives:

OBJECTIVES		ANTICIPATED OUTPUTS	ACTUAL ACHIEVEMENTS	VERIFIABLE INDICATORS
General Objective:	To develop Angolan capacity for 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.		a) Functional GIS Unit established b) National technicians trained in GIS technology c) Environmental Health indicator study carried out d) Major Community Services project set up with local government incorporating GIS monitoring component	from project report
Specific Objectives:	5. To develop a set of assessment tools for measuring the inter-relationship between environmental factors, well-being and health of the communities in the project area.	Base line of environmental health indicators within the project area for project design purposes.	a) acquisition of GIS software and appropriate hardware b) trained technicians in use of GIS tools c) developed digitised cartographic base of scanned and geo-referenced maps of Luanda	project report 1 senior technician 1 database technician 3 map scanning technicians
	6. To develop a database of appropriate environmental health indicators for a significant, representative area of peri-urban Luanda which taken together map the changing state of the environment and of the well-being and health of the people.	Environmental health data ie on diarrhoea and malaria will be drawn from routine reports compiled by bairro level health posts and disaggragated from Provincial Department of Public Health statistics (ie mortality data).	a) diseggragated statistics on mortality due to diarrhoea and malaria for a consecutive 5 year period. b) project population statistics on a comuna by comuna basis for the city of Luanda c) project available environmental indicators on a urban district basis for access to water and sanitation and waste disposal	See project annexes

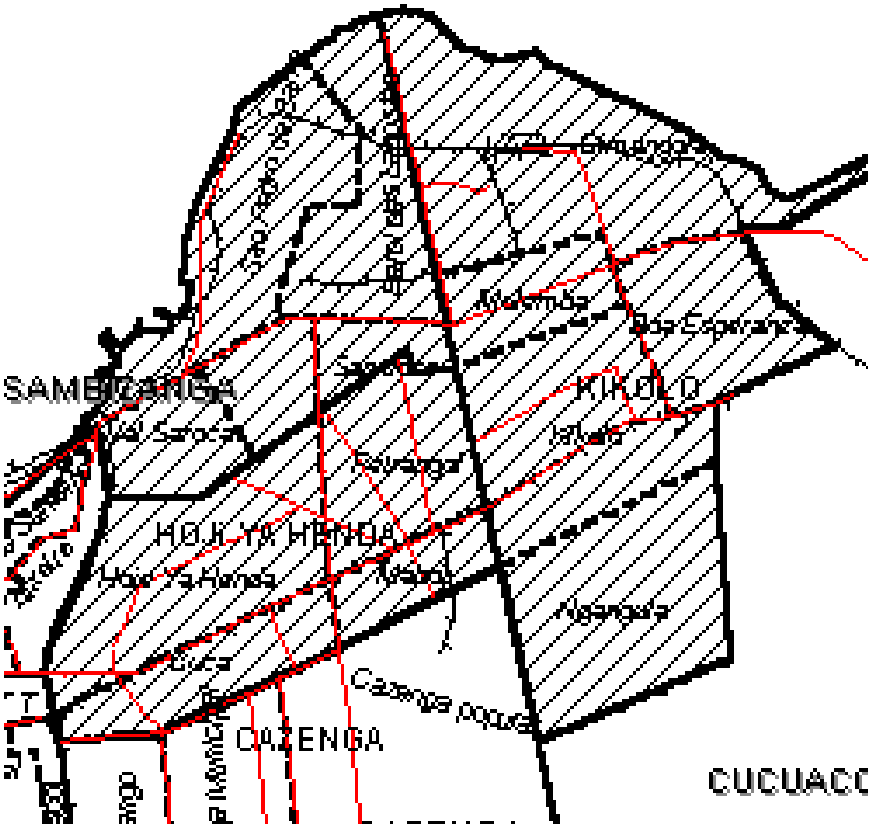
	7. To develop a team of nationals capable of using environmental assessment tools to evaluate risks and monitor the impact of project interventions on communities.	National team (5 persons) capable of carrying out environmental assessment studies. This team, drawn from DW and co-operating partner organisations to form the basis of a monitoring network upon which the second phase of the project will depend.	a) Geographer (1) – senior technician trained in GIS tools. b) Scanning technicians (3) trained. c) Programme managers trained in data-base management (2) d) Demonstration workshops given to DW & partners	INPF – Min. Planning, seconded to DW INAROEE – Min. Social Reintegration Dept. of Public Health and Development Workshop National Statistics Institute
	8. To subsequently develop an ongoing monitoring capacity using key indicators to accompany the evolution of programmes and interventions which impact on the environmental health and well being of peri-urban communities. (principal objective of phase II of project)	Data collection and dissemination system established linking government and non-government institutions.	a) relational databases for DW projects set up on standposts and latrines built constantly updated b) ongoing data collection and monitoring set up at 5 local health posts c) community mapping exercise carried out with local government administrations and residents commissions in 3 comunas	SCSP database annexed tables annexed updated boundary maps produced showing sector, comuna and municipality limits and numbers of households
Revised Objectives	1. Provide immediately usable geographic information which DW and partners can use in its programmes	Base maps produced for DW programmes and local government to build staff and partner knowledge of and interest in the GIS.	Comuna Administrations provided with maps and demographic data Water Authority EPAL provided with GIS maps and location of pipelines	see maps and data bases produced. examples in Annexes
	2. Use the GIS as a tool for improved planning and monitoring of DW's community services and infrastructure projects.	Detailed planning indicators for the community services programme (SCSP) activities are to be articulated. These are identified as part of DW's general monitoring and evaluation approach.	SCSP engagement with local and Luanda provincial Government. Input into urban management at Provincial Planning Office.	Reports against Logical Framework

8 LOCATION & BENEFICIARIES OF PROJECT

Project Evaluation of Ambient Risks has as intervention area the commune of Ngola Kiluange, located in the municipality of Sambizanga, whose beneficiary direct they are the war dislocated ones that live in precarious sanitary situation.

The areas targeted for project implementation are the poorest districts of the city where water prices are highest, where there are no solid waste removal services and where less than 50% of families have on-site sanitation facilities. More than 50% of these families live below the poverty line (Perfil da Pobreza em Angola, INE, September 1996). This study also indicated that poverty is generalised geographically and across social groups in the peri-urban areas of Luanda. Families with large numbers of dependents and most recently migrated to Luanda are the most vulnerable within the peri-urban districts targeted by the project.

Map of Project Area



9 DIFFICULTIES ENCOUNTERED IN PROJECT IMPLEMENTATION:

The time estimated in the original project design to scan and later geo-reference all of the ___ maps that were processed by the project technical team, was underestimated. This task was undertaken in parallel to training project technicians and necessitated the duplication of some activities to make corrections as part of the learning process. In fact more that 12 months of the programme time-table was used in preparing the map-base. Even after this time, less than half of the total map base was geo-referenced. Priority was given to geo-referencing the portion of the map base covering the project study area, including the Municipalities of Sambizanga, Cazenga and Cacuaco.

A further unanticipated problem was discovered in the non-standard map co-ordinate system used by the Angolan Cartography Institute in their 1/100,000 series maps. These maps were produced with technical support from the - then Soviet Union's - military mapping department. The co-ordinate system is believed to contain a distortion factor which was probably applied due to the requirements of military security at the time of production in the 1980s. Geographers working with

INAROE inform of the existence of an equation that allows for the transformation of the Datam de Camacupa into other convertible formats. Neither the INAROEE Geographers or the current project team have been able to obtain the formula to decipher the maps or overcome the discrepancy in co-ordinates which will allow for linking GPS readings with the map references. All the organisations using the map base, including the Ministry of Planning, IGCA and INE confirm the existence of the discrepancy and none have found a way to date of overcoming the co-ordinate problem.

-The fact that the project does not have its own wide carriage scanner for size A0, A1 and A2 maps has necessitated the use of INAROEE's equipment on a loan basis, in order to do the scanning of the maps at 1/2000, 1/5000,1/25000 and 1/100000 scales. This necessitated regular requests to INAROEE and the project maintaining friendly relationships with the director of INAROEE. Unfortunately, regular access could not be ensured due to INAROEE's own priority use of the scanning equipment for their work. Relationships with INAROEE were facilitated by the fact the current project's trainer also helped train INAROEE's technicians and the scanning equipment was purchased with a grant to IRAROEE from the Canadian Government.

- the existing printer in project is of size A3. It in does not allow for the production of A1 size maps. To get maps of this size, it in necessary to print at A4 or A3 sizes then paste together a composite larger map. The project does have an A0/A1 XEROX photocopy type printer, which allows the project to produce good quality large continuous sheet copies of the composite maps.

ANNEX I

FINANCIAL REPORT

(Financial Report in EXCEL Spreadsheet)

ANNEX II

PROGRAMME PARTICIPANTS

PROJECT PARTICIPANTS

The Project Team:

Katuzalo Sanza Paulina – GIS technician / co-ordinator
Ildo – data base technician
3 scanning technicians from National Cartographic Institute
Allan Cain – director responsible for managing project
Dr. Mary Daly – deputy director
Olivia Agusto – computer systems
Project community workers - Mobilises

Partners:

INE – National statistics Institute – Ministry of Planning
INAROE – in early stage – Ministry of Social Resettlement
ADRA – NGO – Angolan Action for Rural Development
INOT – National Institute for Territorial Planning – Ministry of Planning
Local Government – Municipal and Comuna Administrations

Community Partners:

Bairro level co-ordinators
NGO and bairro level health posts

ANNEX III

EVALUATION OF GIS

ENVIRONMENTAL RISK ASSESSMENT PROJECT

FOR DEVELOPMENT WORKSHOP - ANGOLA

Expert mission
by
Joss Swennenhuis

Luanda, Angola
22 June - 7 July 1999

CONTENTS

ANNEX IV

COMMUNITY WATER & SANITATION

INDICATORS DATA BASE GIS MAPPING

MONTHLY STANDPOST DATA COLECTION REPORT
PROGRAMA INTEGRADO PARA SERVICOS COMUNITARIOS

RELATÓRIO MENSAL DO CHAFARIZ

Nome de Mobilizador: _____

Municipio_____Comuna_____Bairro_____Sector_____
Quarteirão_____

Data recolha informação: Dia____/_____/_____ Sistema de pagamento (**dia/mês/ano)**

DIARIO:
Chafariz No. _____ Mensal: Balde:

População aproximada na zona onde se situa o chafariz_____-habitantes

1 - INFORMAÇÃO SOCIAL

Data da reunião ____/_____/_____ Hora da reunião _____	**Comentários sobre a reunião realizada**
Numero de Participantes: Homens _____ .Mulheres _____ Crianças _____ Quem Organizou _____ _	

Opiniões dos utilizadores sobre o trabalho do comité

Designação	**Realizada regularmente**	**Não foi realizada**
Inspeccionar o chafariz diariamente		
Abrir e fechar a válvula principal na hora certa		
Limpar dentro e a volta do chafariz diariamente		
Apresentar o livro de caixa em dia a comunidade no fim do mês		

2 - INFORMAÇÃO TECNICA DO CHAFARIZ

Peças do chafariz	**Condição** **Boa/ mal**	**Problemas durante o mês:**		
		Descrição do problema	**Acção tomada**	**Por quem?**
Torneira (s)				
Condições do terreno				
Condições de drenagem				
Limpeza do chafariz				
Tampa de caixa				
Tampa de fossa				
Válvula principal				
Paredes do chafariz				

2.1. Informação técnica de fluxo

No. de horas que correu água durante o mês				horas
No. de dias que correu água durante o mês				dias
Tempo para encher um balde de 20 L com uma torneira aberta de cada vez (segundos)	1a torn.	2a torn.	3a torn.	4a torn.

