



Global Environment Facility

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Leonard Good
Chief Executive Officer
and Chairman

April 14, 2005

Dear Council Member:

I am writing to notify you that World Bank, the Implementing Agency for the project entitled, *Regional (Botswana, South Africa, Zimbabwe, Mozambique): Groundwater and Drought Management in SADC*, has submitted the proposed project document for CEO endorsement prior to final approval of the project in accordance with World Bank procedures.

Over the next four weeks, the Secretariat will be reviewing the project document to ascertain that it is consistent with the proposal included in the work program approved by the Council in March 2004, and with GEF policies and procedures. The Secretariat will also ascertain whether the proposed level of GEF financing is appropriate in light of the project's objectives.

If by May 12, 2005, I have not received requests from at least four Council Members to have the proposed project reviewed at a Council meeting because in the Member's view the project is not consistent with the Instrument or GEF policies and procedures, I will complete the Secretariat's assessment with a view to endorsing the proposed project document.

We have today posted the proposed project document on the GEF website at www.theGEF.org. If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Cc: Alternates, Implementing Agencies, STAP

THE WORLD BANK/IFC/M.I.G.A.

OFFICE MEMORANDUM

DATE: March 9, 2005

TO: Mr. Leonard Good, CEO/Chairman, GEF

FROM: Steve Gorman, GEF Executive Coordinator



EXTENSION: 35865

SUBJECT: **COUNTRY NAME: *Southern African Development Community (SADC)***
Groundwater & Drought Management in SADC

Submission for GEF Council Recirculation and Final CEO Endorsement

1. Please find attached the electronic file of the GEF Project Document for the above-mentioned project for GEF Council Recirculation and your final review and endorsement. This project was approved for Work Program entry at the February 20, 2004 Council meeting. We would appreciate receiving your response by April 20, 2005, so that we may finalize the Bank Board submission.
2. The GEF Project Document is fully consistent with the objectives, scope, and overall cost of the proposal approved at the February 2004 Council meeting. GEFSEC and STAP comments were addressed before submission to the above GEF Council meeting and were hence incorporated in the GEF Project Document approved by Council. World Bank Decision Meeting requirements resulted in clarification of the institutional arrangements for the implementation of the project. GEF Council comments have been addressed in the project document as per the attached electronic document entitled *Response to GEF Council Comments*.
3. The SADC Secretariat has confirmed its approval of the negotiated documents i.e. the Project Appraisal Document, including the financing plan, the legal documents and the supplemental letters (including performance indicators).
4. The total funds for the project and related activities amount to \$13.12M of which the contribution of GEF is \$7M. Sida is providing \$0.5M co-financing. The signed Trust Fund Agreement for the Sida funds is attached. The value of 'in-kind' contributions of Member States is \$3.52M which comprises annual contributions from thirteen African participating countries. In addition to the funding from government, a considerable contribution will be made to the project by the communities in the pilot areas over the five years of the project. This will be in terms of community representatives' engagement in the governance and guidance of the pilot areas. Bi-lateral funding of SADC for closely related hydrogeological activities amounts to \$2.1M through projects funded by France, Germany, the EU, the Netherlands and others. Due to the protracted project preparation period (as a result of

SADC restructuring) much of the work of these associated projects has already been completed. *Refer to Annex 5: Project Costs of the PAD.*

5. Please let me know if you require any additional information to complete your review of the project document. We look forward to receiving your endorsement of the project for Bank Board approval.

Many thanks.

Attachments :- Project Document,
Minutes of Negotiation dated January 19, 2005
Response to GEF Council Comments
Confirmation of in-kind funding from SADC Secretariat
Signed Sida Trust Fund Agreement (Co-funding)
Sida Proposal detailing co-funding

cc: Messrs./Mmes. King, GEF PROGRAM COORDINATION (GEFSEC);
Khanna, Wedderburn, Aryal (ENV);
Leonard John Abrams TTL (AFTU1);
ENVGC ISC, Regional Files

RESPONSE TO GEF COUNCIL COMMENTS

INTERSESSIONAL WORK PROGRAM: COMMENTS FROM COUNCIL MEMBERS
(REFERENCE TO GEF/IS/10 – FEBRUARY 20, 2004)

International Waters

Regional (Botswana, South Africa, Zimbabwe, Mozambique): **Groundwater and Drought Management in SADC (WB)**

Comments from France:

The GEF support to management of transboundary groundwater in this region is a relevant objective and SADC is the required organization, which has the capacity to carry out this project in the long term.

Comments from Germany:

The project is supported. However, the following issues need to be addressed and be further elaborated:

- A transparent strategy to involve the local communities with participatory and multistakeholder methods needs to be developed and incorporated in the project and its design at the initial stage of implementation. Representation of rural communities/rural civil society and NGOs in the steering committee and other decision-making bodies within the project should be ensured.
- The division of responsibilities among all partners should be clearly outlined (SADC Secretariat – Water Division, Project Service Agency (PSA), Project Management Unit (PMU), Project Steering Committee (PSC), Limpopo River Basin Commission (LIMCOM), SADC Sub-Committee for Hydrogeology, SADC Water Resources Technical Committee (WRTC), Sectoral Committees of Senior Officials and Ministers of Water, other international River Basin Organisations in the region).
- A German contribution of 1,220,000 US\$ is mentioned that will be implemented by the BGR. The contribution shall be spent for regional groundwater mapping requirements. Linkages with the German financed and GTZ implemented transwater programme (www.gtz.de/transwater/) may appear opportune. Through the transwater programme the GTZ is seeking to assist the riparians of the Nile, Limpopo and Orange Rivers to promote regional economies and maintain peace.

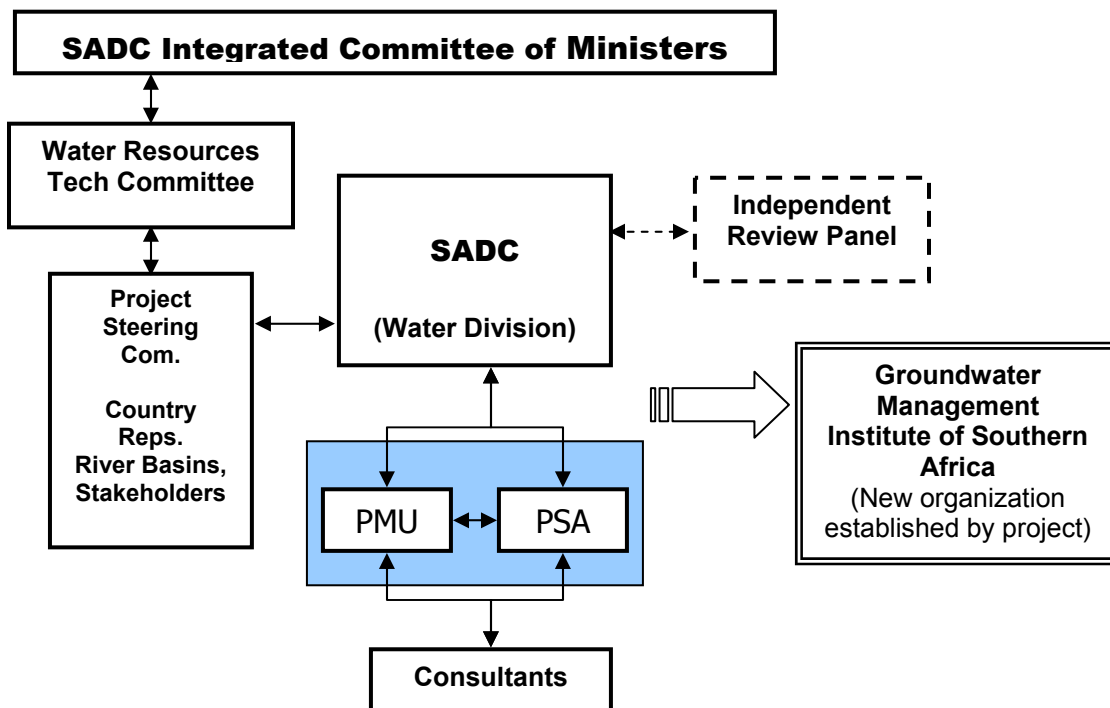
Recommendation:

It is recommended to take the above comments into account during further project planning and implementation.

Response and Steps taken in project preparation:

The points are well taken and have been accommodated in the project preparation and will continue to be addressed during implementation. The points have been addressed as follows:-

- This point is strongly endorsed and has been strengthened in the final PAD. The first activity of Component 1 - **Development and Testing of a Groundwater Drought Management Plan for the Limpopo River Basin Pilot Areas** is:- “1) Establish local framework involving all stakeholders to ensure a transparent learning environment for the exchange of learnings before, during and after the pilot interventions and to ensure maximum benefit from the pilot demonstration activities.” [See Annex 4 in PAD]. In addition the Steering Committee will comprise the following as described in the PAD:- 1 senior technical representative from each Member State, a representative of SADC Environment Unit, SADC-WD and LIMCOM. Representatives from related ministries of Member States, local government in pilot areas, a representative of the NGO community, Sida and other development partners may participate as Observers, plus any other persons as agreed by the PSC. [See Annex 6 in PAD]
- During the course of project preparation the responsible bodies within SADC have changed. The division of responsibilities for project implementation has been accordingly re-evaluated and simplified in the PAD. The structure is now as follows [See Annex 6 in PAD – Implementation Arrangements]:-



- During the course of project preparation the project funding situation has changed. The following table now represents the project funding situation [See PAD Appendix 5 – Project Costs]. Note that in terms of current World Bank policy counterpart funding is no longer a requirement. In dealing with regional projects, especially in a region such as SADC with 13 Member States, counterpart funding becomes prohibitively difficult and complex to arrange.

Fund Source	US\$ millions
Direct Project funding:-	
Global Environment Facility	7.00
Sweden: Swedish Intl. Dev. Cooperation Agency (SIDA) - Bank executed Trust Fund – as per signed Trust Fund Agreement.	0.50
Value of 'in kind' project support:-	
Local govts. (prov., district, city) of borrowing country (see PAD for breakdown)	3.52
Related project funding:-	
European Commission, Netherlands + others - SADC HYCOS program	0.80
France, Gov. of (except for Min. of Foreign Affairs-MOFA) – Hydrogeological Mapping Project	0.08
Germany, Gov. of (except for BMZ) - Hydrogeological Mapping Project - 1M Euro	1.22
Total	13.12

Comments from U.S.A.:

The U.S. requests that this project be recirculated to the Council prior to CEO endorsement, incorporating revisions to address the following comments:

This project is designed to help member countries of the Southern African Development Community (SADC) manage transboundary groundwater resources in drought prone areas, in order to meet human development needs while protecting groundwater dependent ecosystems. We agree with the objectives of the project, but are concerned that the results are not well defined in the log frame. Most of the indicators are process oriented (80% of physical interventions identified, senior officials aware of pilot interventions and able to ensure sustainability) and do not show the measurable impacts and outcomes of this project on the sustainable use of the region's groundwater. Moreover, country ownership is questionable as measured by financial commitments. Of the \$6.9 million pledged in co-financing, only France has committed \$80,000. The remaining contributions are pledged or under discussion, including the contribution from SADC members.

Response and Steps taken in project preparation:

The project has very limited resources given the size of the Southern African Region and the relatively small pilot areas in the Limpopo River Basin and hence could not be expected to achieve more than a contribution towards improved management of groundwater resources in the SADC region. The project is investigative in nature with lessons learned at the pilot level being incorporated into the management tools to be prepared for region-wide use. The project is thus targeted towards contributing towards the process of improved management of groundwater resources in the region and the indicators are thus process oriented. Quantitative measurement of improved sustainable use of the entire region's groundwater would not be possible and would not be measurable within the life of the project. The establishment of the proposed Southern

African Groundwater Management Institute through the project is the primary instrument of the project to ensure sustainability of improved management of the resource. Notwithstanding these points, the Results Framework of the project has been strengthened [See Appendix 3 of the PAD].

On the question of country ownership, the SADC Member States were all represented on the Project Steering Committee which prepared the project. Specific endorsement of the project has been provided by the four countries involved in the Pilot Study Areas – Botswana, Mozambique, South Africa and Zimbabwe. In addition the SADC Secretariat was requested at the negotiation of the Grant Agreement in January 2005 to provide specific written indication that the SADC Council of Ministers had endorsed the project and that the project was included in the priority projects which form part of the short term regional strategic action plan of SADC – this request was complied with in writing by the SADC Secretariat.

With regards to the financial commitments and co-financing of the project, as noted above, the funding situation has changed during project preparation. The direct co-financing of the project by Sida to the value of \$500,000.00 has been secured in the form of a signed Trust Fund Agreement between the government of Sweden and the World Bank. Counterpart funding of the project by SADC Member States has been calculated as ‘in-kind’ spending on the project and related activities by member states. Cash contributions from SADC Member States as direct co-financing has not been a requirement of the project particularly because this is prohibitively difficult to arrange and administer in such a regional project as opposed to single country projects or projects involving limited numbers of countries. It was for this reason that specific endorsement for the project was sought from the SADC Secretariat in their capacity as the mandated representatives of SADC Member States.

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Document of
The World Bank

Report No:

PROJECT DOCUMENT

ON A

PROPOSED GRANT FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF USD SEVEN MILLION

TO THE

SOUTHERN AFRICAN DEVELOPMENT COMMUNITY (SADC)

FOR A

GROUNDWATER & DROUGHT MANAGEMENT IN SADC PROJECT

{ March 8, 2005 }

CURRENCY EQUIVALENTS

(Exchange Rate Effective {Date})

Currency Unit = US Dollar

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

GDE	Groundwater Dependent Ecosystems
GMISA	Groundwater Management Institute of Southern Africa
GW-MATE	Groundwater Management Advisory Team, formed with the support of the Bank-Netherlands Water Partnership Program
ICA	Incremental Cost Analysis
LIMCOM	Limpopo River Basin Commission
MDG	Millennium Development Goals
NCSA	National Capacity Self-Assessment
PAD	Project Appraisal Document
PIM	Project Implementation Manual
PMU	Project management Unit
PSA	Project Services Agency
RISDP	SADC Regional Indicative Strategic Development Plan
RSAP	Regional Strategic Action Plan, for water, developed by SADC
SADC	Southern African Development Community
SADC WD	SADC Water Division
SADC WRTC	SADC Water Resources Technical Committee
Sida	Swedish International Development Cooperation Agency
STAP	Scientific and Technical Advisory Panel of GEF
TDA	Transboundary Diagnostic Analysis
WB	World Bank
WSSD	World Symposium on Sustainable Development
ZAMCOM	Zambezi Watercourse Commission

Vice President:	Gobind Nankani
Country Manager/Director:	Mark Tomlinson
Sector Manager:	Jaime Biderman
Task Team Leader:	Leonard John Abrams

AFRICA
Groundwater & Drought Management in SADC

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A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

Regional issues

The Southern African Development Community (SADC) has the goal of fostering cooperation and mutual benefit from the resources of the region amongst its member countries – Angola, Botswana, DRC, Lesotho, Mauritius, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.

Whilst there is no formal poverty reduction strategy for the region, the 1996 SADC Policy and Strategy for Environment and Sustainable Development states that the organization aims to:

- protect and improve the health, environment and livelihoods of the people in Southern Africa, particularly the poor;
- preserve the natural heritage, biodiversity and life-supporting ecosystems in Southern Africa; and
- support regional economic development on an equitable and sustainable basis for the benefit of present and future generations.

Thus, poverty reduction is closely linked with protection of the environment and preservation of life supporting ecosystems.

