

A Comparative Study on Free GIS Software Applied in Development Cooperation Contexts



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3. Why free software?
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1. Background

Water supply and sanitation programme in Same District, Tanzania by Ingeniería Sin Fronteras-Asociación para el Desarrollo.



Map No. 3077 Rev. 0 UNITED NATIONS Department of Peace-keeping Operations January 2005





1. Background

Water supply and sanitation programme in Same District, Tanzania by Ingeniería Sin Fronteras-Aasociación para el Desarrollo.





1. Background



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1. Background





1. Background

El proyecto tiene por objetivo abastecer de agua y de servicios de saneamiento al distrito de Same. El programa se basa fundamentalmente:

- ✓ en la construcción y diseño de sistemas de abastecimiento de agua
- ✓ el desarrollo de entidades locales de gestión de los sistemas





1. Background

El proyecto tiene por objetivo abastecer de agua y de servicios de saneamiento al distrito de Same. El programa se basa fundamentalmente:





1. Background

El proyecto tiene por objetivo abastecer de agua y de servicios de saneamiento al distrito de Same. El programa se basa fundamentalmente:



- ✓ la implementación de estrategias de marketing social para la construcción de letrinas
- ✓ la capacitación de la población en prácticas higiénicas



1. Background

Desde la *Universitat Politècnica de Catalunya* se realizan tres tareas en el proyecto:

- ✓ Elección de una herramienta SIG libre
- ✓ Recopilación de información espacial y su implementación en la herramienta SIG
- ✓ Fortalecimiento de las capacidades de la administración del distrito, del *Distric Water Department* (DWD) y de los técnicos locales de ISF para una mejor planificación de las intervenciones y de la supervisión de los servicios de abastecimiento de agua y de saneamiento.



1. Background

Recopilación de la información espacial

No se dispone de información cartográfica de referencia en formato digital.

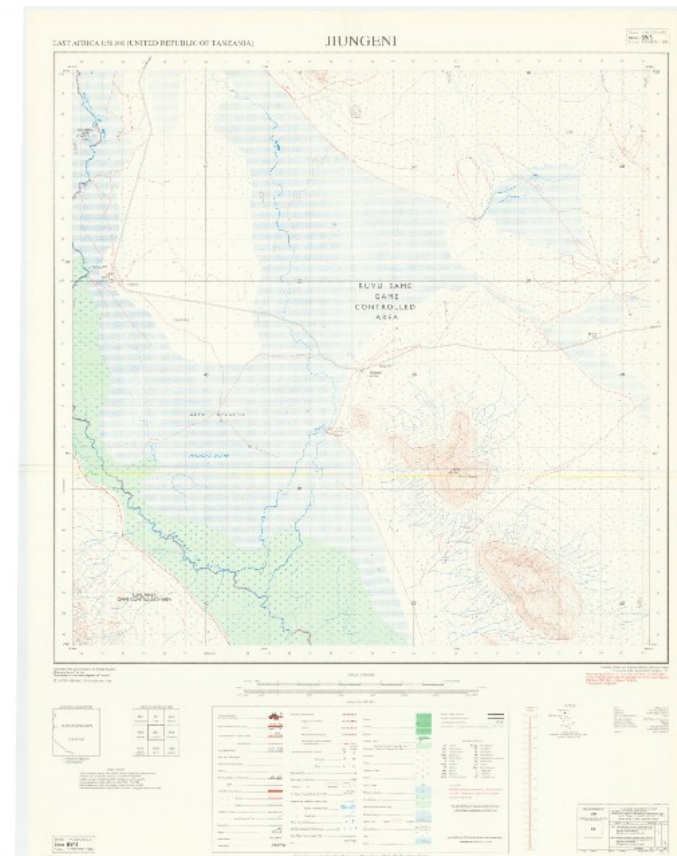
En Tanzania la única cartografía que existe es el Mapa Topográfico Nacional a escala 1:50 000 en formato papel.