2.2. Informação técnica financeira

Quantidade de agua adquirida no chafariz (unidade de venda)				Litros
Custo da agua no chafariz durante o mês	1a sem.	2a sem.	3a sem.	4a sem.
Custo da agua dos vendedores a volta do chafariz durante o mês (por balde)	1a sem.	2a sem.	3a sem.	4a sem.

3 - Informações sobre o gasto do dinheiro

Dinheiro recebido	KZR
Pagamentos feitos	KZR
Saldo no fim do período	KZR

3.1. Forma como foi gasto o dinheiro:

Colocar (X) no rectângulo caso se realize a acção:

Pagamento a EPAL ☐

Pagamento a Administração ☐

Reparação do chafariz ☐

Melhorias no chafariz ☐

Compra de tubagem ☐

Estimulo do monitor ☐

Fotocopias ☐

Transporte ☐

4. Cambio do dia _____kz .

(a) Administrador Comunal Coordenador da zona, Bairro, Sector , Monitor, funcionário da D.W, Membro do Comité de agua, outro (especifique)_____.

HOUSEHOLD SANITATION DATABASE

Q.1-2 NOME MOBILIZADOR:

N	Municipio	Comuna	Sestor	Quart	Rua	N Casa	Tipo Lage	Kits		Projecto Ang (436/469)	Nivel Agua (Alto,Medio,Baixo)	N Pessoas Casa	Data entrega material	Recebedor
								Completo(s/n)	incompleto(s/n)					
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														
9.														
10.														
11.														
12.														
13.														
14.														

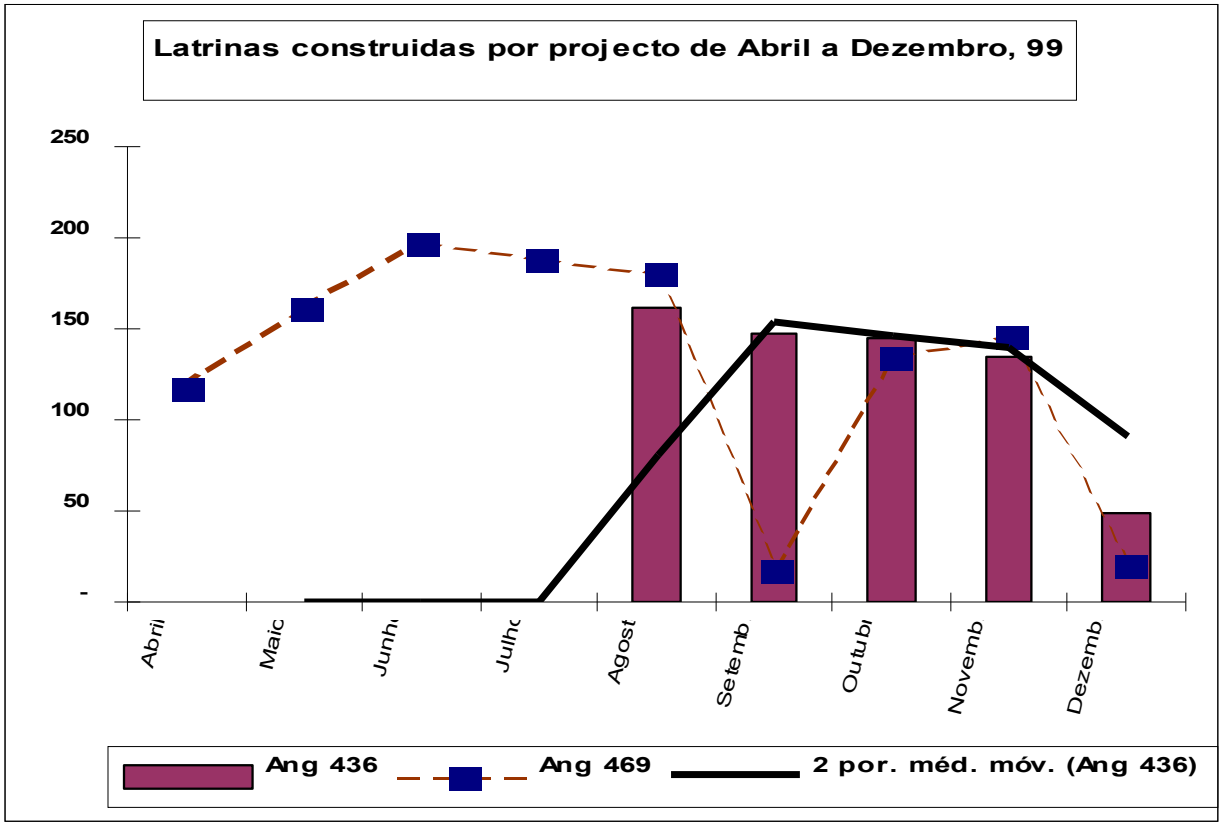
15.														

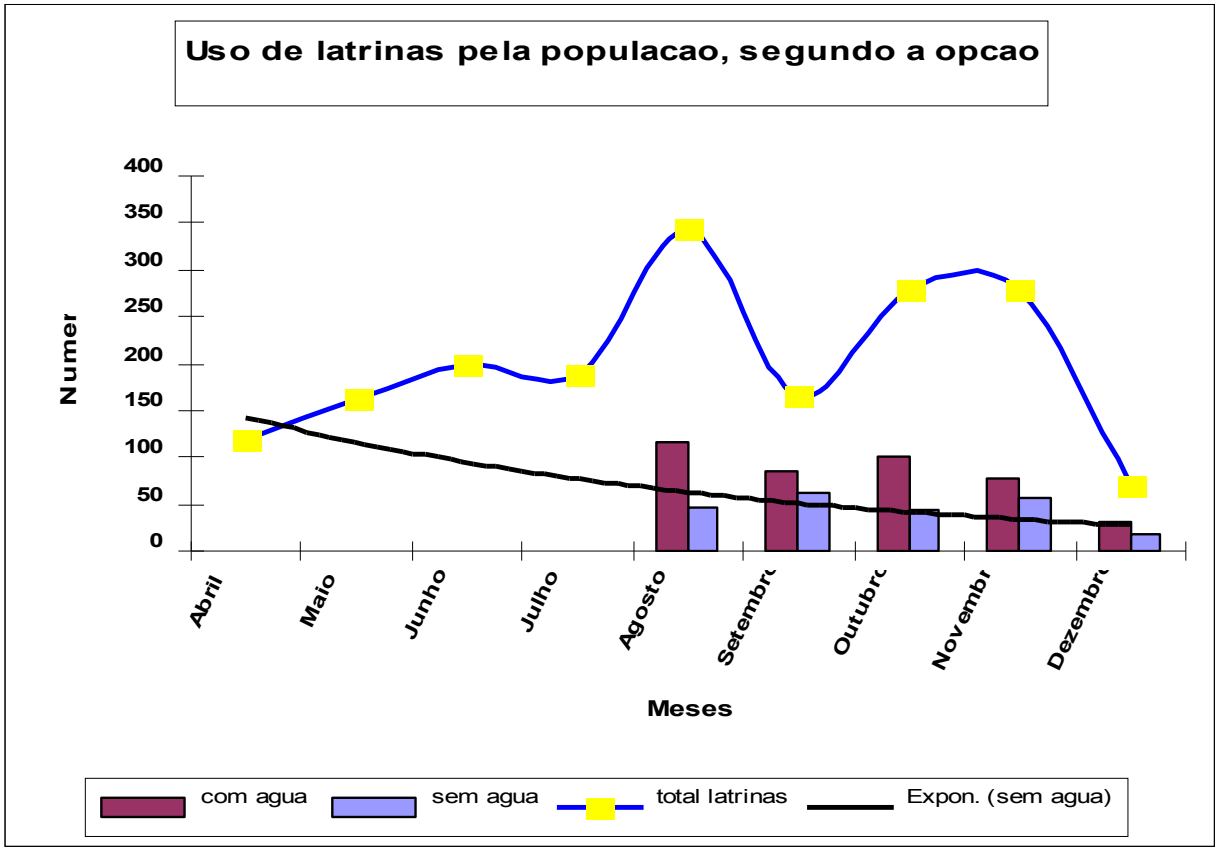
Q/.2-2

N	N blocos	N sacos cimento	Ref.lage	Tipo fossa	Respirador(s/n)	Tipo Blocos	Tipo Solo	Dono Casa(s/n)	Nao, sua p osicao	Data construcao casota	Ja teve latrina(s/n)	Nao, onde fazia necessidade	(data)Latrina concluida	Observacao
16.														
17.														
18.														
19.														
20.														
21.														
22.														
23.														
24.														
25.														
26.														
27.														

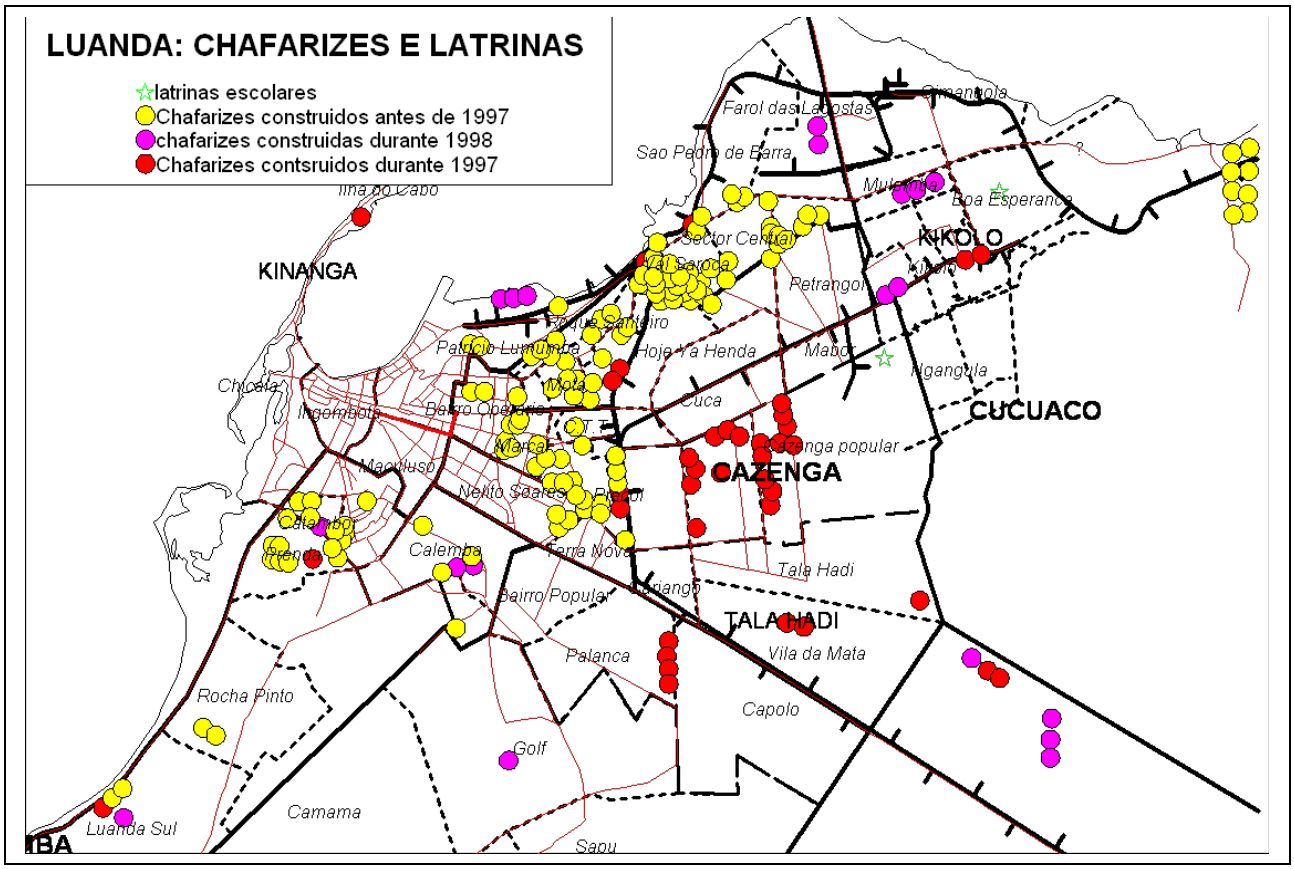
28.													
29.													
30.													