Countries in the region face **natural constraints** such as a high degree of spatial and temporal variability in the rainfall, and **imposed constraints** including a lack of basic data and knowledge, fragmented responsibility for management of water resources, lack of community involvement in management, outdated policies, laws and regulations, and inadequate enforcement of existing regulations. These constraints are particularly apparent in the case of groundwater resources. Overarching these national issues is the regional issue of a lack of an effective mechanism to manage the numerous transboundary watersheds, both surface and groundwater, in the region.

Member states signed the SADC Protocol on Shared Watercourse Systems in 1995. In 1996, SADC established a Water Sector to further the protection and development of this vital regional resource. The Protocol was revised in 2000 and came into force in 2003. A Regional Strategic Action Plan (RSAP) for Integrated Water Resources Development and Management was developed in 1998 which includes 31 priority projects. The present proposal is designed to help implement one of those priority projects - Project.6 entitled Regional Groundwater Management Program in the SADC Region. This Program is overseen by a sub-committee of the SADC Water Resources Technical Committee. This sub-committee has subsequently been incorporated into the Project Steering Committee to provide technical oversight and representation of Member States in the project governance.

Under the umbrella of the Revised Protocol for Shared Watercourses, riparian states have signed an agreement for the joint management of surface and groundwaters in the Limpopo river basin. This agreement includes the establishment of a River Basin Commission and forms the basis for the development of common objectives, and harmonized laws and regulations for the management of the surface and groundwater resources.

All countries in the Southern Africa region are eligible for World Bank and GEF funding

Sector issues and Project rationale

The development of countries in the region is highly dependent on adequate and reliable water resources. Thus, the RSAP states that the region's water resources influences all aspects of the region's social and economic development. Apart from domestic water supply and sanitation, it is essential for agriculture, pastoralism, hydro-power generation, mining, tourism and industry. About one third of the people in the region live in drought prone areas, where groundwater is the primary source of drinking water for the human population and livestock, and most other activities. Groundwater is also the prime source of water for many ecosystems and their wildlife in these dryland areas.

Groundwater resources in arid areas are under threat from over-exploitation, pollution, sedimentation and introduction of exotic species. These threats arise primarily because of poverty linked to an increase in population pressure, as well as from irrigated agriculture, tourism, mining and pollution from human waste and agricultural chemicals. The threat to the groundwater resources of these vulnerable areas also constitutes a major threat to the related groundwater dependant eco-systems (GDEs) in drought prone areas of the region. Currently there is very limited groundwater management in the countries of the region with inadequate resources dedicated to the task and a general lack of effective institutions and technical capacity. The impacts of exploitation of groundwater on GDEs is largely unknown, as is the resulting social and economic impact of the degrading of GDEs on the communities in the affected areas, especially the very poor. These problems are compounded by the cyclical nature and variability of climatic conditions in the southern African region. The implementation period of the project may or may not coincide with a drought event which requires that the outlook of the project must be one of assisting the region and SADC Member States to develop and maintain a long term perspective of groundwater drought management and the protection of GDEs (Box 1).

Box 1: Groundwater drought

Meteorological drought is defined by the degree of dryness (lack of precipitation) and the duration of the dry period. Groundwater drought describes when groundwater resources fail as a consequence of meteorological drought. However, the link between groundwater and meteorological drought is poorly understood, with groundwater drought typically occurring later than meteorological drought.

It is these questions which this project aims to address through four inter-related components

- Testing of practical local groundwater drought management strategies at pilot level;
- Research into GDEs, their occurrence, vulnerability, value and protection;
- The development of groundwater drought management tools and guidelines;
- The establishment of a regional Groundwater Management Institute of Southern Africa to continue long term monitoring and the promotion of better management and awareness in the SADC region and at national level.

2. Rationale for Bank and GEF involvement

Rationale for GEF involvement

The GEF is currently involved in several programs (in addition to this project) which address specifically the utilization and protection of transboundary and international groundwater. This indicates a growing concern for groundwater and for groundwater dependent ecosystems. These projects include :-

Country	Project Name	Region	Focal Area	Agency	Project Type	Project Stage
Egypt	Developing Renewable Ground Water Resources in Arid Lands: a Pilot Case - the Eastern Desert of Egypt	AFR	International Waters	UNDP	Medium Size Project	CEO Approved
Regional	Protection of the North West Sahara Aquifer System (NWSAS) and related humid zones and ecosystems	AFR	International Waters	UNEP	Medium Size Project	CEO Approved
Regional	Environmental Protection and Sustainable Integrated Management of the Guarani Aquifer	LAC	International Waters	IBRD	Full Size Project	Council Approved
Regional	Managing Hydrogeological Risk in the Iullemeden Aquifer System	AFR	International Waters	UNEP	Medium Size Project	CEO Approved
Global	Conservation and Sustainable Management of Below Ground Biodiversity, Phase I	CEX	Biodiversity	UNEP	Full Size Project	CEO Endorsed

In addition there are a number of GEF projects covering related issues which are being undertaken by the World Bank's cooperating partners in Southern Africa. These include:-

1. UNEP - Desert Margins Program (DMP) Phase1 (CEO Endorsed 2001 - under implementation)

The overall objective of the DMP is to arrest land degradation in Africa's desert margins through demonstration and capacity building activities. In the Southern Africa region, this project is working in Botswana, Namibia, South Africa and Zimbabwe to develop an integrated national, sub-regional, and international action programme for developing sustainable natural-resource management options to combat land degradation and loss of biodiversity. The SADC Groundwater project will collaborate with this initiative to assist in the development of the regional groundwater management plans.

2. UNEP - Integrated Management of Dryland biodiversity through Land Rehabilitation in the arid and semi-arid regions of Mozambique, Zambia and Zimbabwe (Council Approved - October 2002)

This project works in two transboundary areas (one between Mozambique and Zambia adjacent to one of the pilot areas of the current project). The objective is to improve community-based resource management, in order to address losses in soil productivity, reduced food security and increased vulnerability of local communities to stresses such as drought. Collaboration will be established with this project to exchange information (data on drought, management plans, engagement of communities etc).

3. UNEP - Zimbabwe - NCSA for Global Environmental Management (CEO Approved 2003)
4. UNEP - Swaziland - NCSA for Global Environmental Management (CEO Approved June 2003)

These projects are working to identify capacity needs to address all levels of environmental management (focusing on the countries' ability to implement projects to support the global environmental conventions) in the relevant countries. Preliminary assessments done in each country point to the need for strong capacity building programs at different levels for these initiatives to be successful. The SADC groundwater project will utilize the results of the NCSAs (normally implemented over 12 months) to help build on local and national groundwater management capacity.

Understanding the use, management and protection of groundwater in international river basins in drought prone semi-arid areas, and the impact of groundwater and land use practices on groundwater dependant ecosystems (GDEs), brings together a number of important issues which fit within several GEF Focal Areas and Operational Programs. In large areas of Southern Africa groundwater is the only dependable source of water for basic needs and food production, which, given the high variability of the climate and increasing population pressure, potentially represents a considerable threat to both water resources (surface and groundwater) and GDEs, including baseflow dependent wetlands. Careful management of these resources will be necessary if both the Millennium Development Goals (MDGs) and the WSSD targets are to be reached.

The objective of the project is to strengthen the capacity of SADC member States in the management of transboundary groundwater resources in drought prone areas to meet human development needs whilst protecting groundwater dependent ecosystems. This objective falls within the International Waters Focal Area and is congruent with the GEF OP 9 – *“Integrated Land and Water Multiple Focal Area Operational Program”*.

The proposed project also clearly falls under the GEF's Strategic Priority IW-2:- To expand global coverage of foundational capacity building addressing the two key program gaps (in particular that of water scarcity and competing water use) and support for targeted learning. The project will contribute to addressing important transboundary groundwater systems in the SADC region with direct global environmental benefits associated with the proper management of the Groundwater Dependent Ecosystems (GDEs). The project under consideration will contribute directly to the targets under Strategic Priority IW-2 by developing country-driven management programs for addressing transboundary priorities in one of the largest aquifer basins in Africa by 2006.

Rationale for Bank involvement

The World Bank's 1996 Africa Water Resources Management Initiative (AWRMI) seeks to support water resources analysis and policy reform at the national level and to assist riparian countries in the development of cooperative frameworks and programs in relation to shared water resources. The AWRMI in turn builds upon the World Bank's long term vision of supporting integrated water resources management programs and projects as stated in the 1992 Water Resources Policy and 2003 Water Resources Sector Strategy.

At present the 1999 Regional Strategy for Southern Africa is the most appropriate guide to regional investments. This document identifies improved management of transboundary resources, including water, as one of five opportunities for regional cooperation.

The AWRMI seeks to establish partnerships with other multi- and bilateral donor agencies and members of the civil society in order to strengthen ongoing and planned initiatives. Within such cooperative approaches, the Bank has a comparative advantage in:

- analytical and operational work that draws on the Bank's cross-country experience;
- ensuring that policy reforms are consistent;
- being an honest broker in transboundary resources such as water basins;
- and using the specific expertise of the International Finance Corporation (IFC) and Multilateral Investment Guarantee Association (MIGA) to promote private sector investments.

The present proposal, being focused on cross-country operational work and laying the foundation for increased transboundary water resource management, draws on these strengths.

3. Higher level objectives to which the project contributes

The proposed project will be part of the GEF Operational Program 9 (Integrated Land/Water) which has the goal of "helping countries utilize the full range of technical, economic, financial, regulatory, and institutional measures needed to operationalize sustainable development strategies for international waters and their basins". This incorporates a special focus on projects in the African region. The proposed project promotes this goal with its objective of improving regional technical capabilities and intervention strategies to promote better management of transboundary groundwater resources.

The project contributes directly to the first two objectives of the SADC Policy for Environment and Sustainable Development (above) and to the newly developed SADC Water Policy by improving access to water and protecting groundwater dependent ecosystems in the Limpopo pilot areas during times of drought, and by providing regional tools and an institution for the improved management of groundwater in drought prone areas, including groundwater dependent ecosystems (GDEs).

B. PROJECT DESCRIPTION

1. Lending instrument

The project will be financed through a GEF grant to be executed by the SADC Secretariat through the implementation arrangements described in Section C2 below.

2. Program objective and Phases

Not Applicable

3. Project development objective and key indicators

The project objective is defined as: "The development of consensus on a SADC regional strategic approach to support and enhance the capacity of its member States in the definition of drought management policies, specifically in relation to the role, availability (magnitude and recharge) and supply potential of groundwater resources." This outcome contributes both to key GEF programs and strategies as noted above, and to the overall objectives of SADC Regional Groundwater Management Program.

The primary target groups for the project are the users of groundwater and groundwater dependent ecosystems (GDEs) in drought prone areas in southern Africa. The target groups are addressed at three scales through the project – at a local level in the two pilot areas (Figure 1), at the river basin level in the Limpopo river basin, and at the regional level through SADC.

At the pilot level the principal outcome of the project will be learning and demonstration of ground water management techniques in the Limpopo pilot areas so that communities and users of GDEs will be better able to mitigate against the negative effects of groundwater drought in the long term. While communities in the pilot areas may not experience a groundwater drought during the implementation of the project, they will be better equipped to deal with these phenomena as a result of the activities. The outputs at the pilot level will consist of limited physical infrastructure (monitoring boreholes, extraction boreholes, pans, alluvial sand storage curtains¹, etc), and non-structural measures such as improved government capacity, strengthening of groundwater user groups, heightened community awareness of the need to manage groundwater and dependent ecosystems on a long-term basis and possibly water pricing. In addition, water conservation techniques such as conjunctive use of surface and groundwaters and improvements in recharge will be tested in the pilot studies if circumstances are suitable.

At the national and regional level, the objective will be the building of consensus on a transborder approach to groundwater management, including tools for management and decision making. Environment Ministries (and equivalent institutions) represent the national stakeholders and the SADC Environment and Land Management Unit represents the regional constituency with an interest in better management of the GDEs. As a result of the project, these institutions will be better able to manage GDEs through the knowledge gained, the provision of tools such as maps and guidelines, and the establishment of a regional institution.

Progress towards achieving reduced groundwater drought vulnerability will be measured through

- the development and implementation of agreed management plans at pilot level;
- an improved ability of local groundwater users and GDEs to survive groundwater drought conditions ;

¹ Alluvial sand storage curtains are small subsurface barriers constructed across sand rivers to impound floodwaters and thereby recharge alluvial aquifers.

- the ability of government officials to support the continuation and replication of these interventions; and
- the application of lessons learnt and the use of management tools at regional level.

At the regional scale, the principal outcome will be supporting the strategy and institutional option/s that emerge from this consensus building process including regional management tools and the potential establishment of a regional Groundwater Management Institute of Southern Africa (GMISA). The GMISA will contain knowledge about managing groundwater droughts, including water conservation techniques such as conjunctive use and improved recharge, and thereby contribute to a long term solution to the problem across the SADC region. Progress will be measured by endorsement by the SADC Water Resources Technical Committee of the regional tools (maps, database, knowledge management system) and guidelines; dissemination of the guidelines to member countries; and the establishment of the GMISA will contribute to a long-term solution to the problem across the SADC region. including completion of its initial staffing and workplan.

4. Project components

Component 1 – Development, testing and demonstration of a groundwater drought management plan for the Limpopo river basin pilot areas

Rationale: The primary objective of this component is to test the application and replicability of methods of decreasing the vulnerability of local communities and GDEs to the effects of groundwater droughts. The rationale is also to ensure that practical on-the-ground benefits accrue to local people from the project. The Limpopo basin has been selected partly because of the pressures its groundwater resources are facing, partly because of the extent of GDEs in the basin and partly because the groundwater assessment in the Limpopo River Basin has been specifically identified as a priority in the SADC Regional Groundwater Management Program. Two pilot areas have been selected within the Limpopo Basin (Figure 1) because they were trans-boundary, representative of GDEs, bio-diverse, drought-prone, had good data availability, and had good local support.

Target Group and Outcome: Local communities, including local government, in the pilot areas are the main target groups of this Component. Target groups also include the river basin organisations, particularly LIMCOM, and regional offices of national Water Departments and Environment Departments. The main outcome at local level in the pilot areas will be improved long-term ability to withstand the negative impacts groundwater droughts on water security and groundwater dependent ecosystems.

Inputs: Inputs will include expertise in communications, facilitation and capacity building to assist in the establishment and strengthening of stakeholder arrangements to develop an agreed management plan. Further inputs will be funds and technical expertise for physical interventions and data gathering, monitoring and interpretation to capture the ‘learnings’ from the pilot exercises. Where possible, a local tertiary institution will be involved in data gathering.

Outputs: The outputs of this component will be improved ability of stakeholders in the pilot areas to manage groundwater and GDEs, the small infrastructure assets constructed in the pilot areas to reduce the shocks of groundwater droughts and the ‘learnings’ derived from the pilot process which will be the input to Component 2 of the project – the development of regional groundwater drought management support.

Sector Issues: This component will provide a greater understanding at the local level of the role of groundwater in drought prone areas and measures which can be taken to balance human demand with the needs of GDEs.

Component 2 – Regional groundwater drought management support

Rationale: In spite of the importance of groundwater resources for regional growth, fundamental tools for transboundary groundwater management, such as hydrogeological maps and maps of groundwater vulnerability and water scarcity, are not available in the SADC region. As a result there is little consensus on the measurement and management of these resources. The tools developed in this component, together with the improved knowledge generated through the research sub-component, meet some of the specific needs identified by the SADC Regional Groundwater Management Program and will contribute to building consensus on the management of transboundary resources.

