



# Orange-Senqu River Basin

Orange-Senqu River Commission Secretariat  
Governments of Botswana, Lesotho, Namibia and South Africa

UNDP-GEF  
Orange-Senqu Strategic Action Programme  
(Atlas Project ID 71598)

# ORASECOM Water Information System

Concept Note

Technical Report 3  
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UNDP-GEF  
Orange-Senqu Strategic Action Programme

## **ORASECOM Water Information System**

### **Concept Note**

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## Glossary

### Acronyms and abbreviations

|       |                                                                 |          |                                        |
|-------|-----------------------------------------------------------------|----------|----------------------------------------|
| DCP   | Data Collection Platform                                        | IT       | Information Technology                 |
| FGEF  | French Global Environment Facility                              | IWRM     | Integrated Water Resources Management  |
| FAO   | Food and Agriculture Organisation                               | NAP      | National Action Plan                   |
| GEF   | Global Environment Facility                                     | ORASECOM | Orange-Senqu River Commission          |
| GIS   | Geographic Information System                                   | POP      | Persistent Organic Pollutants          |
| GTZ   | German Agency for Technical Cooperation                         | RBO      | River Basin Organisation               |
| HYCOS | Hydrological Cycle Observing Center                             | SADC     | Southern African Development Community |
| ICP   | International Cooperating Partner                               | SAP      | Strategic Action Programme             |
| ICPDR | International Commission for the Protection of the Danube River | TDA      | Trans-boundary Diagnostic Analysis     |
| ICT   | Information and Communication Technology                        | UNDP     | United Nations Development Programme   |
|       |                                                                 | WRYM     | Water Resources Yield Model            |
|       |                                                                 | WRMP     | Water Resources Planning Model         |

# 1. Background

The Orange-Senqu River Commission (ORASECOM) is one of the first shared watercourses institutions to be established under the *Revised Protocol on Shared Watercourses in the Southern African Development Community* (2000). The member States of ORASECOM are Botswana, Lesotho, Namibia and South Africa. As a newly established organization, ORASECOM faces challenges in establishing the data, information and knowledge management capacity required for its development and to enable ORASECOM to interact with its member States and to give effect to the SADC Protocol.

To support the development of ORASECOM and improve management of the Orange-Senqu River, UNDP-GEF is implementing the project *Development and Adaption of a Strategic Action Programme for Balancing Water Uses and Sustainable Natural Resources Management in the Orange-Senqu River Basin – the “UNDP-GEF Project.”* Component 1 of the project (Institutional Strengthening of ORASECOM) envisages the development of a ‘geographic information system (GIS) based information system’ for ORASECOM. In the UNDP-GEF Project Inception Report (April, 2010), it is recognized that while no existing mechanism exists for sharing information across the basin and across sectors, a number of ongoing and planned initiatives address sharing of data and information and need to be coordinated.

To conceptualise and plan the information system activities for Component 1, a consultancy has been established. The specific aims of the consultancy are:

- Establish a data sharing and exchange strategy within the ORASECOM member States;
- Establish the principles and functionalities of the information system;
- Conceptualise the system architecture;
- Define resulting hardware and software requirements; and
- Draft an Implementation and Sustainability Plan for the system, including schedule and costing.

An additional aim is to ensure coordination of UNDP-GEF Project activities with other International Cooperating Partner (ICP) initiatives under the ORASECOM Programme.

This report is an initial concept note following a scoping mission conducted to the UNDP-GEF Project office from August 23 to September 3 2010. The report addresses the following:

- Assessment of current data and information generation and management;
- Requirements for a data management system; and

- Principles and functionalities of a proposed data management system, including conceptual design.

A set of recommendations are made for discussion, with a view to develop a consensus among ORASECOM, the UNDP-GEF Project and other ICPs that will enable an implementation plan to be developed.

## 2. Assessment

This section reviews the current situation with regard to data generated by agencies within the member States and also generated by the projects under the ORASECOM Programme. This section also reviews the relevant information systems currently used within the member States and by ORASECOM.

### 2.1 Data and Information

As would be expected, the member States of ORASECOM acquire and manage a large range of data and information relevant to water resources management in the Orange-Senqu River basin. An exhaustive list of departments and institutions is not compiled in this document, but some important custodians are identified in Table 1.. Several reports from ORASECOM ICP projects (most notably the GTZ Project phases 1 and 2) have identified a wide-range of data custodians and datasets available in each member State. These data include hydrology-meteorology, hydrogeology, and water quality. Most of the data that ORASECOM needs to implement its mandate is likely to be available from existing datasets held by the member States. At present, knowledge of where datasets may be held is fragmented and often held by key government individuals or consultants.