SANITATION PROJECT INDICATORS

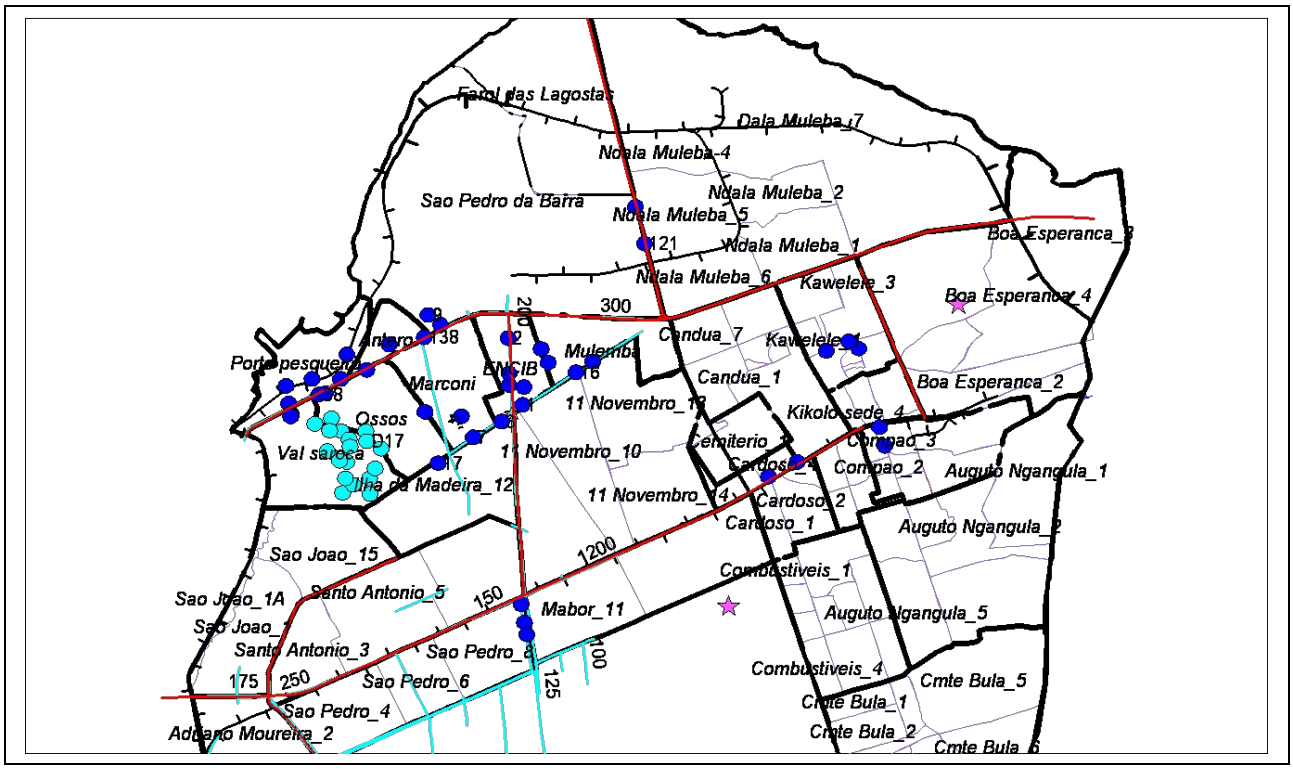




GIS GENERATED MAP OF LOCATIONS OF COMMUNITY STANDPOSTS



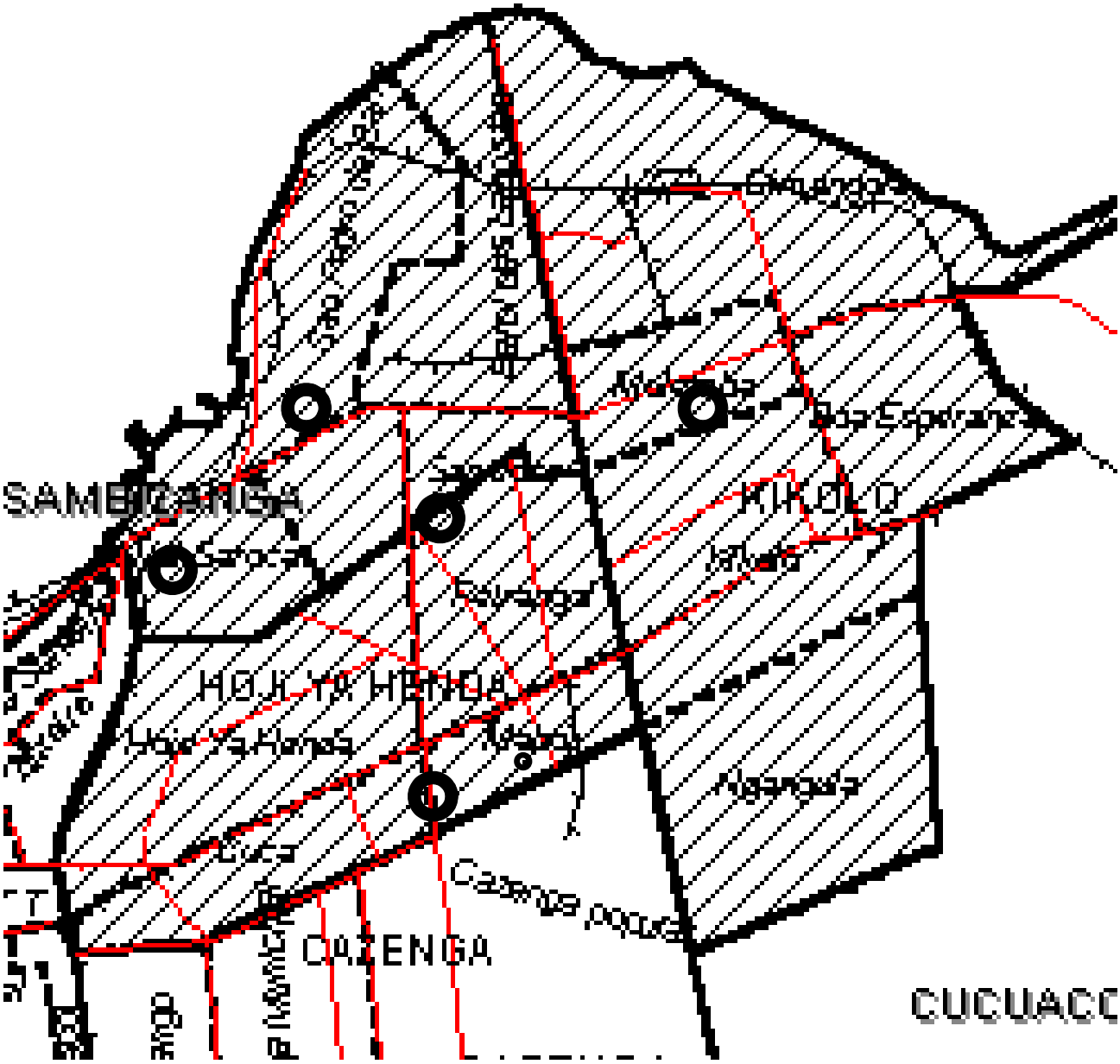
Standpost distribution in pilot project area



MUNICIPIO	COMUNA	BAIRRO / SECTOR	SANEAMENTO		LIXO		FONTE DE AGUA				
			Esgotas	Agua Pluvial	Contentor 1.1m	Contentor 7m	Residencial	Chafarize	Canalizada	Camioes	Preço 20 lit
INGOMBOTAS	ILHA DO CABO	Ilha do Cabo	●	●	●		●	●			
	PATRICE	Patrice	●	●	●		●				
	INGOMBOTA	Ingombota	●	●	●		●				
	KINGANGA	Kinanga	○	●	●		●				
	MACULUSSO	Maculuso	●	●	●		●				
MAIANGA	MAIANGA	Maianga	●	○	●		●				
	CASAEQUEL	Cassequel	○	●	●		○	●			
	PRENDA	Prenda	○	○	●	○	○	●	●		
		Rocha Pinto						○		●	0.34
		Luanda Sul								●	
RANGEL	RANGEL	Rangel				○	●	●	●		0.04
		Precol	○			○	○	●	●		
	MARCAL	Marcal	○			○	●	●	●		0.03
		Zangado	○			○		●	●		0.03
	TERRA NOVA	Vila Alice	●	○	●	○	●				
		Citadela	○	○		○	●				
		Terra Nova	○	●		○	○	●	○		
SAMBIZANGA	SAMBIZANGA	Sambizanga					○	●	○	○	0.13
		Mota					○	●	●		0.07
		Lixeira						○	○	●	
		Boa Vista	○				●	●	○		
		Roque Santeiro						●	●		
	BAIRRO	Bairro Operario	●	○	○	○	●				
	NGOLA KILUANJE	Val Saroco						●		●	0.19
		Sao Pedro de	○					●	○	●	
		Sector Central						●	○	●	0.17
		San José						●		●	0.16
CAZENGA	CAZENGA	Cazenga								●	0.16
		Tungangó					●	●	●		
	CUCA	Cuca	○	○			●	●	●		
		Hoje ya Henda	○	○			●		○	●	
		Petroangol								●	
		Mabor								●	0.16
	TALA HADI	Tala Hadi	○	○			○			●	0.25
		Cariango	○	○			○		○	○	
KILAMBA KIAXI	BAIRRO	Bairro Popular	○	○		○	○		●		0.06
		Palanca	○			○				●	0.29
	GOLFE	Golfe				○	○	○	○	●	
		Novo Golfe (II)	●							●	0.25
		Sapu								●	
		Cambamba								●	
		Morro Bento I								●	
SAMBA	CORIMBA	Corimba	○	○	○	○		●	○	○	
	FUTUNGO DE	Futungo de	●	●	○		●	●		○	
		Morro Bento II					○			●	
	BENFICA	Benfica	○							●	
CACUACO	CACUACO	Cacuaco	○	●			●	●			
		Kikolo						○	●	○	0.05
		Mulemba	○					●	○	○	
		Cimangol								●	
		Boa Esperanca						○	●	○	0.02
		Ngangula								●	0.17
		Mulenvos Baixos						●			
VIANA	VIANA	Viana	○	○			●	●	○	○	
		Viana II	○	○				●	○	○	