Target group and Outcome: Groundwater and environment managers from national agencies throughout region and SADC Environment staff will have access to an agreed mapping of transboundary and national aquifers as a basis for future joint management, improved knowledge of GDEs and the value of groundwater, and a set of guidelines for local groundwater drought management planning.

Inputs: Hydrogeological map and data (from associated French government funded projects); landuse, economic and ecosystem data-sets. Climate data will be accessed from national institutions and regional Drought Monitoring Centre.

Outputs: Improved knowledge of groundwater-dependent ecosystems, economic valuation of groundwater; maps of groundwater vulnerability and water scarcity; greater awareness amongst decision-makers of groundwater role; guidelines on better management of groundwater-dependent ecosystems throughout region. The translation of information gained through the pilot programs, regional data and information, and the GDE research into practical management tools and guidelines will make the output of the project both accessible and useful at regional and national levels.

Sector Issues: Greater understanding of GDEs and their vulnerability will contribute to their protection and the sustainability of fragile resources upon which rural communities depend. The impact upon and use of transboundary aquifers, particularly in the Limpopo River Basin will be better understood through the project together with the development of local management and physical modalities to ‘drought-proof’ local areas or at least increase their ability to cope with groundwater drought.

Component 3 – Establishment of the Groundwater Management Institute of Southern Africa (GMISA)

Rationale: There is a need to maintain a long-term regional awareness and capacity to address groundwater drought because of the climatic variability and unpredictability in the region. This is both to provide follow-through to the project (the implementation period of which may not coincide with a drought event) and to maintain readiness and capacity for future inevitable drought events which may occur anywhere in the SADC region. The SADC Regional Groundwater Management Program has identified the need for an institution (sub-project 6) to raise understanding of groundwater management through research, knowledge management, coordination and capacity building. The degree of consensus for the establishment of the Institute and the commitment to its financial sustainability on the part of the SADC Member States will be determined as a prerequisite for the establishment of the Institute.

The provision of a Groundwater Drought Monitoring Fund (GDMF) to the Institute will enable continuity of the project research program (included in Component 2) and assist the Institute to establish itself, to continue monitoring the pilot areas and set up an initial research program. This will greatly extend the value of the project, particularly given that the project period may not coincide with a regional drought event. The GDMF, administered and guided by the GMISA will be a key element in the management and protection of shared international aquifers in the SADC region and their dependent ecosystems.

Target group and Outcome: National environment and water resource managers, SADC Water Division and Environment Units, and developing River Basin Organizations will have a regional institution that provides data, knowledge, training and other capacity building, coordination with other regional activities and awareness raising of groundwater management.

Inputs: The Institution will be established with initial support from the project together with in-kind support from the host institution. The data and knowledge derived from Components 1 and 2 will also comprise significant inputs to the establishment of the Institution. The GDMF will also assist in ensuring the sustainability of the Institute.

Outputs: Institution capable of taking lead role in regional groundwater drought management, if there is sufficient consensus and established commitment to the financial sustainability of the Institute on the part of the SADC Member States.

Sector Issues: Provides node for promoting improved management to the benefit of all sectors described in A.1.

Component 4 – Project management and administration

Rationale: The project management is designed to provide maximum external support to SADC Water Division (SADC-WD) through a Project Steering Committee, a Project Services Agency and a Project Management Unit in response to lessons from earlier projects.

5. Lessons learned and reflected in the project design

Experience from a wide range of current work throughout the African Continent and in particular from programs such as the Nile Basin Initiative suggests that for projects to be successful related to shared international waters (both surface and groundwater), there is a need for the riparian countries to establish a common vision for action and to have political commitment at the highest possible level. In the case of this project, the Revised SADC Protocol on Shared Watercourses is the common framework agreed to by all the Member States which is currently being translated into a common management approach in the Limpopo and other river basins. The current project will support the Limpopo River Basin Organisation (RBO) and develop common tools to be housed in the regional institution to be established by the project as a precursor to a wider regional approach to transboundary groundwater management.

GEF experience also stresses the need for implementing agency collaboration and donor coordination. SADC has established a strategic reference group consisting of various donors to provide advice to the implementation of the Regional Strategic Action Plan (RSAP). The present project is part of a Regional Groundwater Management Program being supported by various other donors (see Technical Annex 1).

Experience also illustrates the importance of full stakeholder involvement in project preparation and implementation. The project concept presented in this PAD is an outcome of the significant consultative process that was part of the development of the Regional Strategic Action Program (RSAP) and, subsequently, the regional groundwater management program. The project itself will be steered by a group containing all stakeholders.

The Groundwater Management Advisory Team (GW-MATE), formed with the support of the Bank-Netherlands Water Partnership Program, has been supporting the design of the current project, by drawing on the multi-disciplinary international experience of its members. GW-MATE was formed with support from the Bank-Netherlands Water Partnership Program to promote a shift in emphasis from groundwater resource exploitation to improved management of the resource.

Experience through a number of World Bank engagements with the SADC Secretariat, including the preparation phase of this project, indicates that SADC has limited project management capacity. The management of the present project has therefore been designed to provide as much external support as possible through the appointment of a Project Services Agency to carry out the day-to-day administrative, financial and procurement activities and a Project Management Unit that will be responsible for the content of the project and the achievement of the project objectives. An alternative implementation arrangement could have been direct implementation of the

project by the SADC Water Division with administration and financial management being undertaken directly by the SADC Secretariat, however the experience during the project preparation phase under a GEF PDF B Grant indicates that project implementation is not the strength or the function of the SADC Secretariat or the Water Division. There is no experience of past completed World Bank projects being undertaken by SADC and therefore no relevant World Bank OED reports (Implementation Completion Reports (ICRs), Project Performance Assessment Reports (PPARs) etc.)

A key element of the sustainability of the proposed GMISA is the extent to which the commitment of the SADC Member States to the financial viability of the Institution can be determined and fostered.

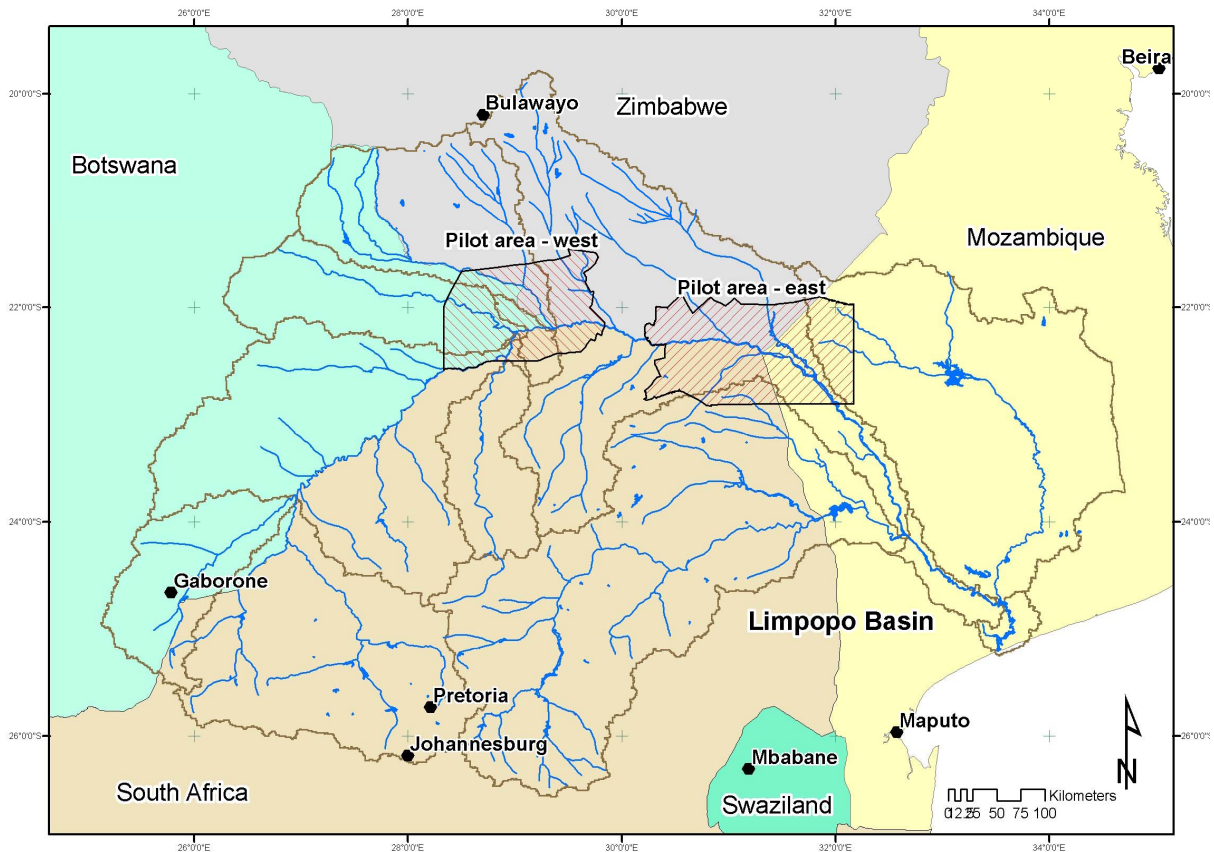


Figure 1- Limpopo River Basin and East and West Pilot areas

6. Alternatives considered and reasons for rejection

The project is specifically designed to meet the needs of the SADC member countries. The SADC Water Resources Technical Committee has emphasized the need to achieve practical on-ground results through work at local level. The pilot subcatchment component will develop and implement strategies for water supply for human needs and the protection of life supporting ecosystems, as well as provide valuable input to the regional components and LIMCOM. The regional and basin situation reports emphasize the impediment to management of GDEs due to a

lack of basic data. Consequently, this project will support the collection of environmental and economic data on GDEs. The other regional components –regional management tools and a Groundwater Management Institute of Southern Africa - are included in direct response to the request of the Sub-Committee for Hydrogeology. They will provide a common base on which regional groundwater drought management can be developed.

The general design of the project emerged from an assessment of alternatives carried out by SADC as part of the RSAP. The extensive situation analysis carried out at that time assessed general aspects of groundwater management keeping in mind the need to promote regional cooperation. Forty-four water resource development projects were considered. Thirty-one of these were then selected, using five criteria that represented the agreed development needs of countries in the region. This analysis subsequently led to the adoption of the overall groundwater management program. SADC (with support of its donors) subsequently recommended that the groundwater management program should focus on drought management issues and the development of regional management tools because of the importance of groundwater resources in arid areas and the agreed need to adopt a regional approach to transboundary aquifers.

The Project Steering Committee selected the Limpopo Basin for the pilot project activities because of the pressures it is experiencing, the importance of GDEs in the basin and the need to support LIMCOM. Eight potential pilot areas within the Limpopo Basin were selected for evaluation. Data were collected against eight criteria², including three socio-political criteria. The country representatives on the project Steering Committee assessed these potential sites in March 2003 and endorsed the two pilot areas shown in Figure 1 and described in Annex 17.

C. IMPLEMENTATION

1. Partnership arrangements

The project is a partnership between SADC (working through the Water Division), the governments and government departments of SADC Member States, the PMU and the stakeholders (in particular the user communities in the pilot areas of the Limpopo River Basin). The project is co-financed directly between GEF and the Swedish International Development Cooperation Agency (Sida), and indirectly through contributions from the French and German governments (through a hydrogeological mapping program, the outputs of which are important inputs to the project) and the SADC Member States.

Sida is providing 0.5 million US dollars as co-financing to the project. These funds are in the form of Bank implemented Trust Funds and will be employed through the AWRMI on activities agreed with SADC.

The project will be carried out in close collaboration with a hydrogeological mapping program, components of which are funded by the French and German governments. The mapping activities in sub-component 2.1 of the current project will be based on the hydrogeological map. The map and associated databases will complement the vulnerability and scarcity mapping activities.

² Replicability, drought proneness, impact on biodiversity, shared resource, data availability, user demand, water use, and socio-economic characteristics.

These projects will all be coordinated through the SADC-WD and jointly overseen by the Project Steering Committee.

The first phase of the development of the hydrogeological maps for the Southern African region is an exploratory phase entitled “Preliminary Study for the Development of the Hydrogeological Map and Atlas for the SADC Region”. This has been funded by the French Government (US\$ 80,000) and has been undertaken during the preparation phase of the project which is the topic of this PAD. The mapping exercised is to be financed by the German Government to the amount of 1 million Euro and is currently under preparation. The proposed Groundwater Management Institute of Southern Africa will be the custodian of the outputs of these projects.

2. Institutional and implementation arrangements

Period of Implementation: The period of implementation is four years.

Executing Agency and the Steering Committee: The SADC Water Division (SADC-WD) is the Executing Agency of the Project. It is located within the Directorate for Infrastructure & Services of SADC Secretariat located in Gaborone, Botswana. The implementation of the Project will be guided by a multi-stakeholder Project Steering committee (PSC). At the technical level, the SADC-WD is also guided by the Water Resources Technical Committee (WRTC).

The Steering Committee will report to the SADC Water Resources Technical Committee (WRTC), and the Integrated Committee of Ministers. Local stakeholder committees will be established in the pilot areas to guide local project activities.

The Limpopo Basin pilot activities will be carried out in close collaboration with the Limpopo River Basin Commission (LIMCOM) which will be represented on the Steering Committee.

Project Management Unit (PMU) and the Project Services Agency (PSA): The Executing Agency of the project (SADC-WD) will work through: (a) a Project Management Unit (PMU) for technical implementation, and (b) a Project Services Agency (PSA) for conducting the financial management, administration and procurement functions. The GMISA (to be set up during the project) will have a small unit to ultimately take over the functions of the PMU and PSA, including procurement and financial administration.

PSA:

Project contracting, disbursement and financial management and reporting will be handled through the PSA as these activities are beyond the capacity and functions of SADC-WD as currently constituted. The PSA will be a management group with experience in the administration of development projects and that meets Bank requirements for financial management and procurement. Both the PMU and the PSA will report to the SADC Secretariat through the SADC-WD. The SADC Secretariat, being the project executing agency, will fulfill its responsibilities for meeting Bank financial and procurement requirements through the PSA. Thus the SADC Secretariat will be relieved of day-to-day functions of the management and administration of the project whilst remaining the responsible executing agency.

On behalf of SADC-WD, the PSA will establish the PMU and contract a range of consultants to carry out the pilot and regional activities. There is considerable groundwater expertise in government agencies, NGOs and the private sector in parts of the region – particularly in South Africa, Namibia and Botswana – and wherever possible this expertise will be used in the project.

UNOPS has been identified by SADC through approved procurement processes as the PSA.

An Independent Review Panel of consultants will be at the disposal of SADC-WD. The objective of the Panel will be to provide an external resource to the project to review the technical and scientific plans, technology use, hydro-geology, GDEs, social and economic impact etc.

PMU:

The PMU will be established in Gaborone, Botswana, in a separate office to the SADC-WD. The role of the PMU will be to manage and coordinate the various consultancies that will be contracted to undertake the different project activities. Technical staff for the PMU will be regionally selected through open competition according to criteria agreed with the Bank.

Financial Management

Financial management arrangements will be as per Annex 7: Financial Management and Disbursement Arrangements. Adequate financial management staff and systems to ensure compliance with Bank financial management requirements will be provided through PSA.