**Recommendation 1: ORASECOM’s data management system includes a list and profile of different regional custodians for key datasets, with a referral or link to their website and contact information.**

Under the ORASECOM Programme, several projects have acquired data from the member States for integration and analysis. Projects have also generated data and information to address data and information gaps or for specific demonstration projects. The completed and ongoing projects under the ORASECOM Programme are summarized in Table 1. with a brief summary of the type of data and information acquired and generated

Table 1. Data custodians for selected data categories in ORASECOM member States

| ISO Data Category <sup>1</sup>                        | Botswana                                                                                                                                                                                                                      | Namibia                                                                                                               | Lesotho                                                                                                                                          | South Africa                                                                                                                                                                    |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Farming<br/>Irrigation<br/>Livestock</b>           | Ministry of Agriculture<br><a href="http://www.moa.gov.bw">http://www.moa.gov.bw</a>                                                                                                                                          | Min. of Agriculture, Water, and Forestry<br><a href="http://www.mawf.gov.na/">http://www.mawf.gov.na/</a>             | Ministry of Agriculture and Food Security                                                                                                        | Dept. Agriculture, Forestry and Fisheries<br><a href="http://www.daff.gov.za/">http://www.daff.gov.za/</a>                                                                      |
| <b>Boundaries,<br/>Base Maps</b>                      | Dept. of Surveys and Mapping<br><a href="http://www.dsmportsa.gov.bw/Portal/">http://www.dsmportsa.gov.bw/Portal/</a><br>National Spatial Data Infrastructure (NSDI).<br><a href="http://www.ngis.gov.bw">www.ngis.gov.bw</a> | Min. of Lands and Resettlement, Dir. of Survey and Mapping<br><a href="http://www.op.gov.na">http://www.op.gov.na</a> | Dept of Lands, Surveys & Physical Planning                                                                                                       | Dept. of Rural Development and Land Reform<br><a href="http://www.ruraldevelopment.gov.za">http://www.ruraldevelopment.gov.za</a>                                               |
| <b>Climatology,<br/>Meteorology</b>                   | Dept. of Meteorological Services<br><a href="http://www.weather.info.bw">www.weather.info.bw</a>                                                                                                                              | Namibia Meteorological Service<br><a href="http://www.meteona.com/">http://www.meteona.com/</a>                       | Lesotho Meteorological Services<br><a href="http://www.lesmet.org.ls/">http://www.lesmet.org.ls/</a>                                             | South African Weather Service<br><a href="http://www.weathersa.co.za/">http://www.weathersa.co.za/</a>                                                                          |
| <b>Environment<br/>Protected<br/>Areas<br/>Biota</b>  | Ministry of Environment, Wildlife and Tourism, Department of Environmental Affairs<br><a href="http://www.eis.gov.bw/">http://www.eis.gov.bw/</a>                                                                             | Ministry of Environment and Tourism<br><a href="http://www.met.gov.na">http://www.met.gov.na</a>                      | Ministry of Tourism, Environment and Culture<br><a href="http://www.mtec.gov.ls">www.mtec.gov.ls</a>                                             | Dept. of Environmental Affairs and Tourism<br><a href="http://soer.deat.gov.za">http://soer.deat.gov.za</a>                                                                     |
| <b>Inland Waters<br/>Hydrology<br/>Water Quality</b>  | Dept. of Water Affairs HOORC <sup>2</sup> - Okavango Delta Information System<br><a href="http://odis.orc.ub.bw/odis/">http://odis.orc.ub.bw/odis/</a>                                                                        | Dept. of Water Affairs NamWater<br><a href="http://www.namwater.com.na/">http://www.namwater.com.na/</a>              | Water Affairs, Water and Sewage Authority (WASA)<br>Lesotho Electricity Corporation<br><a href="http://www.lec.co.ls/">http://www.lec.co.ls/</a> | Dept. Water Affairs<br><a href="http://www.dwa.gov.za/Hydrology/">http://www.dwa.gov.za/Hydrology/</a><br><a href="http://www.dwa.gov.za/iwqs/">http://www.dwa.gov.za/iwqs/</a> |
| <b>Geoscientific<br/>Information<br/>Hydrogeology</b> | Dept. of Geological Survey, Dept. of Water Affairs                                                                                                                                                                            | Dept. of Water Affairs                                                                                                | Geological Survey                                                                                                                                | Dept. Water Affairs<br><a href="http://www.dwa.gov.za/groundwater/">http://www.dwa.gov.za/groundwater/</a>                                                                      |

<sup>1</sup> The data categories are selected from the International Standard organization (ISO) 19115 TopicCatCd, which is the metadata standard for geographic data.