1. Background

Recopilación de la información espacial

Mapas
topográficos
escala 1:50000

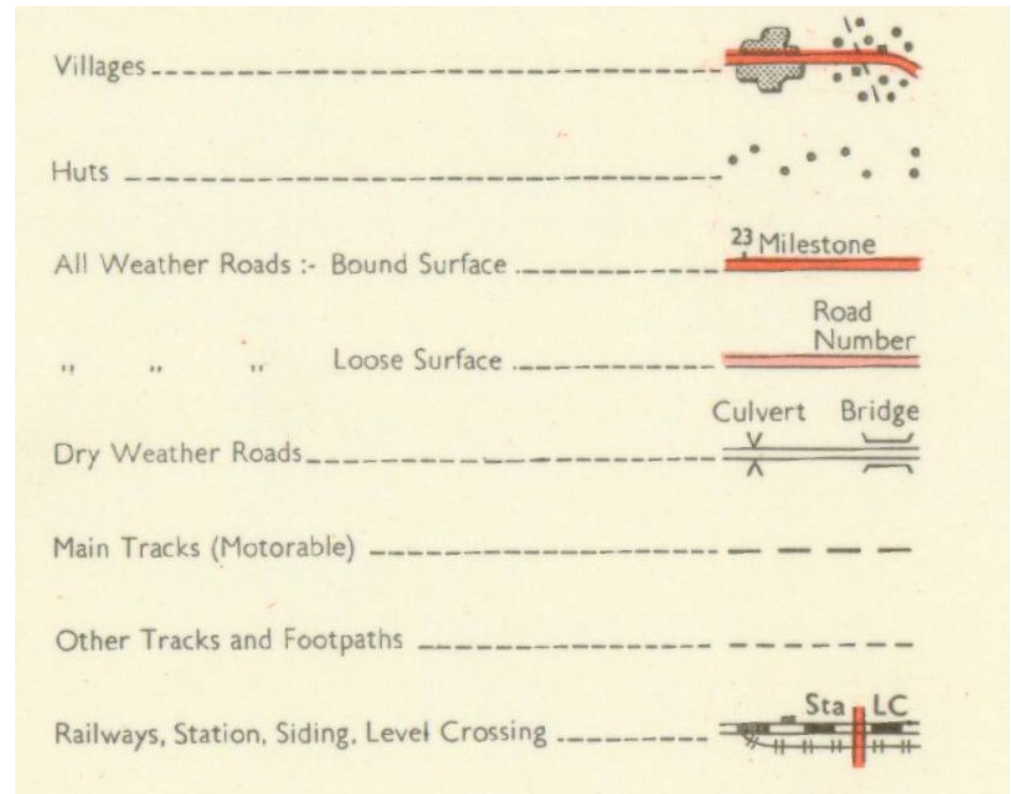




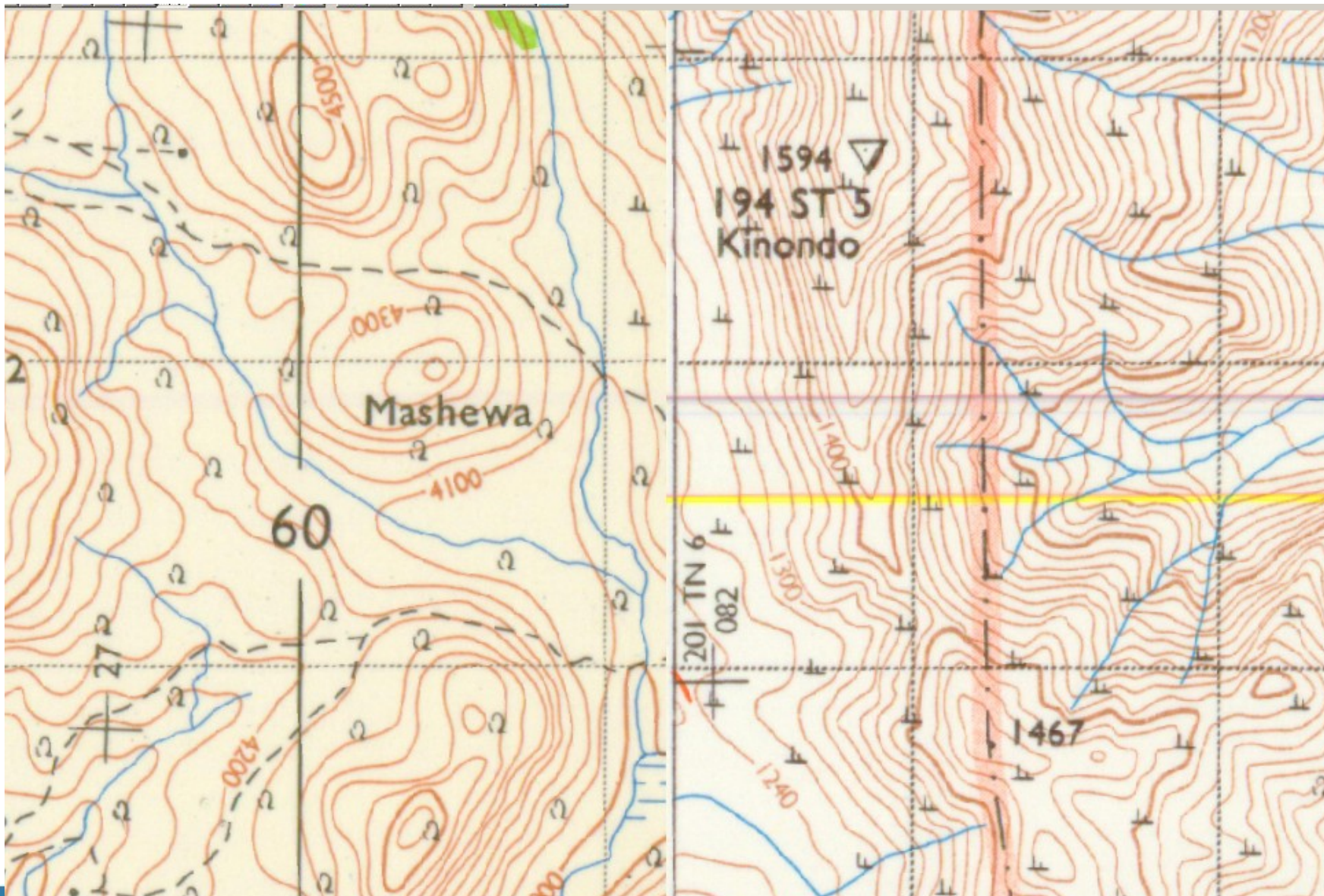
1. Background

Recopilación de la información espacial

Mapas
topográficos
escala 1:50000



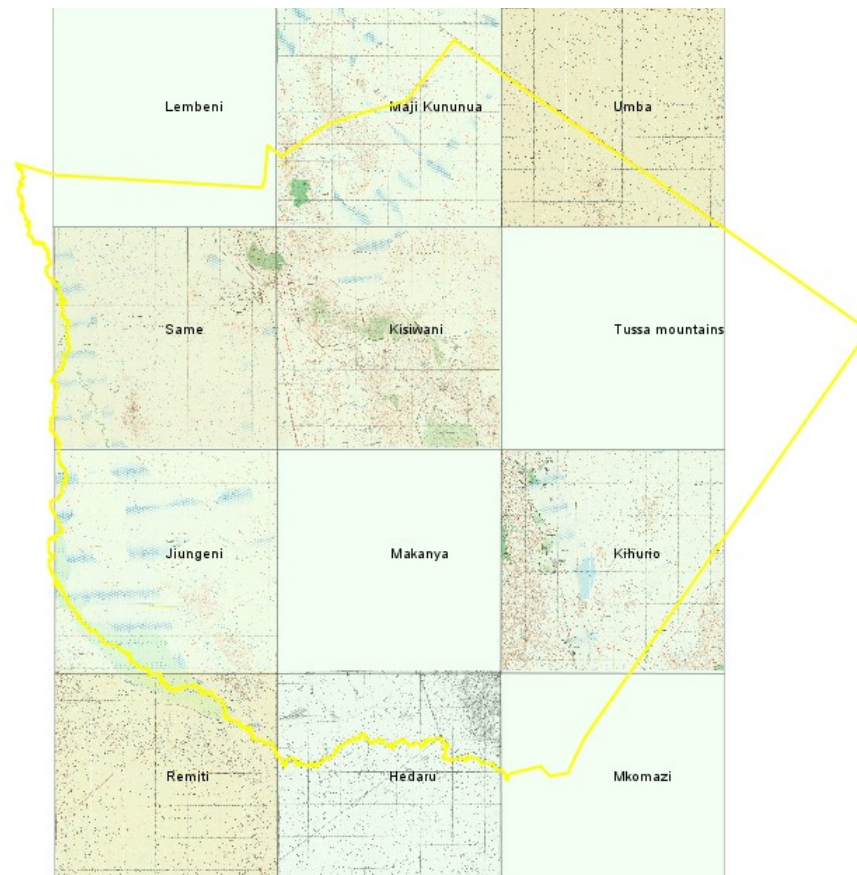
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1. Background