3. Monitoring and evaluation of outcomes/results

The endorsement of the project outcomes by the Water Resources Technical Committee and the subsequent adoption of the tools and use of the Institute by the member countries will constitute the ultimate measure of the extent to which the Development objectives are met. The data for these indicators will come from the minutes of the Committee. Progress with the individual components will be monitored through annual indicators that have been set for each component. Data for these indicators will come from a variety of sources, including contractor reports, special social surveys carried out in the pilot areas, a post-completion survey of government water departments, and annual project progress reports submitted by SADC-WD to the Bank. The PMU will have direct responsibility for collecting data on progress against these indicators and ensuring that it is included in the reports. A Monitoring and Evaluation Strategy will be prepared for the project.

Costs of monitoring are built into the budget, including the surveys of acceptance of the management plan in the pilot project areas and the post-completion survey of adoption by government agencies.

The indicators will be included in the annual progress reports and will be assessed against the targets agreed when the project is effective. Slippage against these targets will be discussed during Bank supervision missions and the reasons for the slippage will be assessed. The Aide-

Memoirs will contain any actions that are agreed to correct serious problems that are uncovered by the indicators.

Monitoring and evaluation will be strengthened by the independent Mid Term Review and the provision in the project budget for the services of an Independent Review Panel which will comprise international and regional experts who will review and comment on every aspect of the project on a continuous basis throughout the project. The Independent Review Panel will review the conceptual and scientific design assumptions and outputs of the project and provide guidance to the Project Steering Committee and the PMU (the Panel will not be engaged in project management issues). This will assist in ensuring the scientific validity of the outputs which will in turn strengthen the sustainability and replicability of the outputs.

4. Sustainability and Replicability

SADC's commitment to the project is illustrated by the extensive process that gave rise to the proposal as well as the support received during preparation. The SADC Sub-Committee on Hydrogeology acted as the Steering Committee for the preparation activities. Representation on this committee was by those officials responsible for groundwater management within government departments. The Sub-Committee noted the importance of this project to SADC member countries during progress reviews of the RSAP. It is planned that this committee will form the core of the Project Steering Committee for project implementation along with a broader representation of stakeholder groups, thus ensuring continuity of oversight and commitment.

The tools developed during the project for regional management of groundwater will be sustained through the SADC system and the Groundwater Management Institute of Southern Africa (GMISA). The Institute is the most important element for the long-term sustainability of the project's outputs. It will have the role of promoting the concept of regional management of groundwater resources, building understanding about the benefits of regional management, developing capacity and furthering the use of the tools developed during the project.

The sustainability of the GMISA is of critical importance. Sustainability will require four main criteria – a) political endorsement and commitment; b) adequate leadership, c) technical and administrative competence, and d) financial security. One of the primary objectives of the establishment phase of the Institute during the first 2 ½ years of the project will be to ensure that these criteria are achieved, **without which the establishment of the GMISA will not proceed**. The measures taken to ensure this will therefore be determined during the project but would include:-

- a) The SADC Secretariat will be requested to canvas and re-affirm the commitment to the establishment of the Institute by the Member States. This will need to include appropriate commitment to the financial sustainability of the Institute (see d. below).
- b) Careful identification of the host institution within SADC such that the working conditions of the head and small staff of GMISA are conducive to attracting the highest caliber of professionals. The search process for the staff of the Institute will also need to be very thorough.

c) The institute will be established during the course of the project so that it operates concurrently with the project for 2 years. During this time the staff will benefit from a planned program of training and development which is provided for in the project budget. This will ensure that the Institute is competently run and the service that it provides to the SADC region is of the highest professional standard.

d) Financial sustainability is critical and will require creative and sustained effort. A number of avenues will be investigated such as

- ‘subscriptions’ from the SADC Member State governments,
- the sale of products, outputs and services,
- levies on research funds administered by the Institute, and
- fund raising.

The costs of running the Institute for the first two years will come from the project budget which will provide the opportunity for finances to be secured for the continued functioning of the organization. The 0.5\$ million Groundwater Drought Monitoring Fund provided for in the project, whilst not intended to cover day-to-day running costs, will also assist the Institute to establish itself and would provide some resources for running costs through administration fees.

The purpose of the Limpopo pilot component is to test various management options at the local scale, to learn from them and to replicate the lessons learned through the guidelines which will be developed for region-wide application. In addition, LIMCOM will be involved in management of the pilot project and, together with other international river basin organizations in the region, will be able to replicate these lessons learned from the pilot areas. Lessons learned can be replicated in other parts of the world through the GEF framework such as the GEF's outreach and publication program, GEF Lessons notes, and country dialogue workshops. These avenues provide excellent opportunities for wider dissemination of results at the global level.

A Replication Plan will be prepared by the mid-point of the project and will be reviewed by the Steering Committee, the SADC WD, the Review Panel and the Mid-Term Review. The Replication Plan will identify the key requirements required to ensure that the outputs of the project will be taken up at a regional level and within Member States, and will identify detailed actions to be undertaken during the remainder of the project period to ensure replication.

5. Critical risks and possible controversial aspects

Risk	Risk Rating	Risk Mitigation Measure
<i>Development Objective</i>		
SADC organs weak on promoting partnerships with civil society, academic research institutions and the private sector	M	The Project Steering Committee will be structured so that it can promote access to stakeholders and thereby develop the necessary partnerships.
Government institutions unable to utilize the regional tools developed and to use the services of the Institute,	S	The awareness campaign (sub-component 2.3) will be specifically targeted towards increasing support at political, management and commu-

<p>because:</p> <ul style="list-style-type: none"> • Priority given to national issues over regional ones unless senior managers appreciate the usefulness of such activities • Shortage of trained manpower • Lack of funds and equipment 		<p>nity levels for a regional approach to groundwater drought management. To this end, there needs to be a clear demonstration of the benefits of regional initiatives, and the Limpopo pilot studies will be utilized for this purpose.</p>
<p>The Institute does not acquire long-term institutional and funding support.</p>	M	<p>The Institute will be housed in an established, supportive organization and its TOR will require it to actively seek long-term donor support.</p>
<p><i>Components</i></p>		
<p>1. Riparian countries fail to reach a working relationship for management of transboundary aquifers in Limpopo pilot study</p>	N	<p>The riparian countries have agreed to work cooperatively towards a LIMCOM organization and have all endorsed the pilot project.</p>
<p>2.1 The regional situation report noted the great disparity in technical capacity amongst the member countries and the associated risk that it may be difficult to acquire the necessary data.</p>	N	<p>The capacity building activities, together with those being undertaken in parallel projects, will be designed to draw on the established capacities of South Africa, Botswana and Namibia in order to build regional links as well as increase technical skills in other member countries.</p>
<p>2.1 Government and private sector agencies are unwilling to provide data to a regional institution.</p>	S	<p>The French government hydrogeological mapping project has noted this risk and will build relationships to minimize it. The current project will utilize this goodwill where possible. The representatives on the Steering Committee will be selected to provide direct high-level support for access to data.</p>
<p>2.2 Hydrogeological base map is not completed in time.</p>	M	<p>Both projects are part of the Regional groundwater Management Program and progress is monitored by the SADC-WD and the Project Steering Committee. In addition, a representative of the French funding agency will be invited onto the steering committee for the current project.</p>
<p>2.2 Knowledge of ecosystem dependence on groundwater is not acquired during project timetable.</p>	S	<p>Existing knowledge about GDE will be used wherever possible. The research sub-component will be commenced as soon as practical, using knowledgeable regional specialists, to maximize the potential for acquiring the knowledge in time for other sub-components.</p>
<p>3. The Institute is unable to acquire donor funds to finance regional groundwater drought mitigation activities</p>	M	<p>Donor support will be partly determined by the success of the pilot activities, the usefulness of the regional guidelines and the willingness of member governments to implement the guide-</p>

		lines.
4. SADC is unable to provide the administrative support required by the donors	S	An experienced PSA is being contracted specifically to handle the day-to-day administrative activities.

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N(Negligible or Low Risk)

There are no specifically controversial aspects to the project.

6. Loan/credit conditions and covenants

None

D. APPRAISAL SUMMARY

1. Economic and financial analyses

The Incremental Cost Analysis provides the economic analysis of the project as a GEF supported program. The project is of benefit as a ‘complimentary/supplementary’ contribution to the development of knowledge of the management and protection of groundwater and GDEs in trans-boundary drought prone areas, complementary to existing efforts in the region.

The economic value of groundwater and GDEs in the SADC region has generally not been determined. That these resources play a vital role in local economies (and collectively in national economies) is unquestioned as in many semi-arid rural areas in the region groundwater is the only dependable source of water without which there would be no economic activity at all, even of a subsistence nature. One of the main outputs of this project is therefore precisely to contribute to the regional and global knowledge of the value of these resources.

The activities in the pilot areas will be carefully analyzed to determine the most cost effective means of improving the management of resources and the security of services during drought events. The analysis will need to include offsetting the costs of management and physical interventions against the cost of failure of supply during drought and the destruction of GDEs and their ecological and economic benefits. Failure has a range of human, social and economic costs at local and national levels including food insecurity, rural – urban migration, environmental degradation and increased long-term risk aversion to investment at local level resulting in the persistence of rural poverty.

The primary financial concern within the project is sustainability of the Groundwater Management Institute for Southern Africa (GMISA). This will be addressed as a major concern in the establishment of the Institute during the project. The issue of financial sustainability of the Institute is more fully addressed in Section 4 above – “Sustainability and Replicability”.

Financial management of the project has been an issue of concern related to the capacity of the SADC Secretariat to undertake the administrative, financial management and procurement requirements of a project of this size. The capacity of the Secretariat to undertake these activities in relation to the project preparation phase (through the PDF-B Grant) was appraised by a World Bank Financial Management Specialist to be adequate for the preparation phase but not for the execution phase. This conclusion is supported by the SADC Secretariat on the basis that their function is not to execute projects but to coordinate and facilitate regional development issues.

To ensure adequate financial management of the project, a Project Services Agency (PSA) will be contracted through the project to undertake these activities on behalf of the SADC Secretariat. The details of the functions of the PSA are provided in Technical Annex 6 – Implementation Arrangements.

2. Technical

Technical appraisal of the project is accommodated through the STAP Review which focuses on the scientific and technical soundness of the project in terms of the GEF STAP process (Refer to Technical Annex 16: STAP Review). The STAP review was undertaken in two steps which provided the opportunity to incorporate points raised by the STAP reviewer on the first draft of the PAD into the project design, thus strengthening the overall project design.

The technical quality of the project will be considerably strengthened through Independent Review Panel comprising international and regional experts who will review and comment on the conceptual and scientific design assumptions and outputs of the project and provide guidance to the Project Steering Committee and the PMU.

3. Fiduciary

The project executing agency, SADC Secretariat, does not currently have adequate capacity, including financial management, to implement the project, and can therefore not ensure necessary compliance with all Bank financial management requirements. To minimize the aforementioned risks and ensure the appropriate financial management capacity is in place prior to Project effectiveness, it is intended to contract UNOPS as the PSA and it will be responsible for the financial management aspect of the project. Also, the project is expected to set up the GIMSA, which will have a small unit to ultimately take over, amongst other functions, the financial management.

The PSA to be constituted by UNOPS is responsible for financial management, procurement and administrative functions on behalf SADC-WD. Without adequate staffing and proper segregation of duties, there is a danger that some staff may perform incompatible functions resulting in poor overall internal control. However, UNOPS has previous experience in implementing Bank-Assisted Projects and has handled the financial management functions for some of these projects. It is familiar with Bank Financial Management procedures and requirements. Also, it is expected that it will provide adequate staffing in the PSA based on the Management Services Agreement.

4. Social

The project, in conjunction with other projects in the Regional Groundwater Management Program, has the opportunity to lay the technical basis for cooperative management of shared aquifers into the future. However, there will need to be the development of transboundary institutional, legal and policy frameworks to be able to exploit this information. The current development of ZAMCOM and LIMCOM are examples of such activities. There are no firm plans at present for the promotion of such regional management initiatives. Groundwater management in many SADC countries is so limited that there is a risk that countries will continue to focus on national activities rather than take up the regional opportunities for socially and environmentally beneficial groundwater management.

Stakeholders were involved by SADC during the development of the RSAP out of which the Groundwater Management Program emerged. Stakeholders were again involved during project preparation at both the regional and Limpopo pilot levels.

At the regional level there was a complex mechanism for government stakeholder input to the project design through the multi-stakeholder project steering committee, SADC Sub-Committee on Hydrogeology, SADC-WD, SADC Water Resources Technical Committee (WRTC), the Sectoral Committees of Ministers and the Council of Ministers. In addition, the consultants undertaking the regional situation analysis contacted management agencies in all member countries to, *inter alia*, obtain their inputs to the project design, including components such as the proposed Institute.

Representatives of member countries, through the project steering committee, selected the pilot areas. The consultants undertaking the Limpopo situation analysis consulted with rural communities at 5 sites to understand their use and dependency on groundwater as well as their perceptions of its availability and quality. A workshop was held in May 2003 to provide input from stakeholder groups into the design of the project. Special attention was given to the importance of protecting GDEs at this workshop. Industry, central and local government, conservation interests, and catchment managers were represented at the workshop.

The implementation of the project will be overseen by a steering committee comprising government representatives (based on the steering committee formed for the project preparation) together with representatives of other stakeholders including private sector and community groups.

The pilot area situation report did not note any instances of traditional rights or entitlements although it did record occurrences of unequal access to groundwater.

The pilot project will inevitably advantage communities in the pilot areas over those elsewhere in the Limpopo basin. For this reason, it is imperative that this component of the project is treated as a pilot activity and not just as an end in itself. That is, the results from the pilot must be disseminated to the Limpopo basin area (through LIMCOM) and the rest of the region through the development of guidelines for local management plans and the activities of the Institute.

The monitoring program will include assessment of improvements in social wellbeing in the pilot areas through surveys and feedback via the steering committee.

5. Environment

The project is specifically aimed at developing an improved understanding of GDEs and testing management plans that will reduce the stress on these ecosystems in the pilot areas by promoting more sustainable use of groundwater.

Poor rural communities are the prime beneficiaries in the pilot areas. The pilot areas include portions of four countries – Botswana, Mozambique, South Africa and Zimbabwe. The communities in the different countries vary in terms of their comparative wealth / poverty. Whilst small

scale agriculture provides some degree of food security, one of the main sources of income is from migrant labor remittances. The communities depend largely on groundwater resources for drinking water, small scale irrigation and stock watering. The tourist activities in the pilot areas are also reliant on groundwater and the sustainability of GDEs. The management plans which will be developed in the pilot areas as part of the project, and then promoted throughout the region via the guidelines, will be designed to reduce the vulnerability of these communities to droughts by instituting better management practices, improved monitoring, and the construction of infrastructure to provide better storage and increased recharge of groundwater.

The regional and basin level situation reports make it clear that there are localized instances of nitrate pollution from human and cattle excretions where the concentrations are so high as to pose a threat to the health of those using the groundwater. The project will also promote the need for reduced groundwater pollution in its Public Awareness sub-component. It is expected that this campaign will be well received, given the receptiveness of participants at the Stakeholder workshop to the need for reducing these sources of pollution.

6. Safeguard policies

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[]	[x]
Natural Habitats (OP/BP 4.04)	[]	[x]
Pest Management (OP 4.09)	[]	[x]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[]	[x]
Involuntary Resettlement (OP/BP 4.12)	[]	[x]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[]	[x]
Forests (OP/BP 4.36)	[]	[x]
Safety of Dams (OP/BP 4.37)	[]	[x]
Projects in Disputed Areas (OP/BP/GP 7.60)*	[]	[x]
Projects on International Waterways (OP/BP/GP 7.50)	[x]	[]

Safeguard Screening Category

The Safeguard Screening Category is S3.

Environmental Screening Category

The Environmental Screening Category is C.