<sup>2</sup> Harry Openheimer Okavango Research Center (HOORC), University of Botswana



Table 2. ORASECOM Programme projects and data information generation

| Project/Organisation                                          | Data, Systems                                                                                                                                                                                                                                                                                                    | Information                                                                                                                                             |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ORSAECOM Secretariat</b>                                   |                                                                                                                                                                                                                                                                                                                  | Newsletters, Meeting Agendas and Minutes;<br>Administrative and financial reports.                                                                      |
| <b>FGEF Project</b>                                           | Groundwater for the Molopo-Nossob Basin (national databases at the sub-basin level).                                                                                                                                                                                                                             | Technical reports<br>Administrative reports<br>GIS data                                                                                                 |
| <b>GTZ Project Phase 2</b>                                    | Orange-Senqu River Basin Model Hydrometeorology database (HYDSRTA);<br>Water quality data for selected key stations. Data management system;<br>Climate Change scenarios, vulnerability;<br>Monitoring system responsive to environmental flow allocations;<br>Irrigation area, water demand, Satellite imagery. | Technical reports;<br>Administrative reports.                                                                                                           |
| <b>Orange-Senqu River Awareness Kit (GTZ Project Phase 1)</b> | Website and content management system;<br>Base maps;<br>Google Earth files/tours.                                                                                                                                                                                                                                | Administrative reports;<br>CD-ROM, website.                                                                                                             |
| <b>EU Project</b>                                             | Transboundary Water Quality and “Fitness for Use”;<br>Aquatic health database.                                                                                                                                                                                                                                   | Administrative reports;<br>Poster maps.                                                                                                                 |
| <b>UNDP-GEF Project</b>                                       | Environmental quality: POPs and heavy metals survey;<br>Rangeland management;<br>Environmental flows;<br>Irrigation efficiency, water quality, water use                                                                                                                                                         | Scientific papers;<br>Technical reports;<br>Administrative reports;<br>Procedures on data management and exchange;<br>Procedures for transboundary EIA. |

It is important for ORASECOM to define “ORASECOM data” and “third party data”, since data ownership has important implications for data management, exchange and sharing. Three cases illustrate this point:

- The UNDP-GEF Project funds and implements a survey of persistent organic pollutants (POPs) and heavy metals, with technical support from the member States. The sampling locations and laboratory results are primary data generated by the ORASECOM Programme and are ORASECOM data;
- The GTZ Project Phase purchases a commercial satellite image for an irrigation management project. The data license states that ORASECOM can use the imagery, but cannot distribute the image to other parties. The image is third party data;

- The EU Project acquires water quality data from each of the member States at sites of trans-boundary importance. The data are quality assured, integrated and analysed to create a water quality database and “fitness for use” categories. These data could be considered ORASECOM data or third party data.

Data ownership and current data exchange and sharing between ORASECOM and other stakeholders are conducted informally and data gathering in the member countries or SADC region by ORASECOM Programme projects is conducted in an ad-hoc manner. Data gathering may be supported by letters from the ORASECOM Secretariat or an ICP. Data generated or acquired by projects are not currently submitted to ORASECOM, since ORASECOM has no capacity to receive such data or databases. There is a serious risk that data generated by ORASECOM will be lost.

**Recommendation 2: ORASECOM develop a set of policies and procedures covering the submission of data from ongoing and completed projects. The procedures ensure that ownership/custodianship for each dataset is clearly defined.**

## 2.2 Information Systems

The member States of ORASECOM also operate a large range of systems to manage the data and information described in Section 2.1 and the same packages are often in use in several countries. Some of the key systems include:

- Hydro-meteorology – HYDSTRA (<http://www.kisters.eu>) is commercial software for managing large amounts of time-series data in the hydro power, water resources and wastewater industries. According to the GTZ Project Phase 2, each member State now uses HYDSTRA for hydrometeorology data management. The GTZ Project has purchased a HYSDTRA license that could be transferred to ORASECOM on completion of the project;
- SADC Hydrological Cycle Observing System (HYCOS) (<http://sadchycos.dwaf.gov.za>) – is a regional component of the World Meteorological Organisation programme. SADC-HYCOS Phase II is under implementation, and consists of: a network of Data Collecting Platforms (DCPs) for the collection and data transmission via the Meteosat data collection system; enhanced management of national databases; and a regional database of current data from the DCP network and historical data and information provided by previous projects. The Project Regional Centre (PRC) is located in Pretoria. It is reported by the GTZ Project Phase that the SADC HYCOS system will be converted to HYDSTRA software in the near future.
- Water Quality – The GTZ Project Phase 2 (Work Package 3) reviews the water quality data and information systems in the member States. South Africa uses a Water Management System (WMS), which is desktop application. South Africa reports key water quality to the

public using Google Earth. Lesotho has the Lesotho Water Sector Information Management System Portal (<http://www.lwsims.gov.ls>). Namibia is using a dedicated groundwater database that can accommodate water quality data.