ANNEX V

COMMUNITY HEALTH INDICATORS



MAP SHOWING PROJECT ÁREA AND LOCATION OF COMMUNITY HEALTH FACILITIES PARTICIPATING IN MONITORING OF INDICATORS

KEY TO MAP

Area of Pilot Project

Facility Catchment Area

Participating Community Health Facility

COMMUNITY HEALTH POSTS PARTICIPATING IN PROJECT MONITORING

TABLE 1 COMMUNITY HEALTH INDICATORS RESULTS FROM HOUSEHOLD QUESTIONAIRES

TYPE OF INDICATOR		PROJECT			QUANITATIVE OUTPUT PER INDICATOR Total:
		Mabor Activistas Proj: 512-01	Siloe Health Centre Proj: 512-06	Rocha Pinto Activistas Proj: 512-10	
household visits or interviews		372	36,825	3,338	40,535
Hygiene	clean courtyards	252	-	1,384	1,636
	dirty courtyards	125	-	158	283
	no data on household hygiene	-	-	18	18
Latrines	latrine with dry pit	95	10,664	107	10,866
	latrine with septic tank	242	-	919	1,161
	latrines blocked or overflowing	103	2,361	23	2,487
	no information on latrines	-		98	98
Vaccinations	children with up-to-date vaccinations	249	5,508	829	6,586
	children without vaccinations	102	2,478	35	2,615
	children without vaccination data	-		82	82
	children with incomplete vaccinations	126	31,505	227	31,858
	children vaccinated but not documented	-	2,066	-	2,066
Women	women aged 15-45 vaccinated	195	-	590	785
	women aged 15-45 not vaccinated	117	-	268	385
	women aged 15-45 with incomplete vaccinations	109	-	17	126
	pregnant women appearing for pre-natal consultations	-	1,796	-	1,796
	pregnant women using traditional midwives	-	1,497	-	1,497
Disease	cases of conjutivitis	52	-	49	101
	cases of scabies	24	713	21	758
	cases of diarrhea	69	1,455	61	1,585
Water	families treating their water	261	-	2,107	2,368
	families not treating their water	99	-	723	822
	household water tanks treated (chlorinated)	-	-	219	219
Child	children with extended bellies	-	1,746	-	1,746
	children suspected with mal-nutrition or anemia	-	9,878	-	9,878
Treatments	distribution of chlorine (l/kg)	-	162	221	383
	tablets of mentazol distributed	-	12,800	-	12,800
	iron supplements distributed (tablets)	-	24,740	-	24,740
	scabies ointment distributed	-	15,194	-	15,194
public health lectures		-	42	24	66

Source: Relatorios dos Activistas e Centros Medicos

Table 2 INDICATORS OF ILLNESSES PREVALENT (BY SEX) IN COMMUNITIES SERVED BY THE PROGRAMME

INDICATOR (TYPE OF ILLNESS)	Projects								Total General	
	Health Centre Kikolo				Health Post Siloe		Health Centre IEBA			
	M+F	M	F	%	M+F	%	M+F	%	M+F	%
Malaria	**918**	**164**	**754**	**46.2**	**3,904**	**83.0**	**2,108**	**37.0**	**6,930**	**56.0**
Intestinal Parasites	**24**	**-**	**24**	**1.2**	**58**	**1.2**	**2,918**	**51.3**	**3,000**	**24.2**
Diarrheal Sicknesses	**220**	**105**	**115**	**11.1**	**117**	**2.5**	**376**	**6.6**	**713**	**5.8**
Respiratory Sicknesses	**235**	**48**	**187**	**11.8**	**439**	**9.3**	**-**	**-**	**674**	**5.4**
Typhoid	**126**	**93**	**33**	**6.3**	**24**	**0.5**	**75**	**1.3**	**225**	**1.8**
Urinary Infections	**197**	**98**	**99**	**9.9**	**-**	**-**	**-**	**-**	**197**	**1.6**
Scabies	**-**	**-**	**-**	**-**	**-**	**-**	**157**	**2.8**	**157**	**1.3**
Anemia	**74**	**-**	**74**	**3.7**	**31**	**0.7**	**-**	**-**	**105**	**0.8**
Hipertension	**72**	**41**	**31**	**3.6**	**-**	**-**	**-**	**-**	**72**	**0.6**
Conjutivitis	**9**	**-**	**9**	**0.5**	**44**	**0.9**	**-**	**-**	**53**	**0.4**
Mal nutrition	**-**	**-**	**-**	**-**	**50**	**1.1**	**-**	**-**	**50**	**0.4**
Measles	**-**	**-**	**-**	**-**	**8**	**0.2**	**24**	**0.4**	**32**	**0.3**
AIDS	**-**	**-**	**-**	**-**	**-**	**-**	**10**	**0.2**	**10**	**0.1**
Tuberculosis (Lung)	**1**	**-**	**1**	**0.1**	**-**	**-**	**9**	**0.2**	**10**	**0.1**
Chicken Pox	**-**	**-**	**-**	**-**	**-**	**-**	**8**	**0.1**	**8**	**0.1**
Gastritis	**5**	**-**	**5**	**0.3**	**-**	**-**	**-**	**-**	**5**	**0.0**
Baterial Infections	**2**	**-**	**2**	**0.1**	**-**	**-**	**-**	**-**	**2**	**0.0**
Colic	**5**	**-**	**5**	**0.3**	**-**	**-**	**-**	**-**	**5**	**0.0**
Skin Infections	**3**	**-**	**3**	**0.2**	**2**	**0.0**	**-**	**-**	**5**	**0.0**
Meningite	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**0.0**	**2**	**0.0**
Tetanus	**-**	**-**	**-**	**-**	**2**	**0.0**	**1**	**0.0**	**3**	**0.0**
SCA	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**0.1**	**3**	**0.0**
Poliomielite	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**0.0**	**1**	**0.0**
Otite	**-**	**-**	**-**	**-**	**12**	**0.3**	**-**	**-**	**12**	**0.1**
Schistossmiase	**-**	**-**	**-**	**-**	**1**	**0.0**	**-**	**-**	**1**	**0.0**
Meno-metrorragia	**-**	**-**	**-**	**-**	**7**	**0.1**	**-**	**-**	**7**	**0.1**
Influenza	**4**	**-**	**4**	**0.2**	**-**	**-**	**-**	**-**	**4**	**0.0**
Others	**90**	**19**	**71**	**4.5**	**5**	**0.1**	**-**	**-**	**95**	**0.8**
Total por Centro	**1,985**	**568**	**1,417**	**100.0**	**4,704**	**100.0**	**5,692**	**100.0**	**12,381**	**100.0**

Source: Relatorios dos Centros Medicos

TABLE 3 CHILDHOOD DISEASE INDICATORS - By Season, Gender and Age

DISEASES TREATED	AGE GROUP	PATIENT CONSULTATIONS BY GENDER & AGE					ANNUAL TOTALS	
		Jan. – June rainy season	July-Dec. dry season					
			Boys	Girls	Girls + Boys		Girls + Boys	%
					total	%		
	Total:	**323**	**563**	**318**	**881**	**64.9**		
Malaria	0 – 5	-	511	256	767	56.5	**1,204**	**42.9**
	6 – 10	-	31	44	75	5.5		
	11 – 15	-	21	18	39	2.9		
	Total:	**120**	**89**	**81**	**170**	**12.5**		
Respiratory Diseases	0 – 5	-	82	71	153	11.3	**290**	**10.3**
	6 – 10	-	5	9	14	1.0		
	11 – 15	-	2	1	3	0.2		
	Total:	**243**	**63**	**54**	**117**	**8.6**		
Diarrheal Sicknesses	0 – 5	-	56	45	101	7.4	**360**	**12.8**
	6 – 10	-	4	7	11	0.8		
	11 – 15	-	3	2	5	0.4		
	Total:	**111**	**42**	**41**	**83**	**6.1**		
Anemia	0 – 5	-	37	40	77	5.7	**194**	**6.9**
	6 – 10	-	5	1	6	0.4		
	11 – 15	-	0	0	0	0.0		
	Total:	**115**	**7**	**8**	**15**	**1.1**		
Typhoid Fever	0 – 5	-	5	5	10	0.7	**130**	**4.6**
	6 – 10	-	2	1	3	0.2		
	11 – 15	-	0	2	2	0.1		
	Total:	**179**	**15**	**7**	**22**	**1.6**		
Parasitose	0 – 5	-	14	5	19	1.4	**201**	**7.2**
	6 – 10	-	1	1	2	0.1		
	11 – 15	-	0	1	1	0.1		
	Total:	**-**	**2**	**2**	**4**	**0.3**		
Influenza	0 - 5	-	2	1	3	0.2	**4**	**0.1**
	6 - 10	-	0	1	1	0.1		
	11 - 15		0	0	0	0.0		
	Total	**-**	**1**	**10**	**11**	**0.8**		
Urinary Infection	0 – 5	-	0	5	5	0.4	**11**	**0.4**
	6 – 10	-	1	5	6	0.4		
	11 – 15	-	0	0	0	0.0		
	Total:	**-**	**4**	**1**	**5**	**0.4**		
Colic	0 - 5	-	4	1	5	0.4	**5**	**0.2**
	6 – 10		0	0	0	0.0		
	11 – 15		0	0	0	0.0		
	Total:	**-**	**6**	**4**	**10**	**0.7**		
Conjuntivitis	0 – 5	-	6	4	10	0.7	**10**	**0.4**
	6 – 10	-	0	0	0	0.0		
	11 – 15	-	0	0	0	0.0		
Skin Infections	**Total:**	**-**	**1**	**2**	**3**	**0.2**	**3**	**0.1**
Kuashiorkor	**Total:**	**148**	**0**	**0**	**0**	**0.0**	**148**	**5.3**
Marasmo	**Total:**	**152**	**0**	**0**	**0**	**0.0**	**152**	**5.4**
Sarampo	**Total:**	**59**	**0**	**0**	**0**	**0.0**	**59**	**2.1**
	Total:	**-**	**19**	**17**	**36**	**2.7**		
Others	0 – 5	-	18	16	34	**2.5**	**36**	**1.3**
	6 – 10	-	1	0	1	**0.1**		
	11 – 15	-	0	1	1	**0.1**		
Total		**1,450**	**812**	**545**	**1,357**	**100 %**	**2,807**	**100 %**

Source: Centro de Saude do Kikolo – Pediatrics Section – 1998

ANNEXO VI

COMMUNITY BASED

MONITORING TOOLS

Plan of Action Phase 2

IMPLEMENTATION OF SENTINAL COMMUNITY SURVEYS

Summary:

Development Workshop has been involved for a number of years in developing programmes of community service provision, water, sanitation, school facilities upgrading and women's micro-economic activities in the peri-urban 'musseques' of Luanda, Angola. DW wishes to develop monitoring tools to measure the impact of its programme interventions and other external and environmental factors on the well-being of communities in the areas of programme intervention. DW is therefore developing information tools appropriate for rehabilitation and policy-making in marginalised peri-urban communities of Luanda through the design of a Geographical Information System for monitoring environmental and social impact.