Key Safeguard Policy Issues

The project has pilot scale interventions in two pilot areas in the Limpopo River Basin which are designed to test the application and replicability of methods of decreasing the vulnerability of local communities and GDEs to the effects of groundwater droughts. The pilot areas are in an international water course – the Limpopo River Basin and therefore OP/BP 7.50, “Projects on International Waterways”, is triggered. However, the four riparian countries of the Limpopo river (Botswana, Mozambique, South Africa and Zimbabwe) are beneficiaries to the project as the project will be implemented in each of those countries. The four countries have been repre-

* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas

mented on the Project Preparation Steering Committee which has been the body responsible for over-seeing the preparation of the project and approving the selection of the Pilot Areas. Each of the four riparian countries have sent specific Letters of Endorsement of the project, which is a GEF requirement, and these are on file. Moreover, the recipient of the GEF grant will be the SADC Secretariat which is mandated to implement the project by the SADC Member States including the Limpopo riparian states. Under these circumstance the requirement of notification of other riparians does not apply.

Capacity to Implement Recommendations

Policy OP7.50, although formally triggered, is already satisfied because of the involvement of all SADC countries in the project selection and preparation. The capacity varies greatly across the four countries bordering the Limpopo basin. South Africa and Botswana have good technical, legal and institutional capacities for implementing safeguard requirements. Zimbabwe and Mozambique have poorer capacities. However, given that the project is designed to reduce stress on the environment, it is unlikely that there will be any impacts and the existing capacities should be sufficient.

The extent to which the project would trigger the safeguard policies was discussed with SADC officials during project preparation and it was agreed that the requirements of OP7.50 had been met.

7. Policy Exceptions and Readiness

No exceptions required.

Annex 1: Country and Sector or Program Background

AFRICA: Groundwater & Drought Management in SADC

SADC groundwater related activities

The Southern African Development Community (SADC) was formed by Treaty in 1992, to replace the earlier Southern Africa Development Coordination Conference. The Treaty was amended in 2001 to accommodate more countries and the changing objectives of the region. Thirteen countries - Angola, Botswana, DRC, Lesotho, Mauritius, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe - are now members.

SADC has the overall objective of “attaining an integrated regional economy on the basis of balance, equity and mutual benefit for all member States”. This overall objective will be pursued through three specific development objectives:

- Poverty alleviation
- Food security
- Industrial development

In 1996 SADC developed a policy and strategy for environment and sustainable development. This strategy identified five priorities for action including: environmental monitoring networks, reports and guidelines; reducing threats to human health and to ecosystems; promoting sustainable developments for benefit of future generations; managing shared natural resources on an equitable and sustainable basis including international river basins; and accelerating regional integration and capacity building.

The member countries of SADC identified water as a key resource that can benefit from cooperative management and established the SADC Water Sector in 1996 with a secretariat to coordinate projects in this area. Two notable outputs from the Water Sector are the SADC Protocol on Shared Watercourse Systems (and its subsequent amendment), and the Regional Strategic Action Plan (RSAP) for Integrated Water Resources Development and Management.

The SADC Water Resources Technical Committee (WRTC), the Sectoral Committees of Senior Officials and Ministers of Water acknowledged that more attention should be given to groundwater development and protection. To address these issues a SADC Sub-Committee for Hydrogeology has been established with membership of each Member State. A Regional Groundwater Management Program (RGMP) was initiated in 1996 with the overall objectives of promoting the sustainable development of groundwater resources, capacity building and supporting the development and implementation of management frameworks at different scales. The Program was approved in 1998. It includes ten sub-projects:

1. Capacity Building in the Context of a Regional Groundwater Management Programme.
2. Formulation of Minimum Common Standards for Groundwater Development in the SADC Region (French government support - COMPLETE).
3. Establishment of a Regional Groundwater Information System.
4. Establishment of a Regional Groundwater Monitoring Network.
5. Compilation of a Regional Hydrogeological Map and Atlas for the SADC Region (French government support - IN PROGRESS).
6. Establishment of a Regional Groundwater Research Institute/Commission.
7. Construction of a Website on Internet and publication of quarterly Newsletters (COMPLETE).
8. Regional Groundwater Resource Assessment of Karoo Aquifers (ISARM project - IN PROGRESS).
9. Regional Groundwater Resource Assessment of Precambrian Basement Aquifers.
10. Groundwater Assessment of the Limpopo/Save Basin

These sub-projects are being progressively implemented with support from SIDA, the government of France, BGR Germany, DFID, and UNESCO. The current proposal will contribute to sub-projects 1,3,4,5,6,and 10.

Current status of groundwater.

The continental SADC region covers 6.8 million km² and has 15 major transboundary rivers and numerous, albeit poorly understood, transboundary groundwater resources. In fact, every continental SADC country shares one or more of its water systems and about 80% of the region falls within a transboundary water system.

Rainfall is highly variable across most of the region resulting in periodic droughts and floods. Drought is a term with a wide variety of definitions. Meteorological drought is defined by the degree of dryness (lack of precipitation) and the duration of the dry period. Social drought incorporates a consideration of the demand placed on the water resource by different users. Groundwater drought describes when groundwater resources fail as a consequence of meteorological drought. However, the link between groundwater and meteorological drought is poorly understood, with groundwater drought typically occurring later than meteorological drought. One consequence of this is that those in groundwater dependent areas do not always receive assistance because the crisis is perceived to have past when the surface drought is over, whereas the groundwater drought may be far from over.

Drought is endemic to much of the region with major droughts occurring in 1946-7, 1965-6, 1972-3, 1982-3, 1986-8, 1991-2 and 1994-5. The region's water resources influence all aspects of the region's social and economic development, including hydropower, navigation, fishing, tourism, drinking water supplies, agriculture and industry and so these droughts have had major economic and social impacts. During the 1991-2 drought the Malawian Kwacha was devalued by 40% and over 3 million people were without adequate water supplies. In Zimbabwe, South Africa and Lesotho severe water shortages affected large areas requiring emergency relief programs³. Many of these people had been dependent on groundwater.

Some major aquifer types which occur across the region include: dambo systems⁴ supporting year round vegetable production; low-yielding aquifers consisting of deeply weathered basement rock (widely used to supply drinking water); sandstone formations; and aquifers in alluvial sediments associated with rivers and streams. Each possesses distinct management challenges.

The status of groundwater development in each individual country largely reflects the importance of the resource in that country. Member states such as Namibia, Botswana and South Africa, are largely dependent on groundwater and are actively integrating the use of groundwater in their water resources management policies. Other SADC Member States, that rely mostly on surface water, have little understanding of their groundwater resources. The vulnerability of groundwater supply systems to drought often results from the poor design and insufficient depth of wells, along with inappropriate pumping devices. The lack of water level monitoring and prediction is an aggravating factor.

In the SADC region, 37% of the population rely upon formal or improved groundwater supplies and 23% on reticulated supplies from surface water sources. The remaining 40% rely upon unimproved sources, which may be either groundwater or surface water, and which are generally unsafe and often prone to drought. About one third of the people in the region live in drought prone areas. In the driest part of the region, groundwater is the primary source of drinking water for the human population and livestock, irrigation for agriculture, industrial uses and town supply. It is also essential for wildlife and other biota and hence is fundamental to the tourism industry in these dryland areas.

Activities in the domestic, agriculture, mining, industry and urban sectors can also degrade the groundwater resources. The widespread use of on-site sanitation in rural and urban parts of the region can cause contamination of shallow aquifers in fractured or karst bedrock with pathogens and nitrates, and groundwaters have been over-drawn in some urban and peri-urban areas. For example, current waste disposal practices and uncontrolled drilling of boreholes in Lusaka have led to a simultaneous drop in water levels and an increase in contamination of the unconfined aquifer underlying the city.

The increase in commercial agriculture, particularly horticulture, in some parts of the region has led to the contamination of some aquifers with fertilizer derived nutrients. For example, nitrates from fertilizers have now contaminated the shallow alluvial aquifers in the middle reaches of the Kafue Valley in Zambia. Nitrates have also entered shallow groundwater systems in the Kutama and Sinthumule districts of Venda, South Africa because of modern agricultural practices under dryland cropping, and excessive drawdown for irrigation has affected aquifers in districts such as the Lomagundi Dolomite aquifer of Zimbabwe.

Mining activities have led to the contamination of aquifers with bacteria and other contaminants as well as the extensive loss of water, and even destruction, of some aquifers to the detriment of other users. Pollution from mineral

³ More details of the impact of droughts are available in the Regional Situation Analysis report.

⁴ Shallow colluvial sediments associated with seasonally inundated headwater swamps

processing has led to the contamination of aquifers with arsenic in Zimbabwe and heavy metals and sulphates in shallow groundwater systems in Botswana.

Groundwater Dependent Ecosystems (GDEs)

A number of the regions ecosystems are dependent on groundwater.

Five wetland systems are recognised in the SADC Region: palustrine, riverine, lacustrine, estuarine and marine systems. Each of these systems occurs throughout the region, representing specific and usually highly localised ecosystem (including human dependence on the services provided by the wetlands). These services include habitat for fish and other food stocks, provision of fibre and natural medicines, crops for cattle grazing, and (in some cases such as the Okavango Delta and Kruger National Park) support for wildlife on which tourism industries depend.

It is clear that the impact of groundwater drought is likely to be greatest in natural wetland ecosystems such as those that occur in the Okavango Delta (Botswana), Zambezi, Kafue and Luangwa flood plains (Angola and Zambia), Lake Malawi and Lake Chilwa (Tanzania, Malawi and Mozambique), the Oshana system (Namibia), the sand river systems (eastern Botswana, southern Zimbabwe and northern South Africa) and the dambo/mbuga/vlei valley systems (Zimbabwe, Zambia and Tanzania) amongst others. While all these ecosystems have received scientific study, these investigations been mostly undertaken from a botanical/wildlife/natural environment perspective. The nature of the groundwater-ecosystem interaction has not been reliably established, and in many cases has not been even considered in the study of the wetland system. The extent to which these wetlands and other ecosystems are dependent on groundwater is not known and constitutes a fundamental knowledge gap for managers. However, there is qualitative evidence that the existence of many of them (and thus the existence of all flora, fauna and human activity that are part of them) may be threatened by changes in groundwater levels, groundwater discharges and/or groundwater quality.

In the pilot areas of the Limpopo River, there are broadly three types of GDEs:

- Shallow, localized regolith aquifers with a limited amount of water storage
- Spring-type discharges associated with faults and contacts between rocks of different characteristics
- Floodplain systems with shallow, unconfined aquifers that are recharged primarily during flood events.

The last of these are believed to be the most important since they are the most likely to be used during droughts. These floodplain GDEs provide habitat for a wide range of flora and fauna and also provide goods and services for rural communities. Undisturbed floodplains display a sequence of vegetation types as one moves away from the river. Riverbanks, particularly in depositional rivers, support reedbeds; on main rivers there is also typically tall riparian forest. The remainder of the floodplain, being less well watered, typically has a woodland community or palm savanna. Much of this natural vegetation in the western pilot area has been severely degraded, at least in South Africa, with the levee forest cut adrift from the adjacent terrestrial environments by agricultural development. The eastern pilot area contains more undisturbed areas.

There are a number of conservation areas within the two pilot areas, illustrating their ecological importance. The western pilot area is centred on the proposed Limpopo-Shaste Transfrontier Conservation Area which consist of the Vhembe Nature reserve, the Limpopo Valley Game Reserve and the Venetia Limpopo Nature Reserve in South Africa and the Northern Tuli Game Reserve in Botswana. Zimbabwe does not have a conservation area in this pilot area although the Tuli Circle Safari Area abuts the Tuli Game Reserve. The eastern pilot area contains parts of the Kruger National Park (South Africa), Limpopo National Park (Mozambique) and Gonarezhou National Park (Zimbabwe). Active negotiations are underway for these three Parks to be joined into a Greater Limpopo Conservation Area.

The Madimbo section west of the Kruger National Park is a unique landscape with a wilderness character, where the riverine vegetation includes two of the four most endangered plant communities in the Limpopo River system. The area is also an important migratory route for elephants and buffalo and the transborder floodplains are considered to be of international importance particularly for breeding waterbirds, fish and amphibians. The floodplain forest provides habitat for eight species of bat, terrestrial mammals and birds. An application is being developed for Ramsar status for the area.

While it is generally known that most of these ecosystems are dependent on groundwater, there is no comprehensive description of GDEs throughout the pilot areas. A comparison of wet and dry season LANDSAT images shows

probable GDEs along most of the watercourses of the western pilot area and as patches along the Limpopo and Shaste Rivers where vegetation remains. The distribution of vigorous vegetation in the eastern pilot area also tracks the water courses and is particularly prominent in the Limpopo and Levubu floodplains and the Mwenzi River. There are also indications of GDEs on the slopes of flat, basalt-topped hills southeast of the Limpopo-Levubu confluence and possibly in the north-east (Mozambique) part of this pilot area.

Issues Affecting Regional Groundwater Management

Lack of information. While surface water resources are generally well characterized in the region, there is a dearth of even basic information for groundwater resources. In many cases even the extent of aquifers are not known, so that it is difficult to predict the effects of groundwater usage in one location on groundwater users elsewhere.

Similarly, there is little information on the dependence of ecosystems on groundwater. Specific ecosystems such as the Okavango Delta, the Zambezi, Kafue and Luangwa floodplains, fringing wetlands around Lakes Malawi and Chilwa, the Oshana system in Namibia, the sand rivers at the junction of Botswana, Zimbabwe and South Africa, and the dambo valley systems have been studied. However, these studies have focussed on the wild-life/vegetation/environmental aspects and have not paid much attention to the dependence of these ecosystems on groundwater. Thus, there is a dearth of physical and ecological information available on groundwater systems in the Southern Africa region and this lack of basic information limits management efforts.

Poor appreciation of the role of groundwater. Several countries in the SADC region share groundwater aquifers. However, there is little understanding of their transboundary nature amongst managers and communities dependent on the aquifers. Use of local aquifers may have a regional impact, as groundwater abstraction may reduce the base flow of international river systems shared by several countries and thus potentially threaten ecosystems and downstream water users. Similarly, the opportunities for cooperation across borders to use groundwater resources to protect human and ecosystems from droughts are little understood. Currently there are no joint monitoring networks, let alone management plans, in place for those shared aquifers.

Rainfall variability. The high degree of variability in rainfall and the associated shocks resulting from severe droughts and floods have a severe impact on the economies and the life supporting ecosystems of some countries of the region. Improved management of water resources is at the core of mitigating these water shocks. The importance of groundwater in drought management arises partly from its ability to provide renewable quantities of good quality water and partly from the storage capacity of aquifers. If properly managed, these aquifers can be used to reduce the stress on surface water resources during the dry periods. To do this in a sustainable way – conjunctive use of surface and groundwaters - requires a good understanding of the basic properties of the aquifer and good management structures.

Legal and regulatory limitations. Laws in most member countries have been drawn up with regulation of surface water sources in mind. For example, in Zambia there is no reference to groundwater in the water law⁵. The consequence is that there is little legal backing for managing some of the characteristics peculiar to groundwater, such as establishing private and public property rights. In addition, water law has not always kept up with the increasing decentralization of responsibility for water management and the rise in responsibility of user groups.

Even where there is adequate legal backing, enforcement of formal regulations is typically weak because of lack of basic resources, and a lack of training and capacity.

Institutional limitations.