- Hydrogeology – the SADC Hydrogeological Map and Atlas (<http://www.sadc-hgm.com>) was completed in March 2010 with financial support from the European Development Fund and GTZ. The website uses a standard ESRI Map interface and provides an overview of the groundwater resources of the SADC region. The map was developed based on data sourced from the member countries and was and quality assured for map preparation. It is not clear on the website where it is currently hosted and what level of maintenance of the system is planned, but it understood that this may be the Department of Geological Survey, Botswana.
- SADC Geonetwork (<http://www.sadc.int/geonetwork/>) – a spatial data repository and catalogue, designed to facilitate sharing of spatial data within the SADC region. The site is maintained by the SADC Regional Remote Sensing Unit of the Food, Agriculture and Natural Resources Directorate.
- GIS and Environmental Information Systems – there are many commercial software packages used in the region, from single-user desktop GIS to multi-user enterprise GIS. The most popular GIS solutions include ESRI ArcGIS, PlanetGIS and Geonetwork Opensource. For environmental information systems, custom solutions and databases appear to be most prevalent.
- Modelling - two models are currently being used by the GTZ Project Phase 2: Water Resources Yield Model (WRYM) and the Water Resources Planning Model (WRPM). These two models are closely related and use very similar input data sets. Component 1 of the GTZ project includes assistance to representatives from each of the four member States to set up the enhanced models in their respective country and training so that staff are able to use the models effectively.

The information systems currently established by ORASECOM or its ICPs are: ORASECOM Website; ORASECOM ICP Portal; and the Orange-Senqu River Awareness Kit. These information systems were recently summarized and reviewed by Alex Höbart from the International Commission for the Protection of the Danube River (ICPDR) and are not reviewed again in this document.

The ORASECOM Secretariat does not currently have data management or well developed information and communications management systems in place. Currently ORASECOM relies on the ICP projects to manage their data and information, but once a project ends there is a concern that valuable data will be lost. Recognising these information management issues, ICPDR conducted a needs assessment related to information and communications technology (ICT) development (i.e. messaging system, document management and handing, shared calendars, and contacts).

**Recommendation 3: The ORASECOM Secretariat and ICPs should coordinate data and information management initiatives and ensure that outputs meet ORASECOM’s needs. The UNDP-GEF Project should focus on data management, whereas ICPDR support should focus on ICT.**

Based on **Recommendation 3**, and to avoid duplication of effort, this review focuses most heavily on data management issues.

## **2.3 IT Infrastructure**

The ORASECOM Secretariat will be established in late 2010 in Centurion, Gauteng, South Africa. The office specifications detail that the office will be equipped with communications and voice cabling and voice points, and a server room with a 25 unit cabinet with 5 way power rail, 4 x fan unit and shelf, and 24 port 3-com switch. No information technology (IT) hardware has yet been purchased, including servers, storage, printers and networking. A contract for Internet connection has not been agreed with an Internet service provider.

The ORASECOM Secretariat includes 4 permanent staff: Executive Secretary (Lenka Thamae), Water Resources Specialist (Rapule Pule), Finance, and Administration. There is no dedicated IT systems administrator and not immediate plans to staff such a position.

## 3. Requirements

The requirements section focuses on the data and information requirements of ORASECOM, in particular towards producing the ORASECOM IWRM Plan, and the functional requirements of a data management system.

### 3.1 ORASECOM's Role in Data and Information Management

Functional requirements related to ORASECOM's role in data and information management are included in the SADC Protocol and the ORASECOM Agreement. General Principle 6 of Article 3 of the SADC Protocol states "*State Parties shall exchange available information and data regarding the hydrological, hydro geological, water quality, meteorological and environmental condition of shared watercourses.*"

Several other provisions of the SADC Protocol refer to sharing of data and information, including "*timely notification... accompanied by available technical data and information.*"

The ORASECOM Agreement tasks the ORASECOM Council to advise the parties on "*the standardized form of collecting, processing and disseminating data or information with regards to all aspects of the River System*" (Art 5.2.5). And Art 7.4 obliges the Parties to the Agreement to "*exchange available information and data regarding the hydrological, hydrogeological, water quality, meteorological and environmental condition of the River System*".