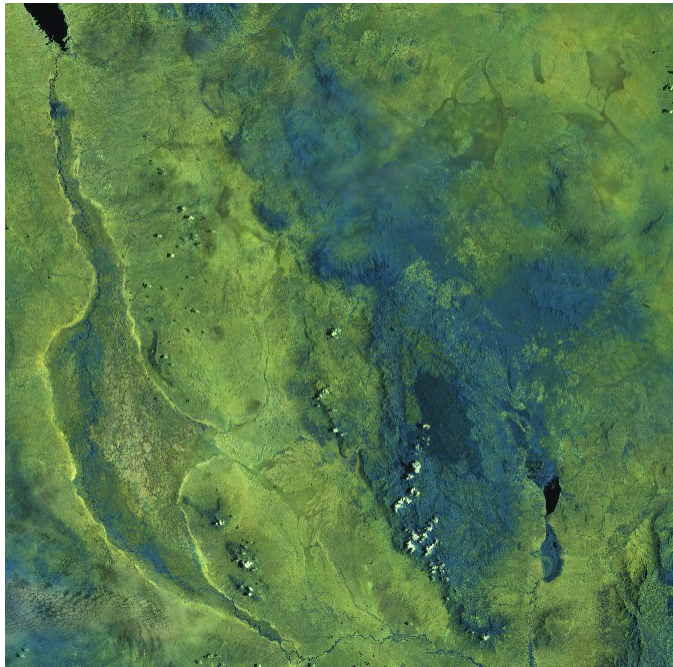
Recopilación de la información espacial



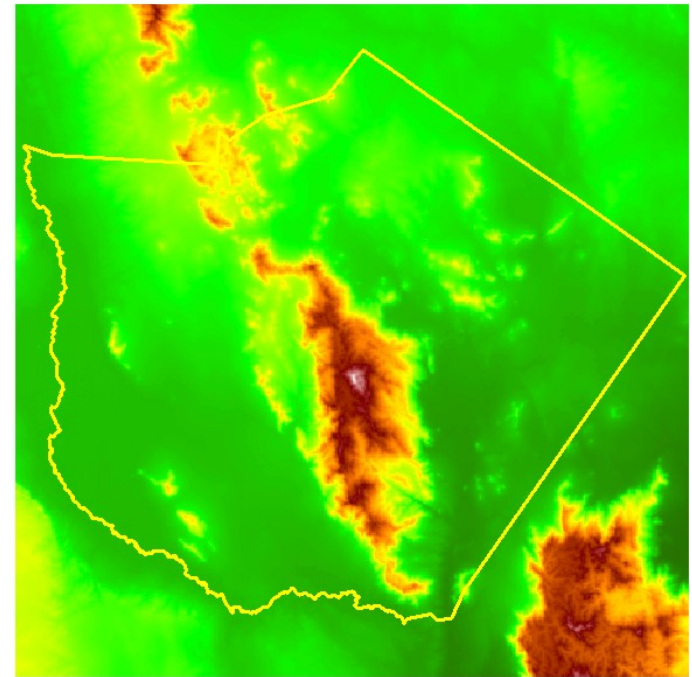


1. Background

Recopilación de la información espacial



Imágenes LandSat

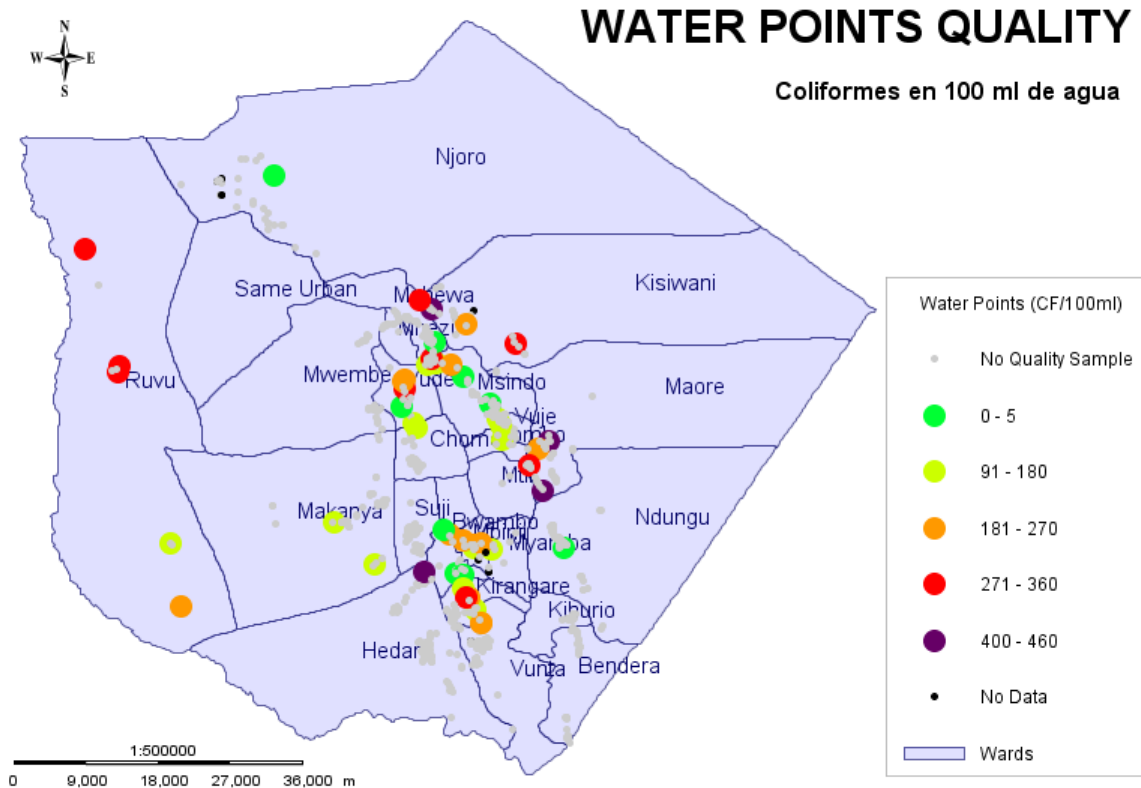


**Modelo Digital de
Elevaciones del
SRTM**



1. Background

Recopilación de la información espacial





2. General Goals

- To provide a tool to **make easier the choice** of the suitable GIS.
- To achieve **objective results** that allow other projects in similar situation to make their own selection.