Responsibility for management of the basic resource is often fragmented between different authorities and at different scales. This issue has been exacerbated in recent years with the move towards decentralization of management responsibility. Typically, local government, and Water Departments, Planning Departments and Environment Departments are responsible for different aspects of groundwater management, with both central and regional offices of the departments further diffusing responsibility. Not only does this lead to convoluted decision making but it makes the provision of even basic information for management, such as groundwater monitoring data, more difficult to obtain.

⁵ Zambian water law is currently being revised.

There is a lack of personnel in many government offices with training and experience in groundwater management, and funding constraints in many SADC countries prevent those personnel that do exist from carrying out their duties. Thus, in Malawi, UNICEF (1995) have noted that it is not uncommon for district level technicians to be without transport for months, making compilation of water supply assessments impossible. Technical staff will be trained as part of the capacity building aspects of the current project.

As yet there are no transboundary institutions in the region tasked with managing transboundary waterbodies. However, treaties establishing the Limpopo Basin Commission and the Zambezi River Basin Commission are being negotiated at present. These commissions will include transboundary groundwater management in their mandates. The former will be a potential home and source of continuity for the information and knowledge gained in the pilot project.

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Annex 2: Major Related Projects Financed by the Bank and/or other Agencies

AFRICA: Groundwater & Drought Management in SADC

For more details also see the Baseline Project table in Annex 15: Incremental Cost Analysis.

Project	Agency	Period	Relevance to this project
Support for the Implementation of the SADC protocol on Shared Water Resources	SADC Water Division with a large group of multilateral and bilateral Donor Agencies	2003-2008	Establishment of RBOs, including Limpopo River Basin Commission, and support to RBOs in carrying out Basin Plans. Formulation and signing of riparian agreements on equitable sharing of common water resources.
Formulation of regional Sector Policy and Strategy	SADC Water Division with support from Belgium, GWP SA, IUCN, Invent and others	2003-2005	Regional Water Sector Strategy Awareness creation on the policy and strategy
Program for the sustainable development of groundwater resources under the community water and sanitation program in South Africa	NORAD	2002 - 2005	Guidelines and standards for implementing groundwater monitoring and management at local government level Groundwater data management system Appropriate technology introduction
WaterNet, regional program to strengthen capacity in IWRM in the SADC region	University of Zimbabwe with funding from NEDA/Sida /DANIDA	1999 – 2005	Support capacity building component of this project through its regional network of Institutions
SADC-HYCOS project, Hydrological Cycle Observing System.	DWAF-SA with funding from EU, Netherlands	2003 – 2007	Provides real time data on river flows in the entire SADC region incl. the Limpopo River
Zambezi Basin Wetlands Conservation and resources Utilization Program	CIDA	September 2003 - 2005	Ecosystem data and management. The information from this project will be used to inform the development of vulnerability maps.
Water Resources Management Study in Botswana	DANIDA	Completed.	Data on water resources in the Limpopo tributaries will be used in Component 1.
Zambezi Action Plan	DANIDA	Ongoing	Situational analysis including environmental, hydrological, pollution and land use planning studies. Will provide input information for Component 2.
Water Management Plan of the Limpopo River Catchment, east of Messina, South Africa	FINIDA	Completed	Includes water quality management plans in several catchment areas and a water law review process in the eastern pilot area. Plans will be used as basis for drought management plans where possible.
Internationally Shared Aquifer Resources Management – Limpopo case study	UNESCO, FAO and IAH	Completed	Study of joint management of Karoo aquifer between Botswana, South Africa and Namibia. Information will be fed into pilot area drought management planning.
Rapid Environmental Assessment of the Limpopo basin	USAID	Completed	Provides data for Component 1.
Development of Minimum	French/GTZ	Com-	Provides an input to the development of the pilot

Common Standards for Groundwater Development in the SADC Region		pleted	areas
Regional Hydrogeological Map and Atlas for the SADC region	French/German BGR	2003-2005	Design complete. Provides base hydrogeological map (1.28 million US\$) for Component 2.

The last of these projects is particularly relevant to the present project since it will provide the base on which the maps in Component 2 can be produced. It will undertake the onerous task of collating and standardizing the existing groundwater data from the SADC countries which are presently at different scales, of different periods and categorizations. The current project will work closely with the steering committee for sub-project 5 to ensure that schedules are met and outputs are compatible. The SADC member countries have expressed a strong desire to have the standardized database freely available and accessible. To this end, the database will be maintained by the Institute along with the additional datasets and maps developed during the present project.

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Annex 3: Results Framework and Monitoring
AFRICA: Groundwater & Drought Management in SADC

Results Framework

PDO/Global Environmental Objective	Outcome Indicators	Use of Results Information
<p><u>PDO</u>: The development of consensus on a SADC regional strategic approach to support and enhance the capacity of its member States in the definition of drought management policies, specifically in relation to the role, availability (magnitude and recharge) and supply potential of groundwater resources."</p> <p><u>Global Environmental Objective</u>: Groundwater dependent eco-systems in drought prone areas of SADC better understood and protected</p>	<p>SADC, RBO's & Member States better able to mitigate against groundwater drought by adopting the management guidelines and tools.</p> <p>Greater awareness of, and scientific knowledge about, groundwater dependent eco-systems measured by refereed reports on dependence in at least three representative ecosystems</p>	<ul style="list-style-type: none"> • 1st six months – determine the successful establishment of the project • YR1 – YR3 determine if pilot lessons are adequate for replication and upscaling • YR2 – establish the extent to which there is political will to set up the Institution • YR4 - indicate the demand for the regional guidelines and management tools and whether they will be used by Member States
<p>Component One : Development and testing of a groundwater drought management plan for the Limpopo River Basin pilot areas</p>		
Intermediate Results	Results Indicators	Use of Results Monitoring
<p>Stakeholders and groundwater dependent eco-systems in the pilot areas are less vulnerable to drought impacts and regional implications are identified.</p>	<ul style="list-style-type: none"> • Pilot area management plans adopted and implemented • Senior responsible officials and professionals aware of /support pilot area interventions and able to ensure sustainability of interventions • 75% of stakeholders indicate confidence in measures to reduce vulnerability and willingness to participate in the implementation of protective measures • Monitoring network & interpre- 	<ul style="list-style-type: none"> • Improve stakeholder involvement and build commitment to program of stakeholders • Identify level of commitment by responsible authorities • Review stakeholder awareness creation effectiveness • Indicate adequacy of capacity to sustain maintenance and operation of installed works. • Improve level of sustained commitment between droughts • Assess effect of management plan on sustainability of local GDEs • Assess the quality and effectiveness of the Plan and its implementation –

	<p>tive processes in place</p> <ul style="list-style-type: none"> • Lessons learned summarized and passed onto those developing regional tools 	adjust where necessary
Component Two : Regional groundwater drought management support		
Intermediate Results	Results Indicators	Use of Results Monitoring
Regional management tools and guidelines prepared	<ul style="list-style-type: none"> • Guidelines and tools endorsed by SADC Water Resources Technical Committee • Planned guidelines and tools disseminated to 100% of Member States 	<ul style="list-style-type: none"> • Determine SADC's commitment to the outputs • Identify and address difficulties with accessing data from national sources • Identify adequacy of environmental data from research activities and feed results back to researchers
Component Three : Establishment of Groundwater Management Institute of Southern Africa		
Intermediate Results	Results Indicators	Use of Results Monitoring
Groundwater Management Institute of Southern Africa established and financially viable	<ul style="list-style-type: none"> • Governance structure agreed and established • Home institution identified and agreement signed • Director and senior staff appointed • Workplan approved by Board of Directors and the Institution functional • Groundwater Drought Monitoring Fund established 	<ul style="list-style-type: none"> • Identify difficulties in securing initial sources of finance for recurring costs • Identify problems with political endorsement of host institution through SADC systems
Component Four : Project Management and Administration		
Intermediate Results	Results Indicators	Use of Results Monitoring
Project successfully managed, administered & implemented	<ul style="list-style-type: none"> • Project activities successfully completed • Required reports produced and approved • Project audits approved 	<ul style="list-style-type: none"> • Identify problem areas in the working interface between the PSA, the SADC Secretariat and the PMU

Arrangements for results monitoring

Outcome Indicators	Baseline	Year				Data Collection & Reporting		
		YR1	YR2	YR3	YR4	Frequency and Reports	Data Collection Instruments	Responsibility for Collection
SADC, RBO's & Member States better able to mitigate against groundwater drought by adopting the management guidelines and tools.	From Regional Situation Analysis report	_____	_____	_____	100% adoption	In last year of project	Minutes of meeting of SADC Water Resources Technical Committee	Water Resources Technical Committee
Greater awareness of, and scientific knowledge about, groundwater dependent eco-systems measured by refereed reports on dependence in at least three representative ecosystems		_____	_____	2 ecosystems	3 ecosystems		Academic literature	
Results for each Component								
Component 1								
Pilot area management plans adopted and implemented	Review of pilot area facilities at commencement of planning process	_____	_____	50	80	Annual progress report	Report from contractors	PMU
Senior responsible officials and professionals aware of /support pilot area interventions and able to ensure sustainability of interventions		_____	60	_____	75	Annual progress report, Yrs 2,4	Survey as part of MTR and ICR	PMU
75% of stakeholders indicate confidence in measures to reduce vulnerability and willingness to participate in the implementation of protective measures		_____	50	_____	75	Annual progress report, Yrs 2,4	Survey as part of MTR and ICR	PMU
Monitoring network & interpretive processes in place		_____	30	50	80	Annual progress report	Report from contractors	PMU
Lessons learned summarized and passed onto those developing regional tools		_____	_____	50	100	Annual progress report	Interim and final Reports to Regional component	PMU

Component 2 Guidelines and tools endorsed by SADC Water Resources Technical Committee	No baseline required	_____	_____	_____	100%	At end of project	Minutes of SADC Water Resources Technical Committee	PMU
		_____	_____	_____	100%	At end of project	Post completion survey of water management agencies in member countries	PMU
Component 3 Host institution identified and agreement signed	No baseline required	_____	100%	_____	_____	Annual	Annual progress report	PMU
		_____	_____	50%	100%	Annual	Annual progress report	PMU
		_____	_____	_____	100%	Annual	Annual progress report	PMU
Component 4 Project activities successfully completed	No baseline required	_____	40%	60%	80%	6 months	Progress reports	PMU
		20%	60%	80%	100%	Quarterly & annual	Financial and other reports to World Bank	PSA and PMU
		20%	60%	80%	100%	Annual	Annual Audit reports	Independent auditor

NOTE: Monitoring will be strengthened by the independent Mid Term Review and the provision in the project budget for the services of an Independent Review Panel which will comprise international and regional experts who will review and comment on every aspect of the project on a continuous basis throughout the project.

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Annex 4: Detailed Project Description
AFRICA: Groundwater & Drought Management in SADC

Table 1: Summary of Component Activities and Tasks

COMPONENT 1 – Development and Testing of a Groundwater Drought Management Plan for the Limpopo River Basin Pilot Areas (2.3M US\$)

Sub-Component 1.1 Development and testing of a Groundwater Drought Management Plan for the Limpopo River Basin Pilot Areas

Activities & Tasks

1. Establish local framework involving all stakeholders to ensure a transparent learning environment for the exchange of learnings before, during and after the pilot interventions and to ensure maximum benefit from the pilot demonstration activities.
2. Collate and assess existing information and knowledge on the institutional, biological, social, formal and customary water rights and economic situation relevant to groundwater droughts in the pilot areas. In addition prepare an inventory of groundwater uses, users, polluters and pollution profile. Assess opportunities for non-structural interventions such as changes in water pricing schedules to promote conservation.
3. Assess regulatory provisions and institutional arrangements in the pilot areas in the context of implementation of groundwater protection and management. Identify impediments to implementation and propose measures to address these impediments.
4. Establish representative ‘nodes’ within the pilot areas for interventions for groundwater drought mitigation. To be achieved using the output of Activity 1 and input from LBPTC and other stakeholders from the pilot areas.
5. Develop management plans for the selected nodes, encompassing the following:
 - physical interventions (e.g. artificial recharge infiltration dams or sand storage curtains)
 - community awareness raising/education and involvement
 - establishment of user organisations stakeholder management groups
 - capacity building for professionals and user organisations in the pilot areas
 - monitoring of environmental, social and economic indicators related to the intervention, including EIA of proposed physical interventions
 - data gathering.
6. Undertake data collection with assistance from local academic institution:
 - inventory of boreholes
 - basic hydrogeological characteristics
 - groundwater quality
 - permeability
 - recharge areas
 - wetland ecology
7. Implement physical interventions and associated capacity building (for professionals, technical staff and local government staff such as water bailiffs) and awareness raising initiatives, including conservation techniques such as conjunctive use and improved infiltration in recharge areas through vegetation management if suitable.
8. Undertake monitoring and evaluation of interventions with independent review panel
9. Establish lessons learnt from representative nodes and integrate into awareness creation programme (i.e. Sub-component 2.3) and decision support guidelines for groundwater drought management developed (under sub-component 2.4).
10. With input from the LBPTC identify and reach agreement on ongoing operational mechanism and institutions for continuing the local strategies

COMPONENT 2 – Regional Groundwater Drought Management Support (2.4M US\$)***Sub-component 2.1 Development of a Regional Groundwater Vulnerability Map (based on hydrogeological map and database)****Activities & Tasks*

1. Determine how groundwater drought vulnerability can be mapped in a workable dynamic timeframe (i.e. develop vulnerability algorithm) [Vulnerability will entail considering GW quality and quantity in relation to the ecological and human environment. Attention will also be given to land-use zoning]
2. Collate existing data and assess information required for vulnerability mapping for the region (considering both existing in-country national and transboundary circumstances) including regional climate data from national institutions and Regional Drought Monitoring Centre.
3. Collate and analyze historical climate events resulting in groundwater deficiency.
4. Agree on and prioritise transboundary aquifers for data collection and mapping at the regional scale. Workshop with technical experts and decision makers.
[Prioritise regional transboundary aquifers, but also use in-country national data if available for future mapping by the Groundwater Management Institute of Southern Africa]
5. Agree on monitoring plan required for development of the vulnerability map and further input to ensure it remains dynamic.
6. Implement monitoring plan and establish update mechanism for database.
7. Establish data base and mapping system for the groundwater drought thematic maps.
8. Determine how GDEs distribution and vulnerability can be mapped in workable dynamic timeframe.
9. Provide pertinent training and essential equipment for monitoring, if necessary, to transboundary Member States
10. Provide necessary capacity building in relation to monitoring, database and mapping system development
11. Develop dynamic vulnerability map and associated thematic layers (from the data provided and also that generated from sub-component 2.2 also develop static ground water scarcity and demand maps)
12. Workshop to present and obtain approval for maps
13. Capture lessons learned from map development process

Sub-component 2.2 Research of Groundwater Knowledge Gaps*Activities & Tasks*

1. Review existing information on ecosystem dependence on groundwater in the SADC region using technical experts in hydrogeology and wetland ecology.
2. Undertake inter-comparable data collection pertaining to:
 - identification of potential GDEs
 - characterisation of the GDEs in different hydrogeological environments
 - identification of the nature, extent and degree of dependency of the ecosystem on groundwater (including noting the impacts of historic droughts on such system)
 - identification and quantification of the goods and services delivered to society from the GDEs
 - identification and quantification of the goods and services which contribute to drought resilience within the local society and economy.
 - indicate the value of the environmental role of groundwater (with special reference to drought preparedness)
 - assess the current management systems which relate to GDEs (and their intervention during historical droughts) and indicate how they may be strengthened to implement the necessary protection mechanisms and derive optimal benefits for drought preparedness.
 - recommend pragmatic measures to address typical dependence cases.
3. Store data in database administered by the component consultant
4. Present results of research (including data) for incorporation into other components (such as: decision support guideline development (sub-component 2.4), vulnerability mapping (sub-component 2.1) and for content to be disseminated as part of awareness raising campaign (sub-component 2.3))