Introduction:

The overcrowded peri-urban slums of Luanda (where over two-thirds of the population of Angola now lives) are clearly unhealthy places to live. However, very little information on environmental health is available which might be used to plan rehabilitation programmes, and whatever information there is tends to be dispersed, inaccessible and difficult to use. This proposal is for the development of a database, and a Geographical Information System, of appropriate environmental health indicators for a significant, representative area of peri-urban Luanda. This is the first phase of a programme to develop national capacity to collect and use data, through GIS, on environmental health that can assist in the planning of national reconstruction.

Development Workshop-Angola already has extensive experience in the peri-urban areas of Luanda, has access to existing information, and includes information collection as part of its ongoing programmes in peri-urban areas. DW has already provided technical assistance to a GIS mapping project for the Angolan Government's landmines survey, and is training a senior technician from the Institute of Physical Planning in GIS.

Spatial data from paper maps and airphotos have already been transformed to a digitised form by a GIS technician trained through the project. This spatial data is being linked with information on the natural environment, infrastructure, human settlements, demography and public health; these kinds of information come from routine and project reports, technical archives, existing maps and reports and from data collection by the project team.

The first phase of the project which is now nearing completion involved the procurement of GIS equipment, the training of a team, data collection, the creation of a map-base and preliminary data dissemination. This phase served as a laboratory for the development of tools and a model database, and the formation of a national technician with a working knowledge of GIS and assessment skills. A broader level of GIS user awareness has been developed through several seminars involving DW staff in Luanda and Huambo and from existing partner organisations of Development Workshop-Angola.

Later phases of the programme (for which funding is being sought from other sources) will cover the creation of an environmental assessment network for peri-urban Luanda, made up of organisations who will share compatible GIS system tools and data gathering formats, who will be able to share information on peri-urban Luanda, jointly create an effective monitoring system and be able to monitor the impact of individual programmes.

General objective:

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.

Specific objectives:

1. to develop a set of assessment tools for measuring the inter-relationship between environmental factors, well-being and health of the communities in the project area;
2. to develop a data-base of appropriate environmental health indicators for a significant, representative area of peri-urban Luanda which taken together map the changing state of the environment and of the well-being and health of the people;
3. develop a team of nationals capable of using environmental assessment tools to evaluate risks and monitor the impact of project interventions on communities;
4. To subsequently develop an ongoing monitoring capacity using key indicators to accompany the evolution of programmes and interventions which impact on the environmental health and well-being of peri-urban communities (principal objective of phase II of project).

Strategy:

Development Workshop is undertaking a two phase project on environmental risk assessment. The first is a phase of developing tools, training national staff, building a data-base and selecting key indicators. A future second phase is the of building national institutional capacity for ongoing monitoring of the key environmental indicators. The detailed design of the second phase of the programme will be built from the experience of the first.

Development Workshop is employing environmental mapping tolls together with qualitative and quantitative information gathering techniques to produce a graphic/geographic base line environmental assessment. Existing data, statistics and demographic information have been transformed into graphic format which was projected onto spatial maps of Luanda. More detailed analysis of the project intervention areas still needs to be carried out using the map base already prepared. Project teams, trained in qualitative research will provide supplementary community information.

Research Method:

During the months of August and September, 1999, Development Workshop proposes a collaboration with CIET (Community Information and Epidemiological Technologies) to develop the research framework built on the Urban Environmental Risk Assessment Project in order to provide monitoring tools for their ongoing peri-urban community services projects.

CIET methods, also known as Sentinel Community Surveys (SCS), were originally developed in the mid-1980s as a capacity building process that could produce accurate, detailed and actionable data rapidly and at low cost [11, 12]. Ordinarily, CIET methods focus on the use of epidemiological[13] data in local or national planning. This may be at the level of a municipality, a city, a state, a number of provinces, or an entire country.

[11] Andersson N. Impact, coverage and costs: an operational framework for monitoring child survival emerging from two UNICEF projects in Central America. September, 1985.

[12] Ledogar RJ & Andersson N. Impact estimation through Sentinel Community Surveillance: an affordable epidemiological approach. *Third World Planning Review* 1993; 15/3:263-272.

CIET surveys adapt modern research methods to gather evidence while involving local partners in the process. Rooted in modern epidemiology and participatory research techniques, CIET methods have been applied in many contexts besides health such as education[14], water and sanitation[15] and land mines[16]. These methods have been used to measure impact, coverage and cost of issues in environment[17], health care services[18], judiciary and institutional restructuring. It has proved useful for community-designed strategies to combat corruption in the public services in several countries[19]. CIET methods have been established in 44 countries over the past decade. They follow a rigorous, tightly-focussed process. After a thorough review of existing information on the proposed topic and the local population, a careful selection of sentinel communities is made to ensure a representative sample.

Fact-finding instruments are designed to produce quantitative and qualitative data - household questionnaires, institutional reviews, key informant interviews, and focus group discussions. The large amount of information gathered with these instruments is then analysed to determine the coverage, cost and impact of particular services, programs and interventions. Community and district level discussions of the data are then held. These discussions guide final analysis and interpretation of results to lead to strategies for communication and action.

Community feedback is an integral part of the information gathering process. This goes beyond householders answering survey questions; data from these interviews are returned to the communities where they are discussed systematically in focus groups of men, women and youth, and later between these focus group participants and community leaders. In this way, the communities in the region can contribute to policy making. The CIET methods thus offer one very concrete way of increasing citizen participation in service delivery.

A single survey offers a limited opportunity for supporting such a process. The CIET approach calls for data collection cycles to be repeated at regular intervals. In the course of repetition of the steps for each cycle, local researchers become increasingly capable of conducting these surveys themselves. With each new cycle, information on the previous cycle is disseminated to communities, the success of the solutions developed in previous cycles is measured, and topics for investigation can gradually be tuned to the needs and perspectives of the communities. In this way, CIET aims to provide a basis for sustained, critical dialogue on issues that have a profound effect on people's daily lives, while building local technical capacities to do the job with decreasing and, eventually, no external assistance.

Training

[13] Epidemiology: the science of studying patterns and relations between events

[14] CIETinternational. Gender gap in primary education. Secretary Planning & Development Department, Government of Sindh, Pakistan,/UNICEF. December 1996.

[15] Andersson N., Villegas A., Paredes S., Micro-regional planning, in *Four Essays on Evidence-based Planning*. CIETinternational: New York, 1995.

[16] Andersson N. da Sousa C., Paredes S. Social costs of land mines in four countries: Afghanistan, Bosnia, Cambodia and Mozambique. *British Medical Journal.* 1995; 311:718-721.

[17] CIETinternational. NICARAGUA: Impact of the National Environmental Program. EDI/World Bank, December 1995.

[18] CIETinternational. Health care services in Uganda. Government of Uganda, Ministry of Civil Service/World Bank. January 1995.

[19] CIETinternational. Tanzania Service Delivery Survey: Corruption in the Police, Judiciary, Revenue and Lands Service. EDI/World Bank. July 1996.

Interviewers and team leaders from each of the participating communities will receive training, including field practices to assure quality of the data gathered while introducing them to the processes of conducting interview with children, door-to-door surveys and focus group discussions. Since some/many of the participants will have done this sort of work before, few problems are expected. Several individuals identified by each of the participating organisations will receive training in data entry and analysis.

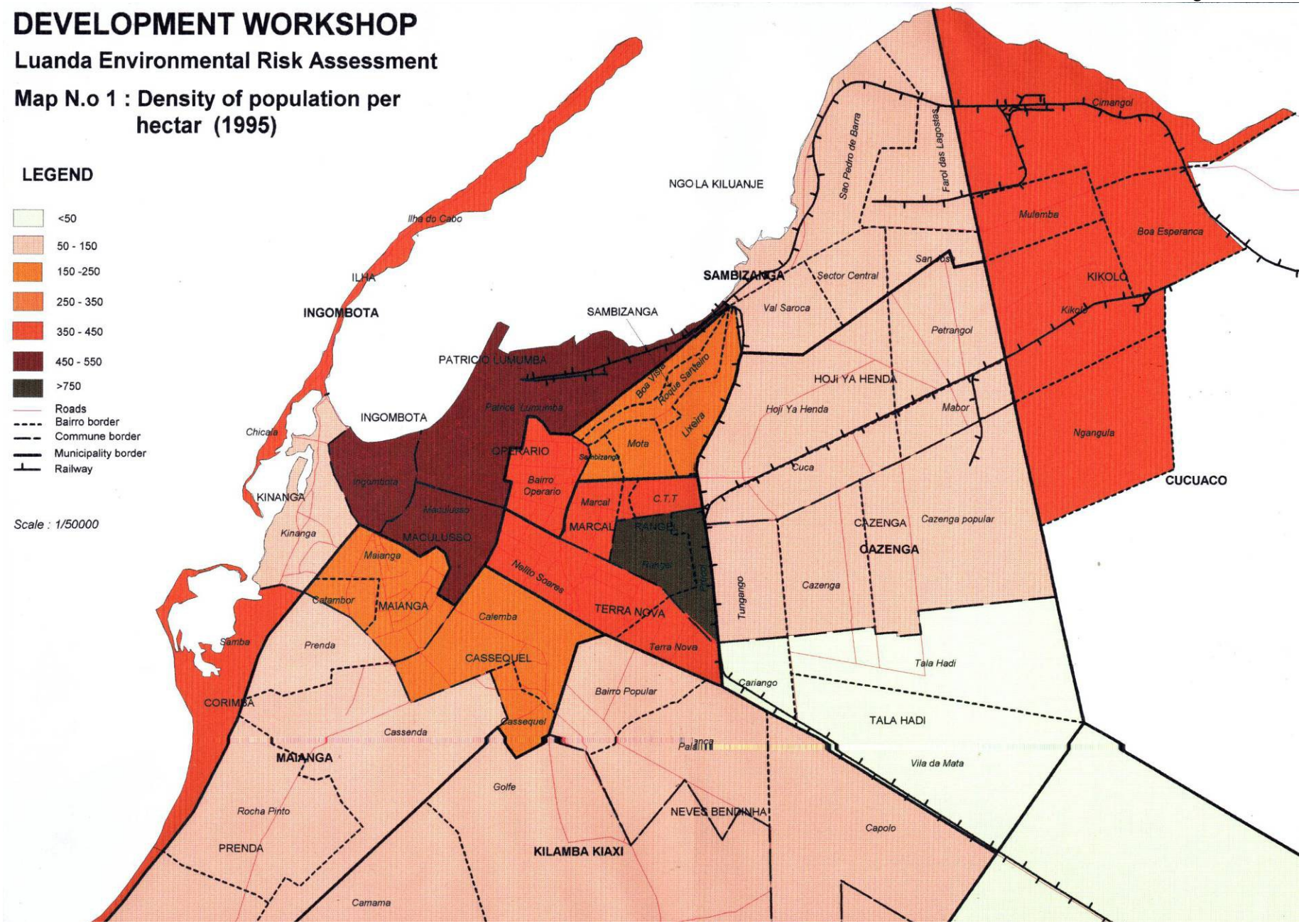
A spin-off benefit will be an increased organisational capacity for evidence-based planning. Staff will be exposed to and active participants in the interventions are developed from the survey findings. Participation of staff during this and subsequent cycles will build capacity for regional planning based on evidence.