3. Why Free Software?

3.1 Free software in development cooperation projects

Free software philosophy fitted with real ISF-ApD requirements.
It provides a tool:

- **Available** for any purpose of the project
- Completely **adaptable** to its own needs
- **Cheaper** than proprietary software (almost always with any cost)



4. Methods

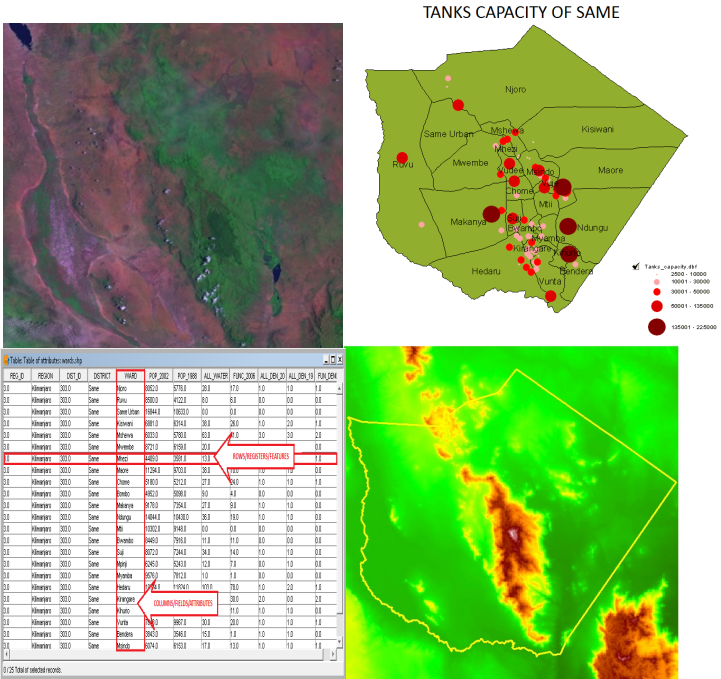
- Seven software were selected from the huge offer available in Internet with the only condition of being able to run over *Windows platform* .
- GIS software have been tested for specific capabilities using different typologies of data.



4. Methods

4.1 DATA TYPES & SOURCES

Data used in this study are coming from “**Proyecto de Abastecimiento de Agua y Saneamiento del Distrito de Same en Tanzania**”, carried out by ISF-ApD in collaboration with UPC.



Available data typology:

- Popular vector formats: SHP, DXF & DWG
- Tables: XLS, DBF & MDB
- Current raster formats: JPEG & TIFF
- Landsat imagery
- GPS tracks
- DEM's



4. Methods

4.2 EXPECTED CAPABILITIES

- Internationalization
- Trouble-free installation
- Efficient in systems of reference management
- Simple and user-friendly graphical interface
- Interoperability:
Importation/Exportation
- Agility with edition
- Easy-to-use tools
- Variety of analysis tools
- Results layout
- Updated documentation



4. Methods

4.3 CHOSEN SOFTWARE

The study included Geographical Information Systems:



• **JUMP**



• **Kosmo**



• **SAGA**



• **SEXTANTE**



• **gvSIG**



• **uDIG**

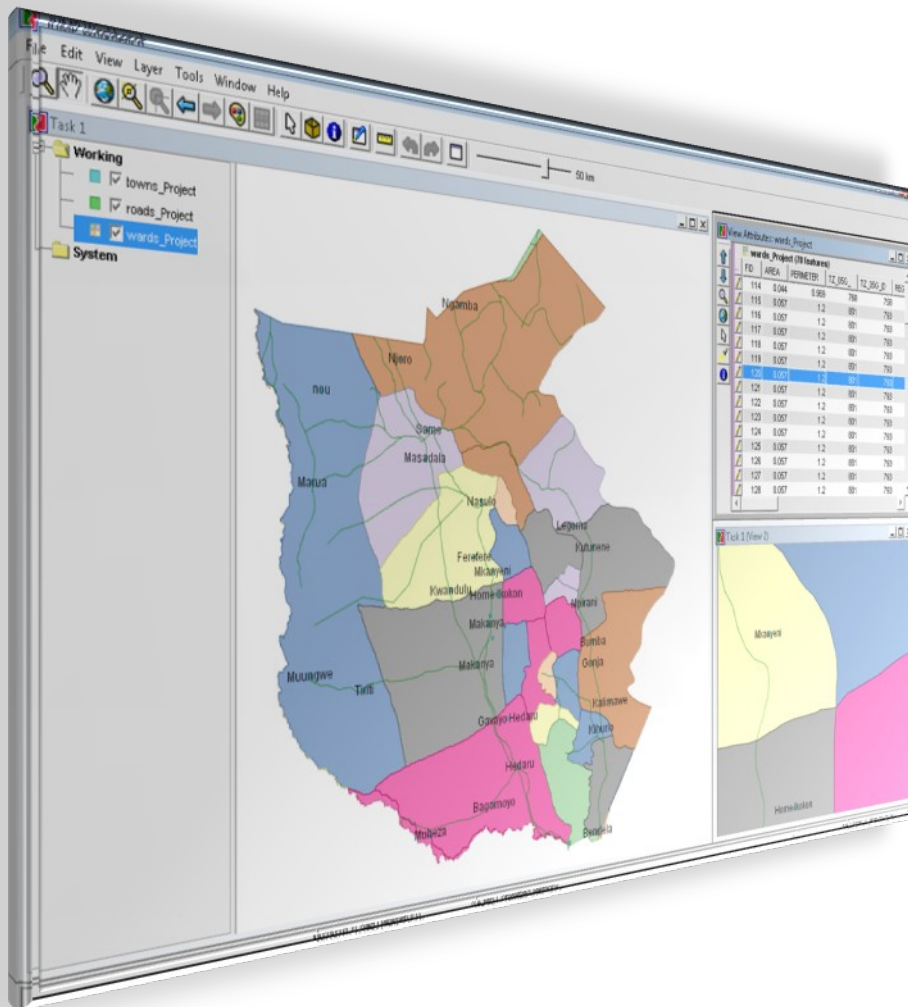


• **Quantum GIS**



5. Comparative study

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5.1 JUMP

GENERAL ASPECTS

- Beginning: 2002
- Development language: Java
- Multiplatform: Windows/Linux/Mac
- License: GNU GPL
- Multilanguage: English, French, German
- Easy installation without prerequisites
- Developers: Vivid Solutions & Refrations Research
- Last release: 23/04/2003

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5.1 JUMP

SPECIFIC CHARACTERISTICS

- Significant supported file formats: GML, SHP, WKT
- Standard connection: WMS
- Without georeference capabilities
- Better alphanumeric edition than graphical
- Topological correction tool
- Limited spatial analysis
- No layout options