5. Develop methodology for economic valuation of groundwater (taking cognisance of the economic impacts of historical groundwater drought events)
6. Select representative activities of the region and locations for the determination of groundwater valuation
7. Collect additional data where necessary
8. Reach agreement on valuation methodology with Member States
9. Implement methodology and establish values of groundwater
10. Present results of research (including data) and methodology implementation for incorporation into other components (such as: decision support guideline development (sub-component 2.4), vulnerability mapping (sub-component 2.1) and for content to be disseminated as part of awareness raising campaign (sub-component 2.3))

Sub-component 2.3 Regional Awareness Creation regarding Groundwater

Activities & Tasks

1. Develop a focused awareness campaign strategy for the region's decision makers (targeting the water resource sector and sectors influenced by groundwater drought). The strategy will augment the results obtained during PDF-B and other SADC WD awareness initiatives [main focus relates to the importance of GW and its use in mitigating against symptoms of drought and relation to GDE].
 - Develop the content for the various audiences through which information can be most effectively disseminated
 - Establish the most appropriate mechanisms (i.e. the Web, newsletters, technical documentation, the mass media etc) for raising groundwater drought awareness
 - Establish indicators and anticipated outcomes of such a campaign
2. Execute the awareness campaign
3. Capture lessons learned from awareness raising campaign including a full evaluation for inclusion in the decision support guidelines for groundwater drought management and the associated knowledge management database (i.e. subcomponent 2.4)

Sub-component 2.4 Develop Decision Support Guidelines and a Knowledge Management System for Groundwater Drought Management in the Region

Activities & Tasks

1. Collate data and lessons learnt generated during component execution (this data should include data and knowledge obtained during the project preparation phase and other related project throughout the region).
2. The data will be used to populate the knowledge management system (repository/database) and the lessons learnt will be used to produce decision support guidelines for groundwater drought management (with particular reference to aspects such as social dynamics associated with 'grassroots' groundwater drought intervention, ecosystem responses to drought, groundwater valuation methodology, vulnerability mapping, requirements for implementing groundwater management and protection, etc).
3. Guideline design and mechanism of dissemination to be determined through guidance obtained from groundwater resource managers and lessons learnt during capacity building initiatives (undertaken as part of sub-component 1.1 and 2.1)
4. Produce and disseminate decision support guidelines for groundwater drought management.
5. Maintain and update knowledge management system for the full duration of the project and transfer to the Groundwater Management Institute of Southern Africa (GMISA) on its establishment (sub-component 3.1)

COMPONENT 3 – Establishment of the Groundwater Management Institute of Southern Africa (GMISA) (0.42M US\$; plus \$500,000 Groundwater Drought Monitoring Fund)

Sub-Component 3.1 Identification and Establishment Of the Groundwater Management Institute of Southern Africa

Activities & Tasks

Phase 1 – Identification of the GMISA host and ensure consensus and commitment

1. Obtain re-endorsement of the concept of the GMISA and the criteria for selection of a host for the institution. [The concept for the GMISA will centre around: (i) the hosting and maintenance of project component outputs, (ii) facilitation of action-oriented research, (iii) technology transfer, (iv) capacity building and (v) donor fund solicitation for groundwater drought intervention].
2. Refine and approve the criteria for host institution selection in consultation with relevant Member States stakeholders. (Identify and agree on an enabling environment requirements such as day-to-day logistical requirements (offices, communications, IT set up etc) and a capacity to accommodate and operate the outputs from the other project components, e.g. database and mapping system, knowledge management system, etc.).
3. Undertake a regional institutional analysis for the potential host (following on from initial institutional analysis undertaken during the project preparation phase)
4. Present a shortlist of candidate institutions and select the GMISA host through SADC procedures

Phase 2 – Establishment and initiation of the GMISA

5. In conjunction with Member States:
 - design the RDGMI
 - develop a mandate or charter for the Institution, including relationship with existing SADC bodies and staffing/planning/financial aspects for an initial period of 5 years
6. Investigate and recommend appropriate mechanisms to ensure the operational and financial sustainability of the Institution after the project period
7. Investigate and assess the potential of the GMISA to function as the solicitor of donor funds and act as the financing mechanism for regional / transboundary groundwater drought mitigation (e.g. upgrading existing water services and upgrading water infrastructure).
8. Generate the Terms of Reference of Institution staff and assist with their employment
9. Provide additional essential equipment to enable the institution to function (e.g. computers, etc.).
10. Provide necessary capacity building in relation to monitoring, database and mapping system development
11. Initiate the functioning of the institution and the transfer of component outputs to be accommodated by the GMISA

Establishment of the Groundwater Drought Monitoring Fund (GDMF)

12. Prepare GDMF Agreement including governing rules and procedures
13. Establishment of GDMF Account
14. Raise funds and initiate ongoing monitoring and research activities

COMPONENT 4 – Project Management and Administration (1,8M US\$)

Sub-Component 4.1 Project Steering Committee (PSC)

Activities & Tasks

1. Establish and activate/commission the project steering committee representing the technical, government and community groups benefiting from the project outputs.
2. Convene and hold annual meetings and advise SADC WD on project implementation

Sub-Component 4.2 Project Services Agency (PSA)

Activities & Tasks

1. Procure and contract PSA according to World Bank guidelines
2. Set up procedures and systems for project administration
3. Establish the PMU and assist in the procurement of the Project Manager from within the region
4. Undertake administration, financial management and procurement activities in support of the PMU (and on behalf of SADC Secretariat) for the full duration of the project
5. Undertake financial and procurement reporting

Sub-Component 4.3 Project Management Unit (PMU)

Activities & Tasks

1. Select PMU staff (i.e. permanent staff and supporting expert panel)
2. Develop project work plan
3. Implement, manage and monitor the work plan
4. Prepare Replication Plan by project Mid-Term
5. Liase with project stakeholders and coordinate project without other regional projects and initiates
6. Carryout project advocacy and project awareness creation roles and responsibilities [NOTE: this is awareness creation relating to the project and not the groundwater drought awareness raising as to be undertaken as part of Sub-component 1.1 and 2.3]
7. Ensure ongoing management of PMU

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Annex 5: Project Costs
AFRICA: Groundwater & Drought Management in SADC

	Total	Year 1	Year 2	Year 3	Year 4
Component 1- Pilot testing	1,735,903	167,376	354,376	574,376	639,776
Component 2- Regional Drought Management support	2,030,612	298,171	516,721	614,535	601,185
Component 2.1- Regional Drought Vulnerability Map	1,299,384	147,921	353,221	432,521	365,721
Component 2.2- Research of GW Knowledge Gaps	529,499	150,250	163,500	104,500	111,250
Component 2.3- Regional Awareness Creation	112,665	0	0	27,957	84,707
Component 2.4- Decision Support Guidelines and KM System	89,064	0	0	49,557	39,507
Component 3- Regional GW Management Institution	582,195	96,374	79,374	200,474	205,974
Component 4- Project Management and Administration	2,151,290	609,367	480,867	490,317	570,739
Component 4.1- Project Steering Committee	122,075	30,519	30,519	30,519	30,519
Component 4.2- Project Services Agent	614,549	153,637	153,637	153,637	153,637
Component 4.3- Project Management Unit	1,414,666	425,211	296,711	306,161	386,583
Groundwater drought monitoring fund	500,000				500,000
Total Project costs	7,000,000	1,171,287	1,431,337	1,879,702	2,517,674
Sida funds - Bank executed Trust Fund	500,000	125,000	125,000	125,000	125,000
France – Hydrogeological Mapping Project	80,000	80,000			
Germany - Hydrogeological Mapping Project - 1M Euro	1,220,000	406,667	406,667	406,667	
EU, Netherlands + others - SADC HYCOS program	800,000	200,000	200,000	200,000	200,000
Total Foreign Contribution	9,600,000	1,982,954	2,163,004	2,611,368	2,842,674
Local SADC Governments Contribution *	3,520,000	880,000	880,000	880,000	880,000
Total	13,120,000	2,862,954	3,043,004	3,491,368	3,722,674

* Local funding will come from government contributions in the form of staff time and effort expended on the project through the attendance of Steering Committee Meetings, time collecting, collating and transmitting information, reviewing and commenting on draft outputs, assisting local project activities, provision of office space and services to visiting project staff, etc. In addition to the funding from government, a considerable contribution will be made to the project by the communities in the pilot areas over the five years of the project. This will be in terms of community representatives' engagement in the governance and guidance of the pilot areas through local steering committees, engagement in localized site activities, assistance with monitoring and data capturing exercises, etc. Contributions are assumed at a level of US\$60,000 per year per SADC country (assuming 12 active countries) with the four countries engaged directly in the pilot areas (Botswana, Mozambique, South Africa and Zimbabwe) contributing a larger share of US\$100,000 each.

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Annex 6: Implementation Arrangements

AFRICA: Groundwater & Drought Management in SADC

The period of implementation is five years (beginning in 2004). The World Bank will be the Implementing Agency. SADC Water Division (previously known as SADC Water Sector Coordinating Unit (SADC-WSCU)) has been the Executing Agency during the GEF PDF B project preparation phase. Project execution, both at a regional and river-basin scale, will be undertaken by the SADC Secretariat, through the Water Division, via a Project Services Agency (PSA) and a dedicated Project Management Unit (PMU). The project will be guided by a multi-stakeholder Project Steering Committee (PSC).

SADC Water Division

The SADC Water Division (SADC-WD) is part of the Directorate of Infrastructure and Services of the SADC Secretariat. The Division is based in Gaborone, Botswana and is staffed by two senior seconded officials from Member States plus Technical Advisors and Assistants which are funded through a number of cooperating partners. The SADC-WD is implementing a Regional Strategic Action Plan (RSAP) for Integrated Water Resources Development and Management (1999). The Water Sector has identified 31 priority projects within the RSAP. The present proposal is designed to help implement one of those priorities, the Regional Groundwater Management Program in the SADC Region. This Program is overseen by a sub-committee of the SADC Water Resources Technical Committee.

The role of SADC-WD as Executing Agency for this project is consistent with their existing role of implementing the RSAP (which includes the groundwater project), including:

- Strategic planning for the further development and implementation of the RSAP (including prioritisation and communication)
- Institutional coordination of consultation and reporting, during the full project lifecycle
- Project coordination between different project's outputs and activities, and the dissemination of the outputs
- Monitoring and evaluation of the RSAP

The SADC-WD is responsible to the Director of Infrastructure Services to ensure that all RSAP projects deliver on their objectives.

The Water Division takes overall responsibility for the project management (at a strategic level):

- Coordination and responsibility for project funding and project outcomes
- Prepare a Project implementation plan
- Coordinate the Project with other water resources projects in the region
- Facilitate and coordinate participation and contributions from participating countries
- Coordinate and Supervise the activities of the PSA and PMU to:
 1. Ensure project adheres to schedule and delivers agreed outputs

2. Ensure timely submission of progress reports
 3. Certify financial reports related to the work done.
- Act on recommendations from Project Steering Committee
 - Report progress to all SADC structures
 - Ensure that SADC decisions are reflected at the project implementation level

Cooperating Partners

The project is a partnership between SADC (working through the Water Division), the governments and government departments of SADC Member States, the PMU and the stakeholders, in particular the user communities in the pilot areas of the Limpopo River Basin. The project is co-financed directly between GEF and the Swedish International Development Cooperation Agency (Sida), and indirectly through contributions from the French and German governments (essential hydrogeological mapping project) and the Member States.

The project will be carried out in close collaboration with a hydrogeological mapping program, components of which are funded by the French and German governments. The hydrogeological maps will provide the base for the vulnerability mapping being undertaken in this project. A representative of these projects will be invited to sit on the PSC to ensure maximum coordination.

Project Steering Committee

The PSC will represent the stakeholders in the project and will provide advice to the implementing agency on:

- ToR for professional staff of the Project Management Unit
- Changes to the project implementation plan
- Annual work plans and budget
- Progress with project implementation

It will also provide a direct communications channel with national institutions, NGOs, and regional bodies to assist project staff in implementing the project. In particular, it will act as a contact point for access to data, collected as part of other projects (especially the hydrogeological mapping project) or held in national institutions or with NGOs.

The PSC will be comprise 1 senior technical representative from each Member State, a representative of SADC Environment Unit, SADC-WD and LIMCOM. Representatives from related ministries of Member States, local government in pilot areas, a representative of the NGO community, Sida and other development partners may participate as Observers, plus any other persons as agreed by the PSC. The PMU and the PSA are observers and serve the committee. The PSC Chairperson will be elected by a majority of the PSC and will meet at least once a year.

Independent Review Panel

An Independent Review Panel will be established at the commencement of the project. The objective of the Panel will be to provide an external resource to the project to review the technical and scientific plans, technology use, hydrogeology, GDEs, social and economic impact, etc. The Panel will be 'dynamic' in that experts will be invited to join as

and when the topic under review requires their input, however a core group will be established to provide continuity and to reduce the transaction costs of procuring their services as short-term consultants. Panel members will be international and regional experts in relevant fields. The Panel will not be engaged in project management issues but will provide guidance to the Project Steering Committee, the SADC WD and the PMU, and will act also as resource to the World Bank Task Team Leader. The Panel will be re-sourced from the Sida Bank executed Trust Fund and not the GEF funds.

Project Services Agency

The day-to-day administrative activities on the project would be carried out by an external, contracted Project Services Agency (PSA) that is experienced in project administration. The objective is to provide general administration, financial management, and procurement services to support the SADC Secretariat in the effective execution and coordination of the project, as these activities are beyond the capacity and function of the Secretariat as presently constituted. This was agreed to by the SADC Secretariat at a meeting between the SADC Secretariat and the World Bank in Gaborone, Botswana on October 7, 2003. The Project Services Agency (PSA) will operate under the authority of the SADC Secretariat and report on a day-to-day basis to the SADC-WD

The PSA's responsibilities will include administration, financial management and procurement functions. This assignment will involve supporting operations at multiple geographic and organization levels. The PSA will support the SADC Secretariat and the PMU in carrying out all activities required to ensure that the fiduciary requirements and procedures of the World Bank are met. This will include the activities listed below and in *Annex 7: Financial Management and Disbursement Arrangements* and *Annex 8: Procurement*.

General administration and implementation support activities will include:-

- Establishment of the PMU.
- Preparation of project implementation manual(s) (PIM), including, *inter alia*, administration, financial management, procurement and staffing procedures; and customization of SADC manual(s) to PMU project-specific needs, all to be approved by the World Bank.
- Preparation of administration/disbursement/procurement plans for the project based on the work plan of the PMU.
- Recruitment and hiring of staff of the PMU, based on a competitive selection process in conjunction with the SADC Water Division as agreed in project documents.
- Ensure effective mechanisms for electronic communication and management of information are in place, including the establishment of guidelines for information management.

The PSA would have expertise in general project administration and management, financial management, legal matters pertaining to contracts and procurement, selection and use of consultants, procurement of contractors and goods, and information technology. The PSA should ideally have experience in the SADC countries and with development pro-

jects. The PSA will propose the organization of the team (including geographic distribution of the staff) to best achieve the objectives of the assignment.