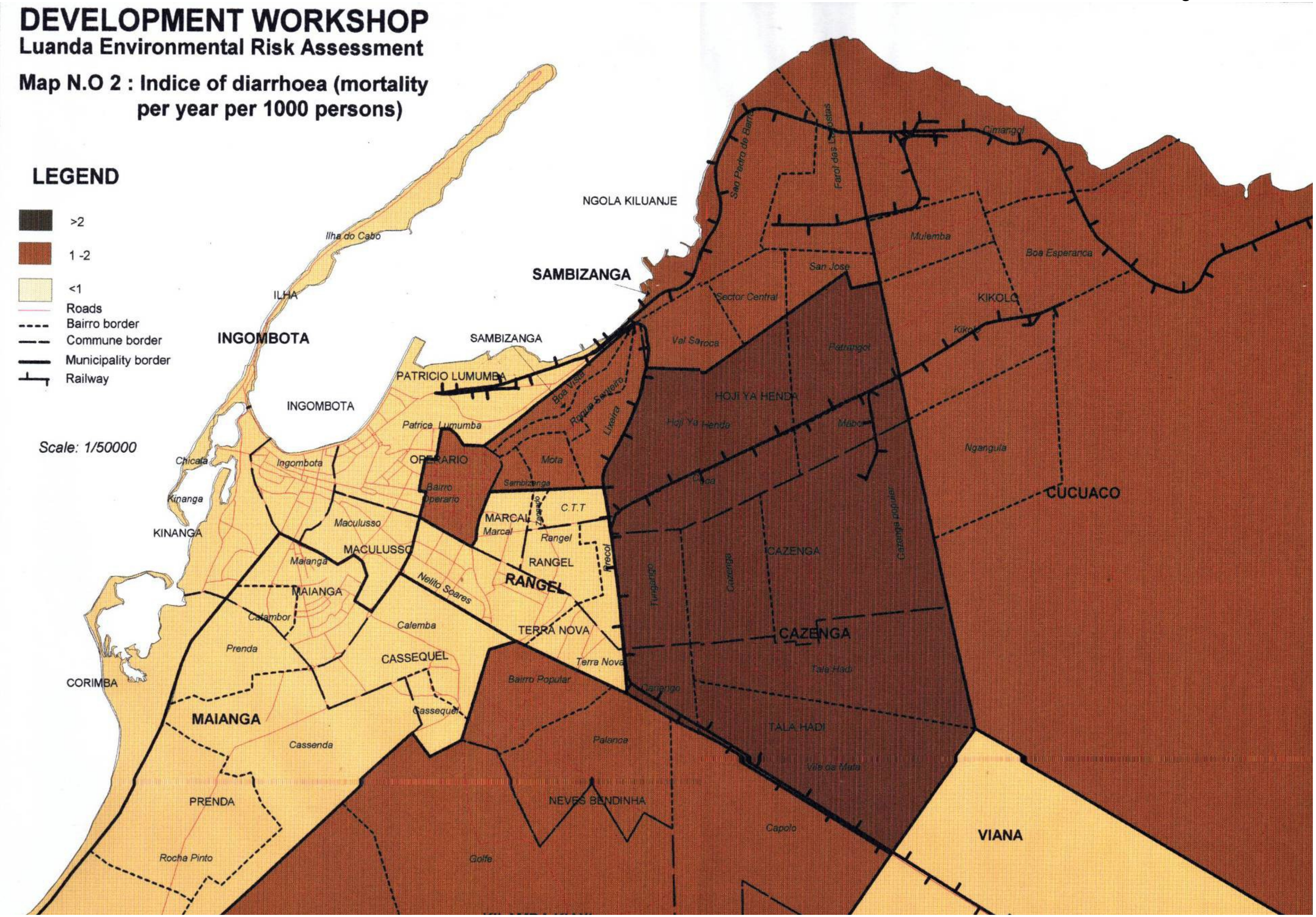
ANNEX VII

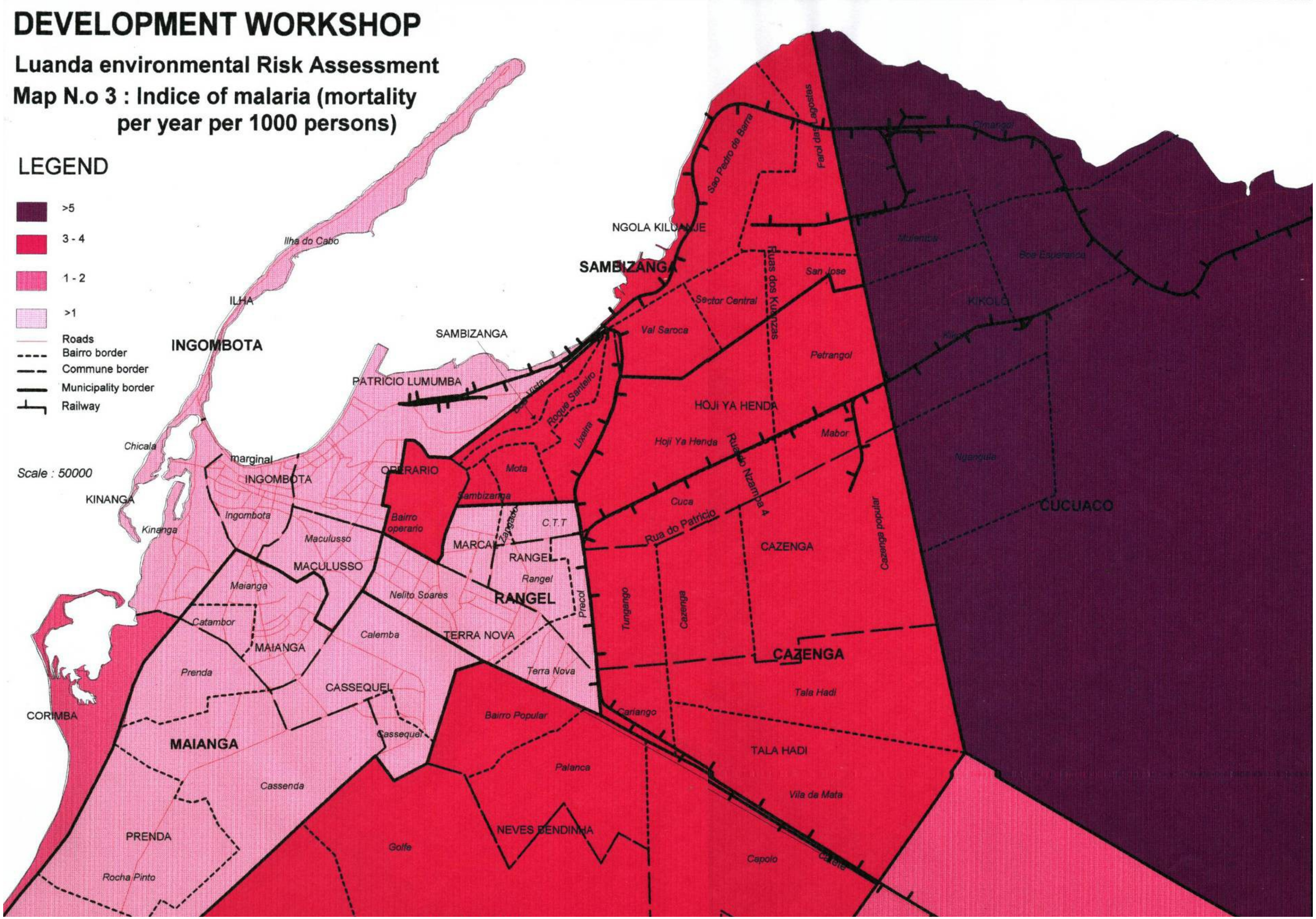
ENVIRONMENTAL INDICATOR - MAPS

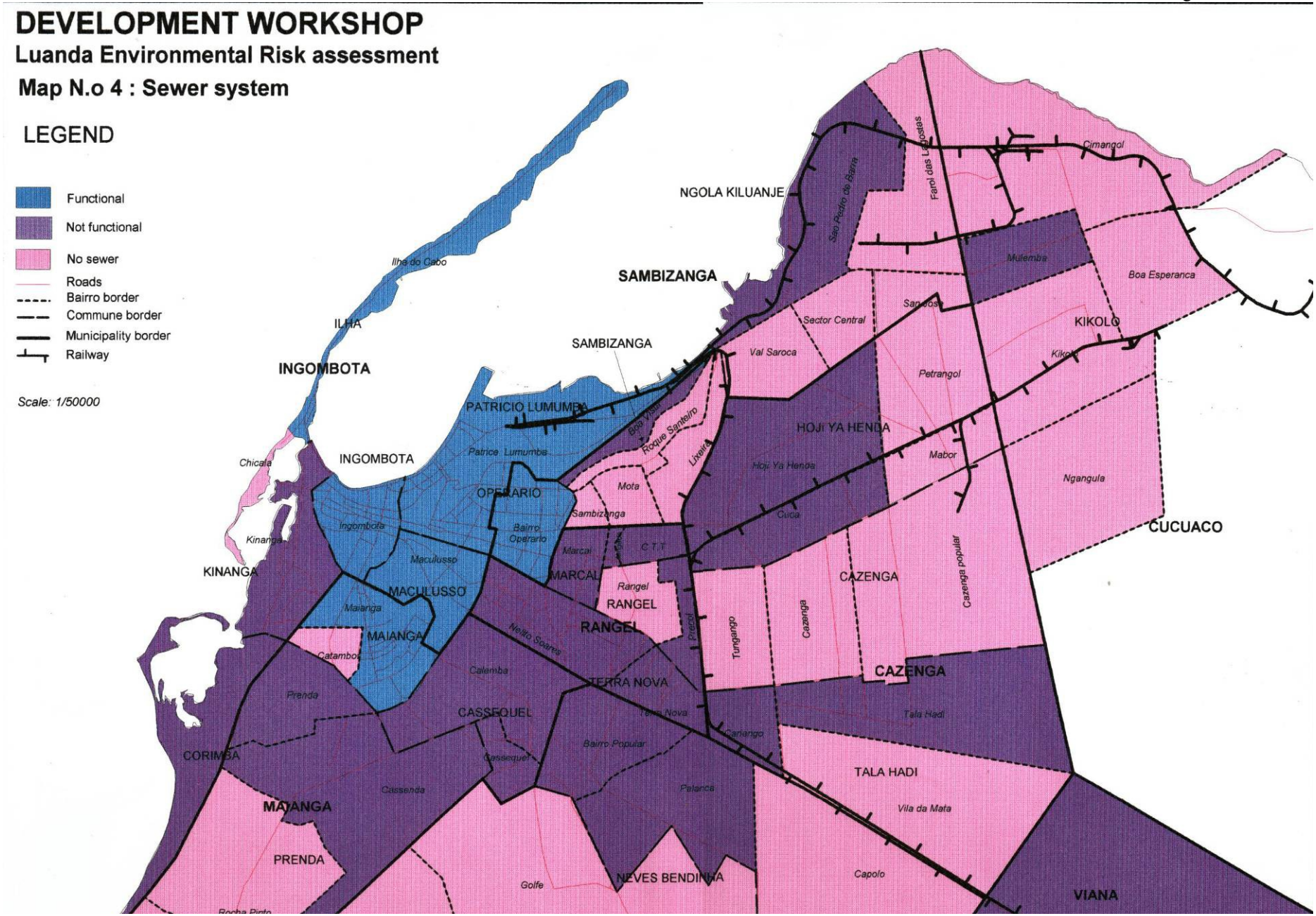
ANNEX VIII

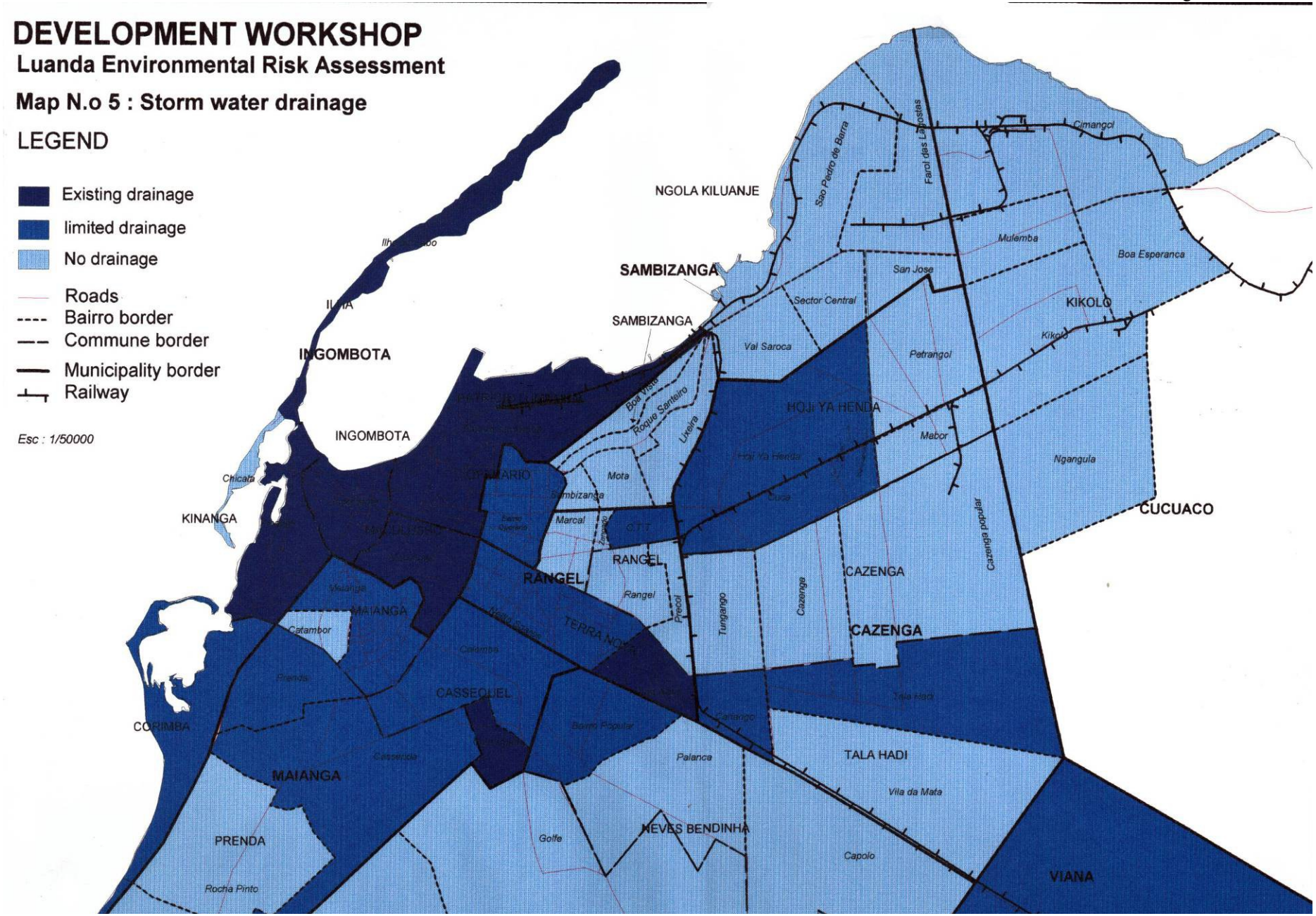
DEMOGRAPHIC & SOCIAL RISK INDICATORS - MAPS

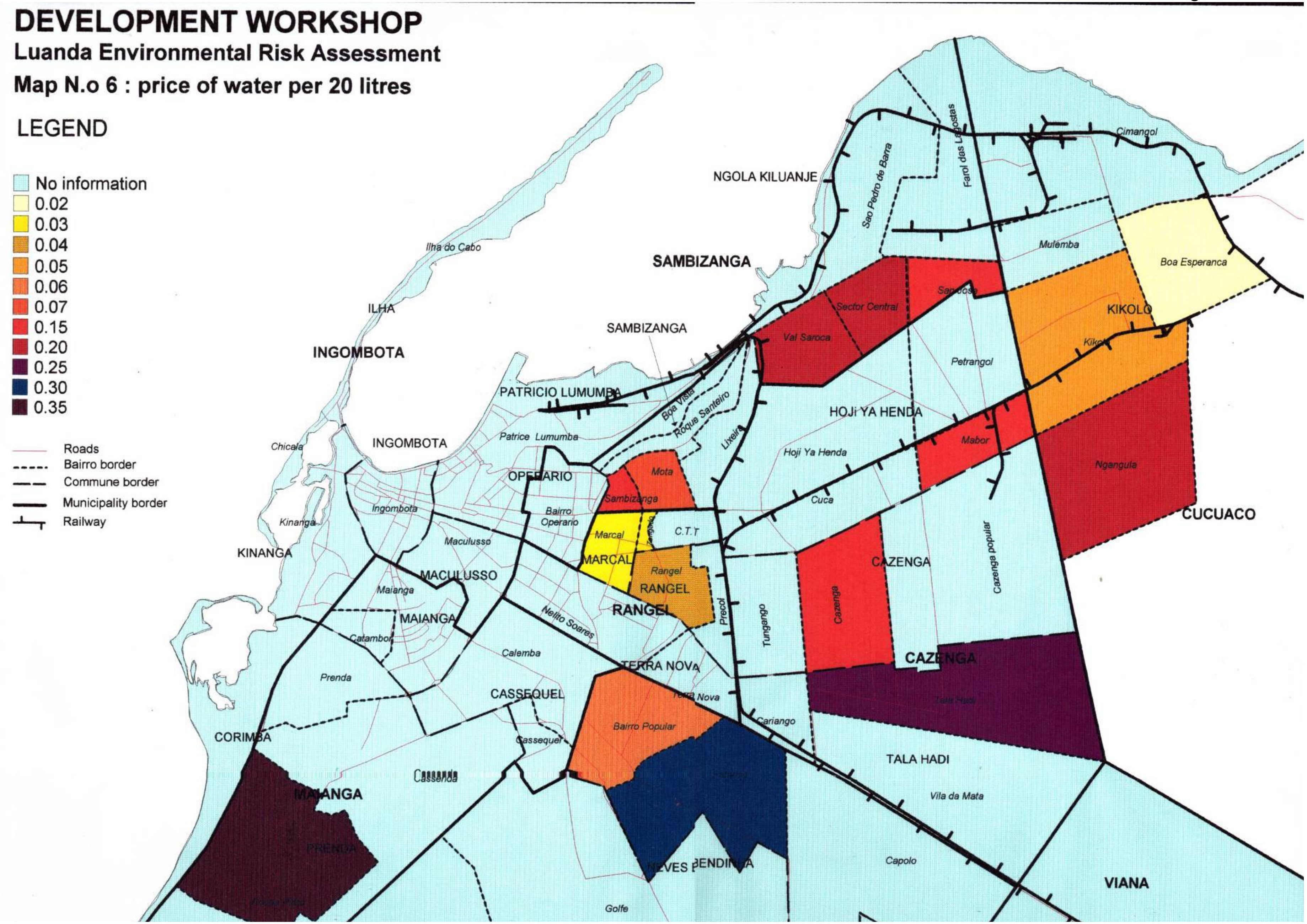

DEVELOPMENT WORKSHOP
Luanda Environmental Risk Assessment
Map N.o 1 : Density of population per hectar (1995)
LEGEND
<50
50 - 150
150 -250
250 - 350
350 - 450
450 - 550
>750
Roads
Bairro border
Commune border
Municipality border
Railway
Scale : 1/50000
NGO LA KILUANJE
Ilha do Cabo
ILHA
INGOMBOTA
SAMBIZANGA
PATRICIO LUMUMBA
Patrice Lumumba
Boa Vista
Roque Santeiro
Lixeira
Mota
Sambizanga
OPERARIO
Bairro Operario
Marcal
C.T.T
MARCAL
RANGE
Ingomotica
Maculusso
MACULUSSO
Chicala
KINANGA
Kinanga
Maianga
Catambor
MAIANGA
Samba
Prenda
Calemba
CASSEQUEL
Cassequel
Nelito Soares
TERRA NOVA
Terra Nova
Bairro Popular
Cassenda
CORIMBA
MAIANGA
Rocha Pinto
PRENDA
Golfe
KILAMBA KIAXI
Camama
NEVES BENDINHA
Capolo
Vila da Mata
TALA HADI
Tala Hadi
Cariango
Tungango
Cazenga
CAZENGA
Cazenga popular
Cuca
Hoji Ya Henda
HOJI YA HENDA
Mabor
Petrangol
Val Saroca
Sector Central
SAMBIZANGA
Sao Pedro de Barra
Farol das Lagostas
Cimangol
Mulemba
Boa Esperanca
KIKOLO
Kikolo
Ngangula
CUCUACO