As a result, the functions of an ORASECOM data management system need to enable ORASECOM to fulfill a data exchange and sharing role. Derived from this is a need for basic data management functions, to ensure that data are stored securely and catalogued to enable timely retrieval. The other functions of a data management system are related to development of an integrated water resources management plan, for example map production, spatial analysis, and modeling. Table 3 summarises the functional requirements for an ORASECOM data management system.

As ORASECOM becomes further established and the SADC Protocol is implemented by other regional organizations, the frequency of data exchange is likely to increase. However, it is unlikely that data would need to be shared in real time manner (e.g. SADC HYCOS). In addition, ORASECOM should not duplicate the activities of data custodians in the member States. Exceptions to this may be the proposed compilations of trans-boundary water quality and hydro-meteorology data. In the case of water quality, it is expected that a database will be developed and updated regularly for stations of trans-boundary importance. With regard to the hydro-meteorology data, it is expected that once the project-based data compilation to support modeling has been completed, this database will not be updated operationally.

## 3.2 Data requirements

ICP projects under the ORASECOM Programme address the data and information requirements of ORASECOM, and a brief summary is provided in Table 2. Basic spatial and non-spatial data related to the Orange-Senqu River Basin which would support the compilation of the ORASECOM IWRM Plan include but not necessarily be limited to:

- Catchment and sub-catchment boundaries;
- Administrative boundaries;
- River systems (including ephemeral rivers);
- Geohydrology;
- Elevation;
- Land cover and land use.

**Recommendation 4: ORASECOM Programme projects should produce a catalogue of data they have generated or acquired, which is important for data management system design. Efforts should be made to compile a catalogue for the completed F-GEF Project. A simple spreadsheet template can be used to standardize catalogue submissions.**

### 3.3 Functional Requirements

The above leads to functional requirements for an ORASECOM data management portal as per below table.

Table 3. *Functional requirements for ORASECOM data management.*

| Function                                                                                                                | Web/internal           | Comments                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data Repository</b><br>Store and catalogue data collected<br>Quality assure data                                     | Internal               | Important data must be stored to ensure data integrity;<br>ORASECOM data and data from third party data custodians must be clearly identified;<br>HYDSTRA database (project-based);<br>Water Quality database (proposed to be operational). |
| <b>Search and Discovery</b>                                                                                             | Web-based              | Stakeholders must be able to discover data that ORASECOM holds;<br>Metadata must adequately describe the datasets and the custodians;<br>Data quality must be transparent.                                                                  |
| <b>Data exchange and sharing</b><br>Direct access to ORASECOM data (e.g. download)<br>Request data                      | Web-based              | SADC Protocol mandates data exchange and sharing;<br>Timely access is required, but not real time access;<br>ORASECOM can also refer stakeholders to the data custodians.                                                                   |
| <b>Security and User Groups</b>                                                                                         | Internal and web-based | Different user groups must have different permission regarding data access.                                                                                                                                                                 |
| <b>Display</b><br>Time series data in charts (e.g. discharge)<br>Spatial data (e.g. catchment maps)<br>3D Visualisation | Web-based              | Prepared maps and charts may be made available (i.e. pdf, Google Maps/Earth).                                                                                                                                                               |
| <b>Spatial Analysis</b><br>e.g. water quality stations and protected areas                                              | Internal               | GIS functions are required internally to produce maps and conduct analysis for report generation.                                                                                                                                           |

## 4. System Design

Derived from the sections Assessment (Section 2) and Requirements (Section 3) this section aims to define the principles and initial design of a proposed data management system to be developed under the UNDP-GEF Project.

### 4.1 Principles

It is proposed that the UNDP-GEF Project will establish a data management system that will provide the following functions:

- Data repository and cataloging to ensure integrity of ORASECOM data;
- Web-based search and discovery of data to enable discovery of ORASECOM data and third party data held by ORASECOM;
- Data exchange and sharing with appropriate user groups, including download of ORASECOM data for different user groups, while respecting third party data ownership rights;
- Provision of data products, e.g. visualisation of selected data (prepared thematic maps); and
- Profiles of the different custodians in the member States and links to their websites to facilitate data discovery and sharing.

This functionality will be achieved by also implementing the following approach:

- Developing and implementing a set of standards, policies and procedures of data management, exchange and sharing;
- System development following open standards and using open source software; and
- Ensuring there is sufficient capacity and resources within ORASECOM for maintenance of the system.