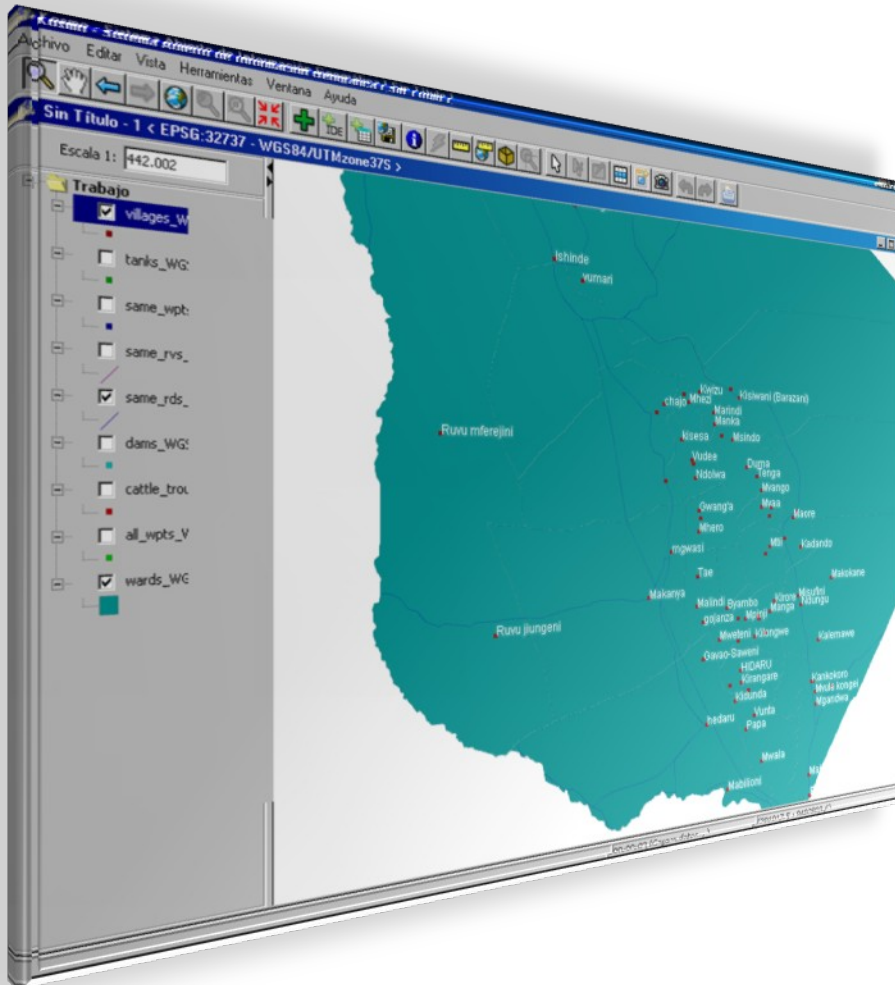
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5.2 Kosmo

GENERAL ASPECTS

- Beginning: 2006
- Development language: Java
- Multiplatform: Windows/Linux/Mac
- License: GNU GPL
- Multilanguage: English, Spanish, Basque & Portuguese
- Easy installation with prerequisites
- Developers: SAIG
- Last release: 28/02/2007





5.2 Kosmo

SPECIFIC CHARACTERISTICS

- Significant supported file formats: DGN, DXF, SHP
JPEG, TIFF, ECW
MrSID
DBF, MDB
- Geodatabases: PostGIS, MySQL, Oracle (modifiables)
- Selection of reference system of visualization
- Correct browsing tools and better symbolization
- Availability of spatial analysis
- ArcoSAIG for layouts

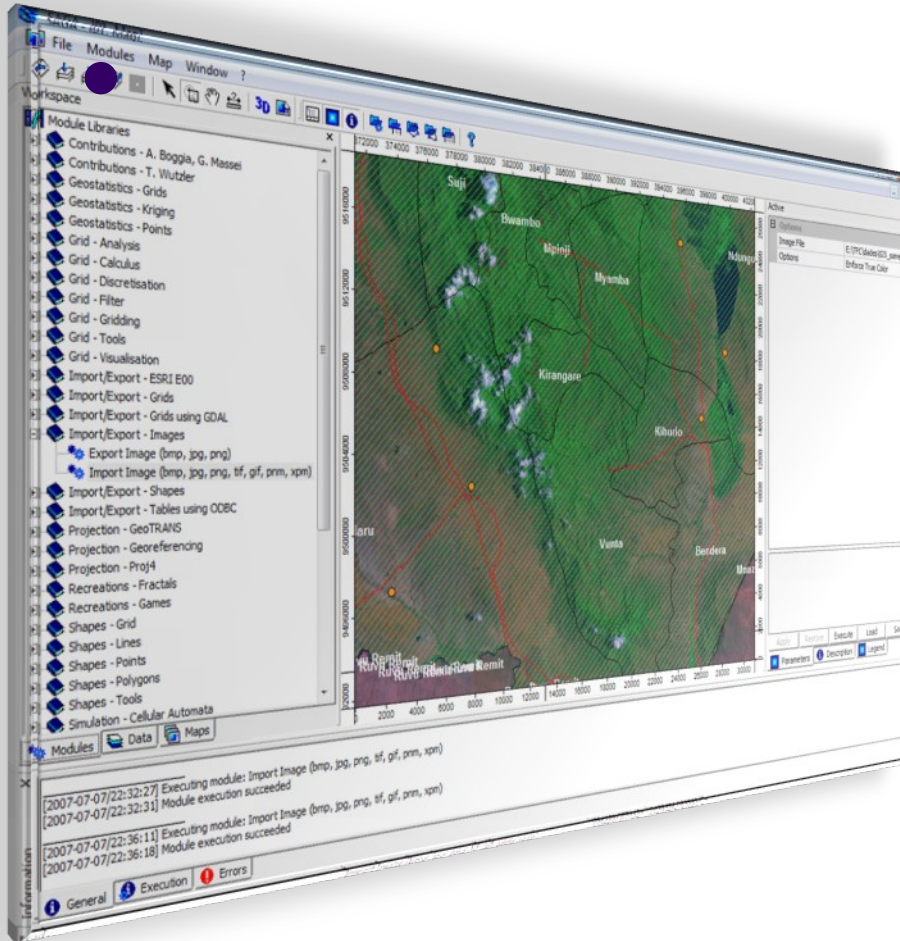
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5.3 SAGA

GENERAL ASPECTS

- Beginning: 2002
- Development language: C++
- Multiplatform: Windows/Linux/Mac
- Licence: GNU GPL (GUI)
LGNU (API)
- Multilanguage: English
- Easy installation without prerequisites
- Developers: University of Göttingen
- Last release: 26/07/2005