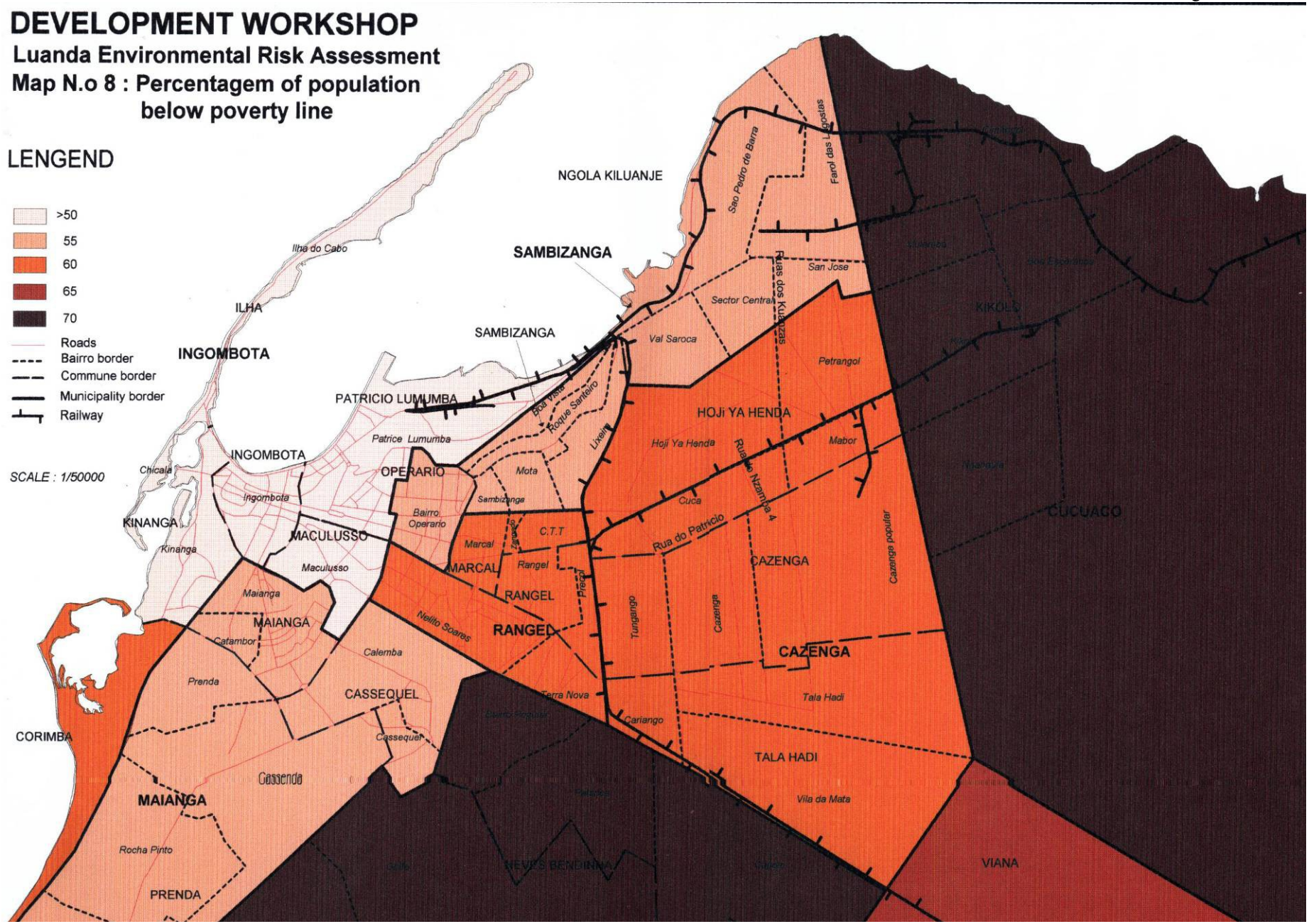

DEVELOPMENT WORKSHOP
Luanda Environmental Risk Assessment
Map N.O 2 : Indice of diarrhoea (mortality per year per 1000 persons)
LEGEND
>2
1 -2
<1
Roads
Bairro border
Commune border
Municipality border
Railway
Scale: 1/50000
NGOLA KILUANJE
SAMBIZANGA
INGOMBOTA
ILHA
Ilha do Cabo
PATRICIO LUMUMBA
OPERARIO
MARCAL
RANGEL
MACULUSSO
MAIANGA
KINANGA
CORIMBA
CASSEQUEL
PRENDA
TERRA NOVA
HOJI YA HENDA
CAZENGA
TALA HADI
KIKOLO
CUCUACO
NEVES BENDINHA
VIANA


DEVELOPMENT WORKSHOP
Luanda environmental Risk Assessment
Map N.o 3 : Indice of malaria (mortality per year per 1000 persons)
LEGEND
>5
3 - 4
1 - 2
>1
Roads
Bairro border
Commune border
Municipality border
Railway
Scale : 50000
INGOMBOTA
ILHA
SAMBIZANGA
NGOLA KILUANJE
PATRICIO LUMUMBA
HOJI YA HENDA
CAZENGA
CUCUACO
KINANGA
MACULUSSO
RANGEL
TERRA NOVA
MAIANGA
CASSEQUEL
CORIMBA
PRENDA
TALA HADI
NEVES BENDINHA
MARCAL
OPERARIO
Chicala
Kinanga
Ingombota
Maculusso
Maianga
Catambor
Prenda
Calemba
Nelito Soares
Terra Nova
Rangel
Bairro Popular
Palanca
Cassenda
Rocha Pinto
Golfe
Cassequel
Cariango
Tala Hadi
Vila da Mata
Capolo
Cuca
Mota
Sambizanga
Bairro operario
C.T.T
Precol
Tungango
Cazenga
Cazenga popular
Rua do Patricio
Ruas dos Kurenzas
Sector Central
Val Saroca
San Jose
Petrangol
Hoji Ya Henda
Mabor
Lixeira
Roque Santeiro
Sao Pedro de Barra
Farol das Lagostas
Ilha do Cabo
KIKOLO
marginal


DEVELOPMENT WORKSHOP
Luanda Environmental Risk assessment
Map N.o 4 : Sewer system
LEGEND
Functional
Not functional
No sewer
Roads
Bairro border
Commune border
Municipality border
Railway
Scale: 1/50000
NGOLA KILUANJE
SAMBIZANGA
ILHA
INGOMBOTA
PATRICIO LUMUMBA
HOJI YA HENDA
KIKOLO
CUCUACO
KINANGA
MACULUSSO
MARCAL
RANGEL
MAIANGA
CAZENGA
TERRA NOVA
CASSEQUEL
CORIMBA
TALA HADI
PRENDA
NEVES BENDINHA
VIANA
Ilha do Cabo
São Pedro da Barra
Farol das Lagostas
Cimangol
Mulemba
Boa Esperança
Sagrada
Sector Central
Val Saroca
Petrangol
Kikolo
Roque Santeiro
Lixeira
Hoji Ya Henda
Mabor
Ngangula
Chicala
Patrice Lumumba
Mota
Sambizanga
Cuca
Ingombota
Bairro Operário
Kinanga
Maculusso
Marcal
C.T.T.
Rangel
Maianga
Catambor
Nelito Soares
Calemba
Prenda
Tungango
Cazenga
Cazenga popular
Tala Hadi
Cariango
Bairro Popular
Cassenda
Palanca
Vila da Mata
Capolo
Golfe
Rocha Pinto


DEVELOPMENT WORKSHOP
Luanda Environmental Risk Assessment
Map N.o 5 : Storm water drainage
LEGEND
Existing drainage
limited drainage
No drainage
Roads
Bairro border
Commune border
Municipality border
Railway
Esc : 1/50000
NGOLA KILUANJE
SAMBIZANGA
SAMBIZANGA
INGOMBOTA
INGOMBOTA
KINANGA
RANGEL
RANGEL
MAIANGA
MAIANGA
CASSEQUEL
CORIMBA
PRENDA
NEVES BENDINHA
TALA HADI
CAZENGA
CAZENGA
KIKOLO
CUCUACO
VIANA
HOJI YA HENDA
São Pedro de Barra
Farol das Lagostas
Cimangol
Mulemba
Boa Esperança
San Jose
Sector Central
Val Saroca
Petrangol
Kikolo
Mabor
Ngangula
Cazenga popular
Roque Santeiro
Lixeira
Mota
Marcal
CTT
Rangel
Precol
Tungango
Cazenga
Tala Hadi
Vila da Mata
Capolo
Palanca
Golfe
Rocha Pinto
Chicala
Catambor
Prenda
Cassenda
Bairro Popular
TERRA NOVA


DEVELOPMENT WORKSHOP
Luanda Environmental Risk Assessment
Map N.o 6 : price of water per 20 litres
LEGEND
No information
0.02
0.03
0.04
0.05
0.06
0.07
0.15
0.20
0.25
0.30
0.35
Roads
Bairro border
Commune border
Municipality border
Railway
NGOLA KILUANJE
SAMBIZANGA
ILHA
INGOMBOTA
PATRICIO LUMUMBA
HOJI YA HENDA
KIKOLO
CUCUACO
OPERARIO
MARCAL
RANGEL
CAZENGA
MACULUSSO
MAIANGA
KINANGA
TERRA NOVA
CASSEQUEL
CORIMBA
TALA HADI
VIANA
Boa Esperanca
Mulemba
Cimangol
Sector Central
Val Saroca
Petrangol
Hoji Ya Henda
Mabor
Ngangula
Mota
Cuca
C.T.T
Rangel
Tunqango
Precol
Calemba
Prenda
Bairro Popular
Cariango
Vila da Mata
Capolo
Golfe
Ilha do Cabo
Chicala
Kinanga
Ingombota
Maculusso
Maianga
Catambor
Patrice Lumumba
Bairro Operario
Marcal
Nelito Soares
Cassequel
Cazenga popular
Sao Pedro de Barra
Farol das Lagostas
Lixeira
Roque Santeiro
Boa Vista


DEVELOPMENT WORKSHOP
Luanda Environmental Risk Assessment
Map N.o 8 : Percentagem of population below poverty line
LENGEND
>50
55
60
65
70
Roads
Bairro border
Commune border
Municipality border
Railway
SCALE : 1/50000
NGOLA KILUANJE
SAMBIZANGA
ILHA
INGOMBOTA
PATRICIO LUMUMBA
HOJi YA HENDA
KINANGA
MACULUSSO
MARCAL
RANGEL
MAIANGA
CASSEQUEL
CAZENGA
TALA HADI
CORIMBA
PRENDA
VIANA
CUCUACO
KIKOLO
Ilha do Cabo
Sao Pedro de Barra
Farol das Lagostas
San Jose
Sector Central
Ruas dos Kuanzas
Val Saroca
Petrangol
Boa Vista
Roque Santeiro
Patrice Lumumba
Hoji Ya Henda
Mabor
Rua do Patricio
Cazenga popular
Chicala
Ingombota
Mota
Sambizanga
Bairro Operario
C.T.T
Marcal
Rangel
Maculusso
Maianga
Catambor
Calemba
Prenda
Nelito Soares
Tungango
Cazenga
Terra Nova
Cariango
Tala Hadi
Cassequel
Cassenda
Vila da Mata
Rocha Pinto