**Recommendation 5: User groups are established for the data management system that will provide different levels of access to data. User groups should be the same as those for the ICT systems being considered and options for “single sign on” should be explored. The user groups and data access should be defined in an ORASECOM policy on data and information exchange.**

### 4.2 Conceptual Design

Based on the principles described above, a conceptual design for the ORASECOM data management system is provided in Figure 1. This design envisages:



- ORASECOM Secretariat implementing a simple set of data management, and data exchange and sharing procedures.
- At its core, the system is a repository and catalogue for quality-assured ORASECOM and third-party data, including spatial, time-series and non-spatial data. The data are stored as files or databases.
- International standard metadata is developed for every dataset. When updated or new data are added to the repository, a simple tool and metadata profile ensures international standard metadata is created or updated.
- ORASECOM Secretariat staff and partners of the ORASECOM Programme can access the repository's data for use with software applications, including GIS and modelling.
- Local copies of the data can be made, but the master copy is within the repository.
- Using the Internet, users can search for and discover ORASECOM's data holdings through a simple web application. Based on registration and user groups, data can be accessed (downloaded) or a request for access submitted to ORASECOM.
- Using Open Geospatial Consortium catalogue services (Z39.50) ORASECOM's catalogue automatically harvests and synchronises metadata between selected distributed catalogues. If the external custodian allows, their data can be directly accessed (downloaded) from the ORASECOM website even though the data are stored remotely. ORASECOM can reciprocate based on its data exchange and sharing policy.
- The ORASECOM website also provides prepared maps of the basin for download or through Google Maps/Earth. Profiles of important data custodians in the region and their information systems are also provided to facilitate networking between different groups.

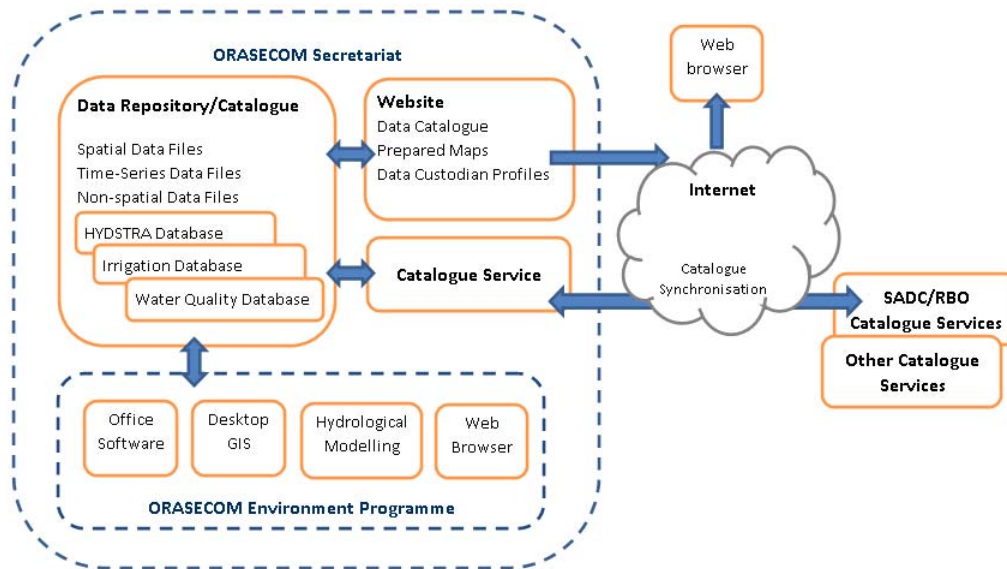


Figure 1. ORASECOM Data Management System Conceptual Design

### 4.3 System Design

System design is the process of defining the architecture, components, interfaces, and data for a system to satisfy specified requirements.

Based on the requirements and conceptual design, several software applications can be used and developed to meet the functional requirements defined in Section 3. Options for applications include:

- ESRI ArcGIS – the leading commercial GIS vendor, ESRI can provide GIS from desktop to server/enterprise GIS and data management solutions. ESRI software was used to create the Botswana Data Portal (see Figure 2);
- Geonetwork Opensource: a standards-based and decentralised spatial information management system, designed to enable web-based access to spatial data and databases and other datasets using descriptive metadata, enhancing the spatial information exchange and sharing between organisations and their audience. Geonetwork Opensource is free and a basic default installation has been implemented by the SADC Secretariat (see Figure 3 and 4);
- Voyager GIS (<http://voyagergis.com/>) – a commercial software package to enable search, management, and visualisation of a spatial data infrastructure. Voyager has been used for the Okavango Delta Information System (see Figure 5), but based on testing this website does not function well at present;

- Voyager GIS (<http://voyagergis.com/>) – a commercial software package to enable search, management, and visualisation of a spatial data infrastructure. Voyager has been used for the Okavango Delta Information System (see Figure 5), but based on testing this website does not function well at present;
- Custom Solutions.

