

# OPEN SOURCE GIS DEVELOPMENT IN SOUTH AFRICA

## GIS for HIV/AIDS Management

Cell-Life, a research team based at the University of Cape Town, investigates technology-based solutions for HIV/AIDS management in South Africa. Many communities have little or no access to spatial information or systems to critically assess their needs. Cell-Life tries to increase the use of GIS at community level by developing simple, open-source GIS tools that allow integration of databases such as the GIS database of a municipality and the local one of a community.

According to the Department of Health, 500,000 people (about 1% of the population) in South Africa rely on the government for HIV/AIDS treatment. However, it will take years before the appropriate treatment can be provided to everybody in need. Therefore the government has to focus on other short-term solutions, such as minimising the number of people needing treatment by prolonging the time for a HIV-positive person to reach the terminal stages of AIDS. The time-span between becoming HIV-positive and developing full-blown AIDS depends on several factors, most defined by lifestyle and environment, such as access to health and support facilities, clean water and basic amenities, and support from family and friends. So the strategic expansion of basic services: water works, service delivery and public transportation, has become one of the first priorities for communities.

### Lost Opportunity

Townships are informal settlements resulting from the apartheid era and the Group Areas Act. The Group Areas Act segregated racial groups into different areas and caused forced migration of black and coloured populations from areas not designated to them to the outskirts of cities. Urbanisation has led to a dramatic growth in townships over the last decade, and caused an informal structure within which only parts of the population have access to formal housing and infrastructure. Since 1994 upgrading of townships has been a major focus for the government, but the backlog is large and too often basic facilities are not yet at an acceptable level. GIS is used by provinces and large municipalities to strategically assess needs across South Africa. Individual communities, however, have little or no access to spatial information. Maps are rarely used to support decision-making in finding areas of greatest need. This is a lost opportunity. Anyone who has been involved with GIS over the past decade will agree that there is a great potential in using GIS technology for planning purposes.

### Web-based GIS

Communities rely on very basic computer set-ups and do not have the expertise to maintain geographical databases. The new GIS software packages which offer unbelievable capabilities in spatial analysis, data capture and database design, have also become very complicated. To reach the community level, a GIS, including its installation on end-user computer, needs to be very user-friendly. Also, the cost should be as low as possible since the target group is not affluent. Therefore the Cell-Life team decided to investigate the possibilities of creating a Web-based GIS using open-source software for collecting real-time information on HIV-positive persons, their environment and access to basic amenities. Fieldworkers equipped with cell-phones collect information that is then logged in a Web-accessible database system. Spatial data can answer questions such as how far has the average person to walk to reach a water tap, and how many community members have access to water-born sanitation? Such basic analysis can help in educating communities on their context and support effective decision making. Communities can start collecting data for their own management, rather than relying on data that might be out of date or not detailed enough. Spatially analysed information can then be used to communicate needs at local and provincial levels. This may lead to a more effective use of resources.

### Open Source Software

Software is considered to be "open-source" if its source code is made available and the product licensed such that unlimited redistribution and creation of license-free derived products are permitted. The license may not limit how, where or by whom the product can be used. Why choose open-source software? Advocates argue that the functionality is at least equal to that of commercial software. Also, such software is free of charge and since the source code is made available one is not bound to a particular software provider and can amend the software oneself. Maintenance contracts and service-level agreements are only signed if the client wishes to do so; they are not part of the original license. The Open-SourceGIS.org website provides an overview of the available software. For the Cell-Life GIS the following components were used:

- GRASS GIS as a desktop
- PostGIS as spatial database; it adds support for geographic objects to the PostgreSQL database, allowing it to be used as a backend spatial database for GIS
- MapServer, originally developed at the University of Minnesota, as internet GIS server; it is a development environment for building spatially-enabled internet mapping applications
- MapScript, MapServer's scripting language, is used for creating the internet-GIS thin client; thin meaning that the server is doing all the necessary processing; a thin client solution enables easy installation and minimises the footprint on the client computer.

## Cell-Life GIS

The Cell-Life GIS consists of building blocks. The end-users log into an internet-GIS client to view spatial information on the availability of, and accessibility to, basic facilities. This client runs inside a Web browser. The functionality consists of the standard functionality expected from an internet-GIS viewer. Using spatial data stored in a spatial database, the internet-GIS server produces maps for the internet-GIS client. The administrators of the system have to configure the system in order to provide end-users with the desired information. The type of questions depends on configuration by the administrators. For this task the administrators have a desktop GIS at their disposal. This may, among other things, be used to manage and analyse geographical data before it is stored in the spatial database.

## Concluding Remarks

Open-source GIS applications would seem to be less mature than commercial counterparts, perhaps because most open-source GIS developments are fairly recent in comparison with commercial GIS ones. However, this is only true for desktop GIS applications. GRASS GIS offers a large amount of sophisticated functionality, although this is not very user-friendly. Other open-source desktop GIS applications are not yet very mature. The challenges of building a GIS for HIV/AIDS management using open-source software are not technological in nature but rather, as with proprietary GIS software, related to data and users.

## Further Reading

- Department of Health (DOH) - Government of South Africa, 2003, Operational Plan for Comprehensive HIV and AIDS Care, Management and Treatment for South Africa.
- Vanmeulebrouk, B. and U. Rivett, 2005, Open source GIS development for HIV/AIDS management, in Proceedings of the AfricaGIS2005 Conference, 31st Oct.-4th Nov. 2005, Tshwane (Pretoria), the Geo-Information Society of South Africa.

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<https://www.gim-international.com/content/article/gis-for-hiv-aids-management>

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