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5.3 SAGA

SPECIFIC CHARACTERISTICS

- Almost all of the tools are available by using modules
- Significant supported file formats: SHP
DBF, TXT, via ODBC
- Without possibility of loading OGC protocols
- Imagery reprojection and georeferenciation
- Specialist in raster management
- Without spatial analysis
- Layout options

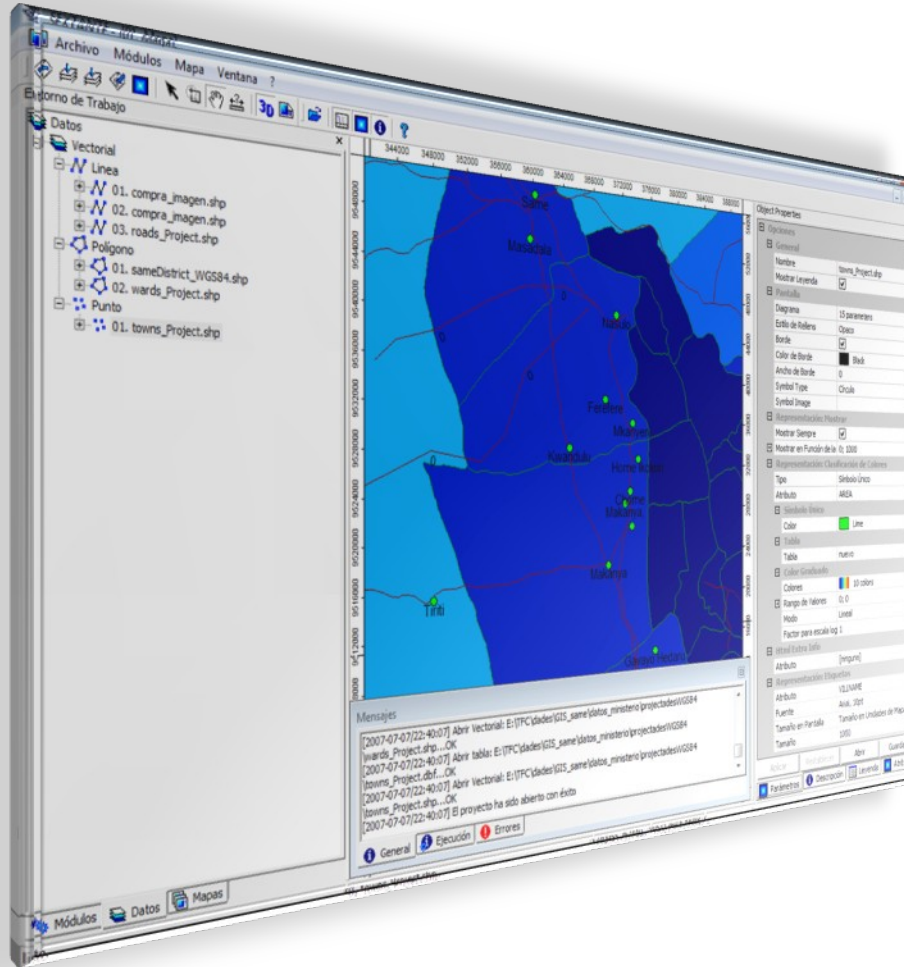
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5.4 SEXTANTE

GENERAL ASPECTS

- Beginning: 2005
- Development language: C++
- Multiplatform: Windows/Linux/Mac (gvSIG)
Windows(SAGA)
- License: GNU GPL
- Multilanguage: Spanish
- Easy installation without prerequisites
- Developers: UNEX
- Last release: 05/06/2007





5.4 SEXTANTE

SPECIFIC CHARACTERISTICS

- It has the same tools as SAGA at user's disposal
- With 80 new modules (most of them specialized in forestall and water analysis matters) motivated by demands of the Junta de Extremadura

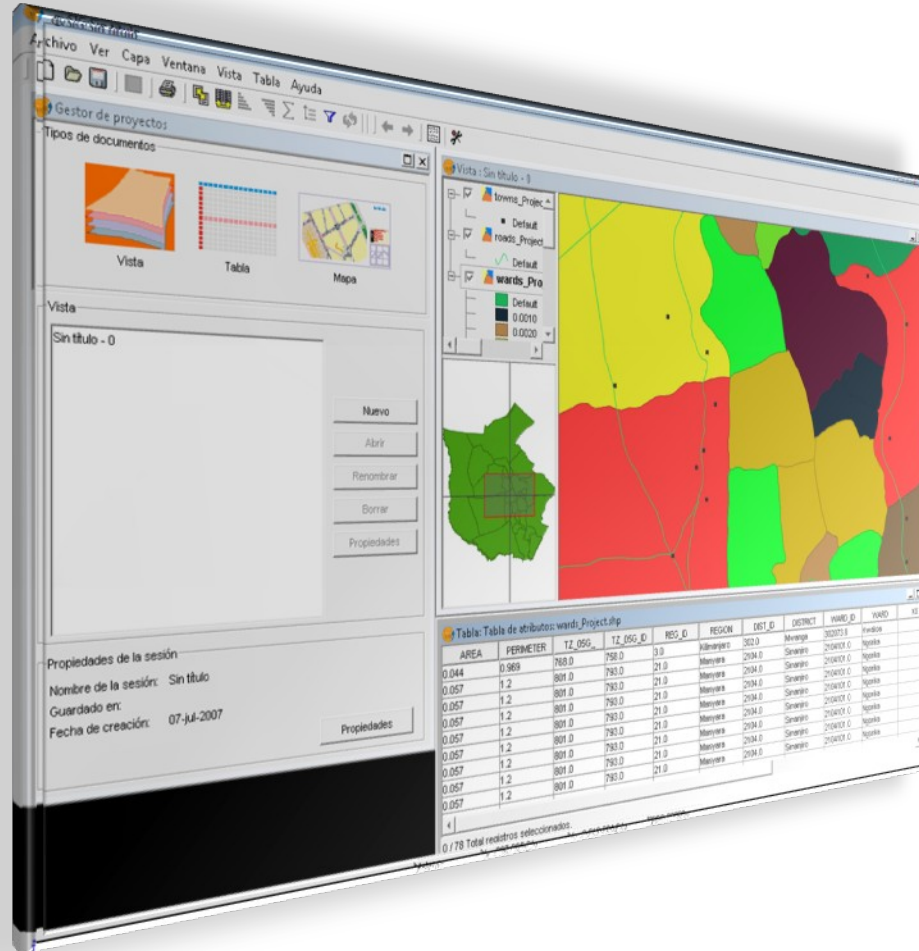
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5.5 gvSIG