**Recommendation 6: ORASECOM’s data management system is designed and implemented using Geonetwork Opensource, including customization of the interface. Geonetwork should be integrated into the public ORASECOM website (shared logins, common navigation, and common “look and feel”), which will make the combined systems much easier to navigate and use. A desktop GIS capability using ESRI ArcGIS should be provided.**

The advantages of Geonetwork Opensource are:

- The software is open source and open standards based;
- Existing regional nodes – the software has already been accepted by national and multi-national organisations, e.g. SADC, Botswana Department of Environmental Affairs (under development), agencies such as the World Food Programme and Food and Agriculture Organisation of the United Nations (FAO). Under the framework of the SADC Protocol, additional nodes can be developed taking advantage of the customization by ORASECOM;
- Wide community of practice, including training materials on configuration and operation;
- Catalogue services (Z39.50) can allow scheduled harvesting of metadata, allowing reliable local search and discovery for data housed on distributed catalogues;
- Functionality includes an interactive web map for geographic based data search, online editing of metadata with a powerful template system, and groups and users management.

A disadvantage with Geonetwork is that the default user interface is poor and not easy to customize. However, it is possible to complete customization and one interface could be developed that serves the needs of ORASECOM and is also replicable for other regional river basin organizations.

**MINISTRY OF LANDS AND HOUSING  
DEPARTMENT OF  
SURVEYS AND MAPPING  
GOVERNMENT OF BOTSWANA**

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**The Department of Surveys and Mappings (DSM) Background**

The Department of Surveys And Mapping (DSM) is a specialised organisation which provides professional services and advice to Government, Parastatals and private companies on all matters related to land and geographic information, surveying, mapping and remote sensing.

**Quick Search**

**Search keyword**

[Search](#)

Enter your word (e.g Roads)  
[Advanced Search](#)

View Botswana map along with the DSM maps indexes  
Find features and show them on the map  
Identify objects or features.

**Topographic Maps**

A map which presents the horizontal position and the vertical positions of the features and contour lines

**Cadastral Maps**

A map showing the boundaries of subdivisions of land usually with the bearing and length and the areas of individuals

**Geodetic Maps**

A map showing the position of control points with its different degrees with a small scale for wide areas

Figure 2. Botswana Department of Surveys and Mapping Web Portal (ESRI technology)

The screenshot shows the SADC Geonetwork website. At the top left is the SADC logo and the text "GeoNetwork". To the right is a collage of images. Below the header is a navigation bar with links: Home | Contact us | Links | About | Help. On the right of the navigation bar are language options: English | Français | Español. Below the navigation bar are input fields for Username, Password, and a Login button. The main content area is titled "Find Interactive Maps, GIS datasets, Satellite Imagery and Related Applications". It features a search interface with a "Free Text" input field, "Advanced search" and "Remote search" buttons, "Map type" options for Digital and Hard copy, and a "Hits per page" dropdown set to 10. A large "Search" button with a gear icon is centered. To the right is a map of Africa. Below the search interface, the text "GeoNetwork's purpose is:" is followed by a bulleted list of four points. Below this is a paragraph about the open-source nature of the platform and contact information. At the bottom, there are two columns: "Recent Additions" with an RSS icon and two links, and "Categories" with two links.

**Home** | Contact us | Links | About | Help

English | Français | Español

Username  Password  Login

### Find Interactive Maps, GIS datasets, Satellite Imagery and Related Applications

**Free Text**

**Map type**  Digital  Hard copy

**Hits per page** 10

Advanced search

Remote search

**Search**

**GeoNetwork's purpose is:**

- To improve access to and integrated use of spatial data and information
- To support decision making
- To promote multidisciplinary approaches to sustainable development
- To enhance understanding of the benefits of geographic information

GeoNetwork opensource allows to easily share geographically referenced thematic information between different organizations. For more information please contact: [rrsu@sadc.int](mailto:rrsu@sadc.int) or send us [feedback](#).

Geonetwork is developed jointly by [FAO](#) and [WFP](#). The SADC Geonetwork is supported by [GMFS](#).

This site is maintained by the SADC Regional Remote Sensing Unit (RRSU) of the Food, Agriculture and Natural Resources (FANR) Directorate.

**Recent Additions** [RSS](#)

- [Zimbabwe Administrative Boundaries](#)
- [Land use- Malawi](#)

**Categories**

- [Agricultural Mapping](#)
- [Applications](#)

Figure 3. SADC Geonetwork catalogue



Figure 4. Example SADC Geonetwork search results for “Lesotho”



Figure 5. Okavango Delta Information System (Voyager GIS Technology)

#### **4.4 IT Infrastructure**

The ORASECOM Secretariat will be based in a new office in September 2010. The presence of ORASECOM Secretariat, UNDP-GEF Project and other ICP projects in the office provides an opportunity for IT infrastructure to be established and managed to meet multiple needs.

**Recommendation 7: ORASECOM's data management system is physically located within the ORASECOM Secretariat office, but the hardware and networking are managed under a contract with an IT management services provider. The same provider should be considered for the ICT systems management, which should also be hosted at the ORASECOM Secretariat.**

## 5. Recommendations and Next Steps

This section provides a summary of the recommendations included in this Concept Note, and a short overview of the next steps for the UNDP-GEF Project.

### 5.1 Recommendations

*Recommendation 1: ORASECOM's data management system includes a list and profile of different regional custodians for key datasets, with a referral or link to their website and contact information.*

*Recommendation 2: ORASECOM develop a set of policies and procedures covering the submission of data from ongoing and completed projects. The procedures ensure that ownership/custodianship for each dataset is clearly defined.*

*Recommendation 3: The ORASECOM Secretariat and ICPs should coordinate data and information management initiatives and ensure that outputs meet ORASECOM's needs. The UNDP-GEF Project should focus on data management, whereas ICPDR support should focus on ICT.*

*Recommendation 4: ORASECOM Programme projects should produce a catalogue of data they have generated or acquired, which is important for data management system design. Efforts should be made to compile a catalogue for the completed F-GEF Project. A simple spreadsheet template can be used to standardize catalogue submissions.*

*Recommendation 5: User groups are established for the data management system that will provide different levels of access to data. User groups should be the same as those for the ICT systems being considered and options for "single sign on" should be explored. The user groups and data access should be defined in an ORASECOM policy on data and information exchange.*

*Recommendation 6: ORASECOM's data management system is designed and implemented using Geonetwork Opensource, including customization of the interface. Geonetwork should be integrated into the public ORASECOM website (shared logins, common navigation, and common "look and feel"), which will make the combined systems much easier to navigate and use. A desktop GIS capability using ESRI ArcGIS should be provided.*

*Recommendation 7: ORASECOM's data management system is physically located within the ORASECOM Secretariat office, but the hardware and networking are managed under a*



*contract with an IT management services provider. The same provider should be considered for the ICT systems management, which should also be hosted at the ORASECOM Secretariat.*

## 5.2 Next Steps

The ORASECOM Secretariat and appropriate Task Teams should review this Concept Note and feedback should also be obtained from ICPs and other stakeholders, as required. A presentation by the UNDP-GEF Project at the upcoming ORASECOM Task Team Meetings in October is the easiest way to achieve this.

Based on feedback on this Concept Note, Table outlines the following activities to be conducted under the UNDP-GEF Project.

*Table 4. Proposed activities of the UNDP-GEF Project*

|                                                         | 2010 |     |      |      |     | 2011 |     |     |     |      |     |     |     |     |      |      |     |
|---------------------------------------------------------|------|-----|------|------|-----|------|-----|-----|-----|------|-----|-----|-----|-----|------|------|-----|
|                                                         | Aug  | Sep | Oct  | Nov  | Dec | Jan  | Feb | Mar | Apr | May  | Jun | Jul | Aug | Sep | Oct  | Nov  | Dec |
| <b>Phase 1. System Concept and Design</b>               |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| A1.1 Scoping Mission                                    |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| Deliverable 1.1: Concept Note                           |      |     | D1.1 |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| A1.2 Draft Policies and Procedures                      |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| Deliverable 1.2: Draft Policies and Procedures          |      |     |      | D1.2 |     |      |     |     |     |      |     |     |     |     |      |      |     |
| A1.3 System Design                                      |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| Deliverable 1.3: Implementation and Sustainability Plan |      |     |      | D1.3 |     |      |     |     |     |      |     |     |     |     |      |      |     |
| <b>Phase 2. Implementation</b>                          |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| A2.1 Review System Design                               |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| A2.2 System Development (Geonetwork, Data Portal)       |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| Deliverable 2.1: Beta Version                           |      |     |      |      |     |      |     |     |     | D2.1 |     |     |     |     |      |      |     |
| A2.4 System Development (Geonetwork, Data Portal)       |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| Deliverable 2.2: Final Version                          |      |     |      |      |     |      |     |     |     |      |     |     |     |     | D2.2 |      |     |
| A2.5 Training and Procedure Implementation              |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      |      |     |
| Deliverable 2.3: Training Event                         |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      | D2.3 |     |
| Deliverable 2.4: Operation Procedures                   |      |     |      |      |     |      |     |     |     |      |     |     |     |     |      | D2.4 |     |

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