GENERAL ASPECTS

- Beginning: 2004
- Development language: Java
- Multiplatform: Windows/Linux/Mac
- License: GNU GPL
- Multilanguage: English, Spanish, Basque, Valencian, Galician, French, Italian, German, Czech, Chinese & Portuguese
- Easy installation with prerequisites
- Developers: SAIG
- Last release: 28/02/2007





5.5 gvSIG

SPECIFIC CHARACTERISTICS

- Significant supported file formats: DGN, DXF, DWG, SHP, GML
JPEG, TIFF, ECW
Raster pilot
DBF, CVS
- Geodatabases: PostGIS, MySQL, HSQLDB
- Standards connection: WMS, WFS, WCS, ArcIMS
- CRS (Coordinate Reference System) module
- CAD commands for graphical edition
- Highly complete spatial analysis
- Excellent layout capabilities with possibility of exporting to PDF and postScript

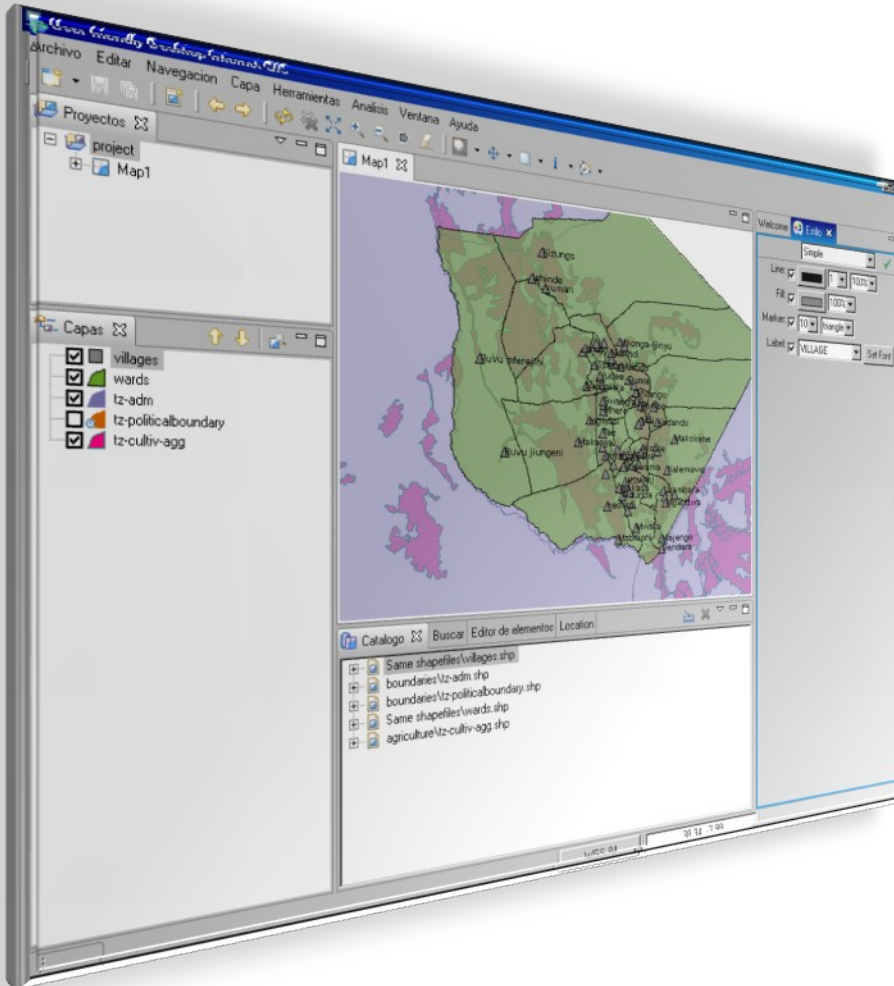
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5.6 uDIG

GENERAL ASPECTS

- Beginning: 2004
- Development language: Java
- Multiplatform: Windows/Linux/Mac
- License: LGPL
- Multilanguage: English, Spanish & French
- Easy installation with prerequisites
- Wiki format documentation
- Developers: Refractions Research
- Last release: 22/05/2007





5.6 uDIG

SPECIFIC CHARACTERISTICS

- Significant supported file formats: SHP, GML
JPEG, TIFF, PNG, GIF
- Geodatabases: PostGIS, ArcSDE, Oracle
- Standards connection : WMS, WFS
- Transformation of coordinates “on-the-fly”
- Simple symbology and browsing tools
- Without spatial analysis
- Layout options

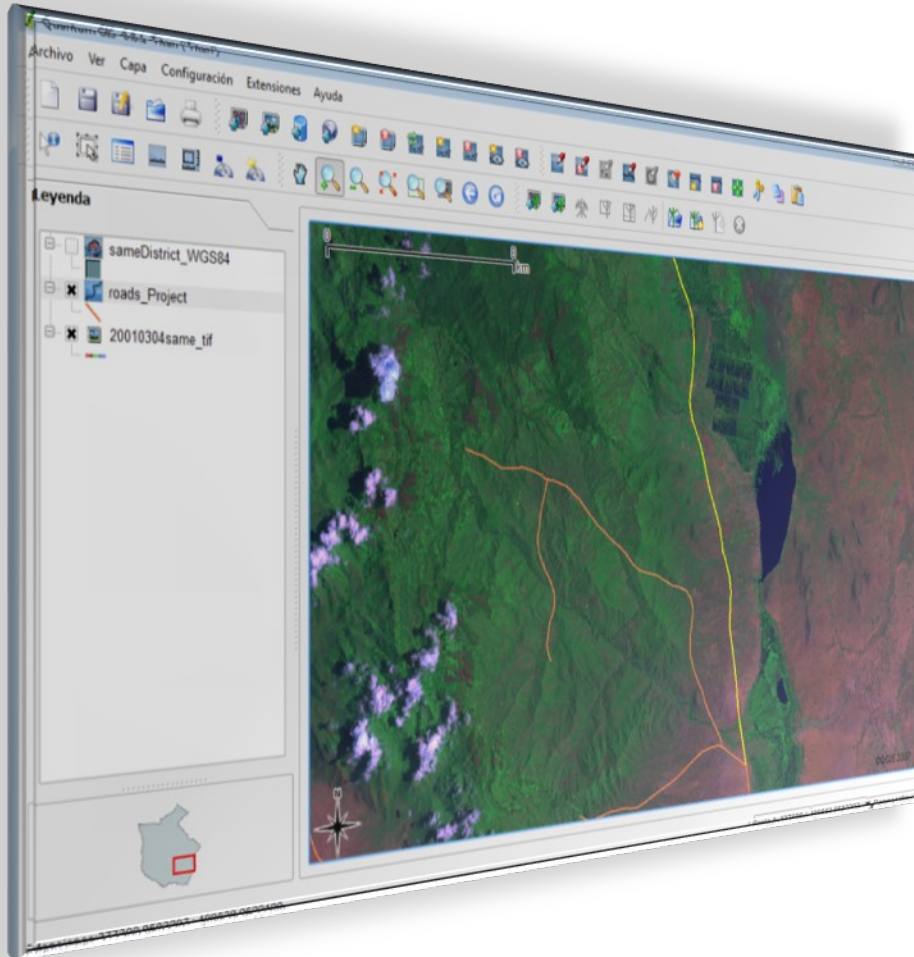
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5.7 Quantum GIS

GENERAL ASPECTS

- Beginning: 2002
- Development language: C++
- Multiplatform: Windows/Linux/Mac
- License: GNU GPL
- Multilanguage: English & Spanish
- Easy installation without prerequisites
- Developers: QGIS
- Last release: 11/06/2007





5.7 Quantum GIS

SPECIFIC CHARACTERISTICS

- Significant supported file formats: DGN, SHP, GML
JPEG, TIFF, ECW
DBF, CVS, TXT
- Geodatabases: PostGIS, Oracle
- Standards connection : WMS
- Imagery reprojection and georeferenciation
- Metadata query
- Without spatial analysis
- Good-quality layout capabilities with possibility of exporting to BMP i SVG

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COMPARATIVE FREE GIS TABLE

Product	JUMP	Kosmo	SAGA	SEXTANTE	gvSIG	uDIG	Quantum GIS
Supported input data							
DGN							
DWG							
DXF							
SHP							
FME GML							
JUMP GML							
GML/XML							
MIF							
TXT							
WKT							
DBF							
MDB							
CVS							
TAB							
ESRI E00							
Gstat shapes							
XYZ shapes							
from database using	PostGIS, ARC SDE	PostGIS,MySQL,Oracle			PostGIS, MySQL,HS QLDB, Oracle+F30	PostGIS,Arc SDE, Oracle	PostGIS, Oracle

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COMPARATIVE FREE GIS TABLE

Product	JUMP	Kosmo	SAGA	SEXTANTE	gvSIG	uDIG	Quantum GIS
Supported input data							
JPG							
JPEG							
D							
PNG							
TIFF							
GIF							
IMG							
BMP							
ECW							
DGM							
ASC							
DDF							
DTO							
DEM							
AIR GRASS							
U ng WFS							
U ng WMS							
U ng WCS							
U ng ArcIMS							



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COMPARATIVE FREE GIS TABLE

Product	JUMP	Kosmo	SAGA	SEXTANTE	gvSIG	uDIG	Quantum GIS
Output file formats							
SHP							
DXF							
PostGIS							
GML							
JPG							
JPEG							
PNG							
TIFF							
GIF							
PCX							
BMP							
XLS							
Others			(ESRI,MOL A, Surfer)Grid, (Gstat,XYZ) shapes y Generate	(ESRI,MOL A, Surfer)Grid, (Gstat,XYZ) shapes y Generate			
Database		PostgreSQL, MySQL y Oracle			PostgreSQL, MySQL, HSQLDB, Oracle		PostgreSQL

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COMPARATIVE FREE GIS TABLE

Product	JUMP	Kosmo	SAGA	SEXTANTE	gvSIG	uDIG	Quantum GIS
Reference							
Customized projections							
Reprojection							
Imagery georeference							
Visualization options							
Zooming	Zoom in/ Zoom out/Fast/ Full extent/ to selection/ to Fence/ Undo/ Redo	Zoom in/ Zoom out/Fast/ Full extent/ to selection/ to Layer/ Undo/ Redo/Cente	Zoom in/ Zoom out/Previo/ Full extent/ to selection/ to Layer	Zoom in/ Zoom out/Previo/ Full extent/ to selection/ to Layer	Zoom in/ Zoom out/Previo/ Full extent/ to selection/ to Layer	Zoom in/ Zoom out/ Full extent/ Undo/ Redo	Zoom in/ Zoom out/Previo/ Full extent/ to selection/ to Layer
Go to coordinate		r					
Locator							
Zoom manager							
Cloning Win							

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COMPARATIVE FREE GIS TABLE

Product	JUMP	Kosmo	SAGA	SEXTANTE	gvSIG	uDIG	Quantum GIS
Vector symbolization							
Unic symbol							
Unic value							
Graduated colour							
Labeling							
Raster data management							
Pixel information							
Frequency histogram							
Statistics analysis							
Changing symbology							
Loading MDT							
Table edition							
Adding fields							
Deleting fields							
Modifying files order							
Modifying databases							

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COMPARATIVE FREE GIS TABLE

Product	JUMP	Kosmo	SAGA	SEXTANTE	gvSIG	uDIG	Quantum GIS
Simple query							
Lengths							
Areas							
Attribute information							
Metadata							
Vector analysis tools							
Buffer							
Clip							
Dissolve							
Merge							
Union							
Spatial Joint							
Convex Hull							
Diference							
Intersection							
Overlay							
Geometry Function							

A Comparative Study on Free GIS Software Applied in Development



COMPARATIVE FREE GIS TABLE

Product	JUMP	Kosmo	SAGA	SEXTANTE	gvSIG	uDIG	Quantum GIS
Presenting results							
Unique symbol thematic mapping							
Unic value thematic mapping							
Graduated colour thematic mapping							
Variable feature ze thematic mapping							
Fixed ze labelling							
Real ze labelling							
Layout							
Views							
Imagery georeference							
Scales							
Legends							
Graphical objects							
North							
Text							
Boxes							
3D views							
Profiles							
Template							



6. Conclusions

6.1 General approach

- Geographical Information world is in a revolution moment: INSPIRE Directive, international standards and free software.
- Appearance of new regulation institutions and organizations that safeguards interoperability: OGC.
- Increase of GIS projects released with free license.
- Growing involvement of universities, public institutions and private entities in this kind of projects.



6. Conclusions

6.2 Specific conclusions

- JUMP

Is a sound grounding for subsequent projects but it has a lack of some important capabilities.

- Kosmo

Promising project but still immature.

- SAGA

Excellent tool in raster management but deficient in vector matters.

- SEXTANTE

Good option if we need to do forestall analysis.



6. Conclusions

6.2 Specific conclusions

- gvSIG
Consolidate vector tool with an emphasis on interoperability. Its declaration of intention makes us expect more improvements shortly.
- uDIG
Young project that, for the moment, only allows us to visualize information. It also attaches importance to OGC standards access.
- Quantum GIS
It offers interesting capabilities and it turn out to be intuitive and easy-to-use.