Project Management Unit (PMU)

The PMU will be established in Gaborone at a suitable venue separate from the offices of the SADC Water Division and will report to the SADC-WD. The PMU will be responsible for technical implementation of the project at a day-to-day level to ensure that the project objectives and outputs are achieved. Its functions will include:

- Prepare, implement and manage the project work plan
- Liaise with project stakeholders and coordinate project with other regional projects and initiates, state agencies, NGOs private sector and other parties in order to facilitate implementation of project components
- Carry out project advocacy and project awareness creation roles and responsibilities
- Assist the PSA with the tender process for the provision of services and procurement of equipment under the individual sub-projects
- Assist the PSA in the management of contracts for the providers of services
- Assist the PSA in the management of procurement of materials and equipment
- Monitor progress and report to the Project Steering Committee and the SADC Water Division on the progress of the project according to monitoring criteria established in work plan
- Provide coordination between project components to ensure achievement of overall project objectives
- Providing documentation to PSC and responding to recommendations of PSC, through SADC-WD
- Coordinate project activities with other relevant projects, under guidance of SADC-WD
- Promote project outcomes to ensure sustainability

The PMU will be small – 2 professional staff and 3 support staff – in order to ensure minimum costs to the project whilst ensuring greatest efficiency. It will be headed by a Project Manager and will be assisted by a Technical Executive Officer. Expected duties of the two senior staff are:

- Project Manager:
 - ~ Overall technical management of the project and the PMU,
 - ~ Liaison and reporting to SADC-WD and PSC,
 - ~ Liaison with the PSA,
 - ~ Management and oversight of consultants,
 - ~ Liaison with member countries, other projects and organizations,
 - ~ Promoting the results of the project throughout the region.
- Technical Executive Officer:
 - ~ Support the Project Manager
 - ~ Provision of technical expertise relating to hydrogeology and ecology.

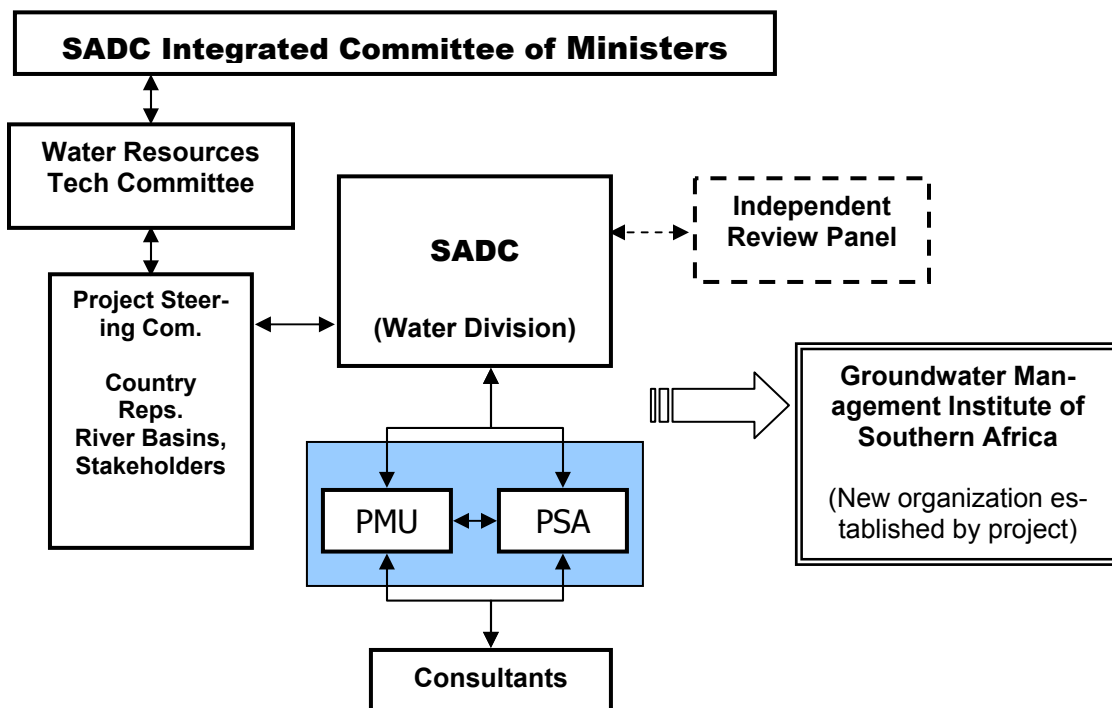
If the Technical Executive Officer does not possess sufficient expertise to oversee the work of consultants in the fields of hydrogeology, surface hydrology and wetland ecol-

ogy then specialist consulting knowledge will be brought in on an ‘as needed’ basis. The senior staff would be supported by a secretary, administrative assistant and a driver.

PMU staff will be recruited and appointed by the PSA in collaboration with the SADC-WD. They will be recruited as follows:

- The Project Manager will be recruited competitively, with preference given to candidates from SADC member countries other than the country hosting the PMU. The position will be advertised in national, regional and international press, seeking balance among the countries represented for the entire project.
- The Technical Executive Officer will be recruited competitively, with preference given to candidates from SADC member countries, following advertisement in national, regional and international press.
- Support staff will be competitively recruited from the PMU host country or regionally/internationally depending on local market response.

Figure 2: The proposed institutional structure.



Annex 7: Financial Management and Disbursement Arrangements
AFRICA: Groundwater & Drought Management in SADC

I. Summary of the Financial Management Assessment

A. GENERAL

Objective of the FM System

1. The objective of the Financial Management Systems (FMS) is to support the implementing units in deploying Project resources to produce the required outputs and with attention to economy, efficiency and effectiveness. Specifically, the FM systems will be capable of producing timely, understandable, relevant and reliable financial information that will enable the implementing units to plan, coordinate, monitor and appraise the Project's overall progress towards the achievement of its objectives as well as ensuring that costs are under control and Project funds are used for the purposes intended.

Implementing Agencies

2. The SADC Water Division (SADC-WD), which is located within the Directorate of Infrastructure & Services of SADC Secretariat, has overall responsibility for implementing the Project. Project implementation will be guided by a multi-stakeholder Project Steering committee (PSC). At the technical level, the SADC-WD will also be guided by the Water Resources Technical Committee (WRTC). With respect to day-to-day project implementation, SADC-WD will work through: (a) a Project Management Unit (PMU) for technical implementation, and (b) a Project Services Agency (PSA) to be constituted by UNOPS for financial management, administration and procurement.

3. The PSA will report to the SADC Secretariat through the SADC-WD. It will help SADC Secretariat, i.e. the project implementing agency, to meet all Bank financial management requirements. UNOPS will provide adequate financial management staff and systems to ensure compliance with Bank financial management requirements, including forwarding the quarterly Financial Monitoring Reports and audited annual financial statements to the Bank. The staff will include qualified accountants and an internal auditor. The internal auditor will carry out a systematic review, evaluation and appraisal of the adequacy of the systems of managerial, financial, operational and budgetary control and their reliability in practice, and report to SADC-WD, SADC Secretariat, UNOPS and PSA regularly.

B. RISK ANALYSIS

Inherent Risks

4. The project implementing agency, SADC Secretariat, does not currently have adequate capacity, including financial management, to implement the project, and can

therefore not ensure necessary compliance with all Bank financial management requirements.

5. To minimize the aforementioned risks and ensure the appropriate financial management capacity is in place prior to Project effectiveness, UNOPS has been contracted as the PSA and it will be responsible for the financial management aspect of the project. Also, the project is expected to set up GIMSA, which will have a small unit to ultimately take over, amongst other functions, the financial management.

Control Risks

6. The overall Project risk from a financial management perspective is considered moderate, provided the financial management action plan described in paragraph 36 is fully implemented.

Strength and Weakness

7. Strength: UNOPS has previous experience in implementing Bank-Assisted Projects and has handled the financial management functions for some of these projects. Therefore, it is familiar with Bank Financial Management procedures and requirements.

8. Weakness: The PSA to be constituted by UNOPS is responsible for financial management, procurement and administrative functions on behalf SADC-WD. Without adequate staffing and proper segregation of duties, there is a danger that some staff may perform incompatible functions resulting in poor overall internal control.

C. FINANCIAL MANAGEMENT SYSTEMS

Funds Flow and Banking Arrangements

9. The overall project funding will be provided by GEF, SADC Governments and bilateral donors. The Bank will disburse the GEF grant through a Deposit Account. SADC-WD will open the following bank accounts, which will be managed by the PSA on its behalf:

- i. A Deposit Account in US Dollars with a commercial bank to which the initial deposit and replenishments from GEF will be lodged.
- ii. A Current (Project) Account with a commercial bank.

10. Also, the PSA will maintain a GEF Ledger Grant Account (Washington) in US Dollars/SDR to keep track of draw downs from the GEF grant. The account will show (a) deposits made into bank X by the Bank, (b) direct payments by the Bank, and (c) opening and closing balances.

11. All bank accounts will be reconciled with bank Statements on a monthly basis by the PSA. The bank reconciliation statements will be reviewed by designated SADC-WD officials, and identified differences will be expeditiously investigated.

12. The PSA will be responsible for preparing and submitting to the World Bank consolidated applications for withdrawal, as appropriate. Appropriate procedures and controls will be instituted and documented in the Project Implementation Manual (PIM), which will be used by the PSA for project implementation, to ensure disbursements and flow of funds are carried out in an efficient and effective manner.

13. The PSA will maintain a cumulative record of draw-downs from the GEF grant that will be reconciled monthly with the Disbursement Summary provided by the Bank.

14. Detailed banking arrangements, including control procedures over all bank transactions (e.g. cheque signatories, transfers, etc.), will be documented in the PIM.

15. The grant will be allocated according to the expenditure categories provided as follows:-

Expenditure Categories	Amount in US\$ millions	% of Expenditures to be Financed
Consultants' Services	2.40	100%
Works	1.61	100%
Goods	0.63	100%
Operating costs	1.00	100%
Training & Workshops	0.76	100%
Unallocated	0.60	
Total project costs	7.00	

Disbursement Arrangements

Use of Reports Based Disbursements:

16. PSA shall submit payment requests to the Bank, copied to the SADC-WD, based on Financial Monitoring Reports (FMRs). Documentation supporting all expenditures claimed against FMRs will be retained by the PSA, and will be available for review when requested by the Bank supervision missions and project internal and external auditors. All disbursements are subject to the conditions of the GEF Grant Agreement and the procedures defined in the Disbursement Letter.

Deposit Account:

17. The authorized allocation of the deposit account would be US\$1 million. To the extent possible, all of GEF's share of expenditures should be paid through the Deposit Account.

18. The Deposit Account will be replenished through the submission of Withdrawal Applications supported with quarterly FMRs and copies of relevant bank statements. The withdrawal application shall include an amount required to finance Eligible Expenditures during the six-month period following end of the quarter for which the FMR was pre-

pared. All disbursements will be channeled through Deposit Account, and in lieu of such Deposit Account, SADC may choose to pre-finance project expenditure and seek reimbursement from GEF.

19. Detailed disbursement procedures will be documented in the PIM.

Planning and Budgeting

20. Cash Budget preparation will follow the procedures outlined in the PIM. Additionally, financial projections or forecasts for the life of the project (analyzed by year) will be prepared. On an annual basis, the PSA will prepare the cash budget for the coming period based on the work program. The cash budget should include the figures for the year, analyzed by quarter. The cash budget for each quarter will reflect the detailed specifications for project activities, schedules (including procurement plan), and expenditure on project activities scheduled respectively for the quarter. (Guidance on the preparation of budgets is available in the Bank publication entitled "Financial Monitoring Reports: Guidelines to Borrowers".) The annual cash budget will be sent to the TTL at least two months before the beginning of the project fiscal year.

21. Detailed procedures for planning and budgeting will be documented in the PIM.

Fixed Assets and Contracts Registers

22. The PSA will prepare and regularly update a Fixed Assets Register. A Contracts Register will also be maintained in respect of all contracts with consultants and suppliers. The PSA will prepare Contract Status Reports quarterly. Control procedures over fixed assets and contracts with consultants and suppliers/vendors will be documented in the PIM.

Information Systems

23. The PSA will establish and maintain adequate computerized system for tracking, recording, classifying and reporting the project transactions.

Financial Reporting and Monitoring

24. Monthly, quarterly and annual reports will be prepared (as outlined in paragraphs 29, 30, 31 and 32) for the purpose of monitoring project implementation. The reports will be submitted to the project coordinators, project implementing units, SADC Secretariat and the Bank. Detailed reporting procedures and the format, contents and frequency of reports will be fully documented in the PIM.

25. Monthly: On a monthly basis, the PSA will prepare and submit the following reports to SADC-WD and SADC Secretariat:

- *A Bank Reconciliation Statement* for each bank account;

- *Monthly Statement of cash position* for project funds from all sources, taking into consideration significant reconciling items;
- *A monthly Statement of expenditure* classified by project components, disbursement categories, and comparison with budgets, or a variance analysis; and
- *Statement of Sources and Uses of funds* (by GEF Category/ Activity showing GEF);

26. Quarterly: The following financial monitoring reports will be prepared by the PSA on a quarterly basis and submitted to SADC Secretariat, SADC-WD and the Bank:

- *Financial Reports* which include a Statement showing for the period and cumulatively (project life or year to date) inflows by sources and outflows by main expenditure classifications; beginning and ending cash balances of the project; and supporting schedules comparing actual and planned expenditures. The reports will also include cash forecast for the next two quarters.
- *Physical Progress Reports* which include narrative information and output indicators (agreed during project preparation) linking financial information with physical progress, and highlight issues that require attention.
- *Procurement Reports*, which provide information on the procurement of goods, work, and related services, and the selection of consultants, and on compliance with agreed procurement methods. The reports will compare procurement performance against the plan agreed at negotiations or subsequently updated, and highlight key procurement issues such as staffing and building Borrower capacity.
- *FMR Withdrawal Schedule* listing individual withdrawal applications relating to disbursements by the reports-based method, by reference number, date and amount.

27. Annually: The annual project financial Statements, which will be prepared by the PSA will include the following:

- A Statement of Sources and Uses of funds (by GEF Category/ Activity);
- Statement of Cash Position for Project Funds from all sources;
- Statements reconciling the balances on the various bank accounts (including GEF Deposit Account) to the bank balances shown on the Statement of Sources and Uses of funds;
- FMR Withdrawal Schedules listing individual withdrawal applications relating to disbursements by the reports-based Method, by reference number, date and amount;
- Notes to the Financial Statements.

28. Indicative formats for the reports are outlined in two Bank publications: (a) Financial Monitoring Reports: Guidelines to Borrowers-quarterly FMRs, and (b) Financial Accounting, Reporting and Auditing Handbook (FARAH) - monthly and annual reports. The actual format will be fully documented in the PIM.

Accounting Policies and Procedures

29. GEF will be accounted for by the Project on a cash basis. This will be augmented with appropriate records and procedures to track commitments and to safeguard assets. Also, accounting records will be maintained in \$.

30. The Chart of Accounts will facilitate the preparation of relevant monthly, quarterly and annual financial Statements, including information on the following:

- Total project expenditures
- Total financial contribution from each financier
- Total expenditure on each project component/activity, and
- Analysis of that total expenditure into civil works, various categories of goods, training, consultants and other procurement and disbursement categories.

31. Annual financial Statements will be prepared in accordance with International Accounting Standards (IASs). All accounting and control procedures will be documented in the FPM, a living document that will be regularly updated by the Project Accountants.

D. ACTION PLAN

32. The following actions are to be implemented as specified.

S/N	ACTION	By Whom	By When
1	Prepare the Project Implementation Manual (PIM)	SADC Secretariat/ UNOPS	Effectiveness
2	Install a computerized financial management system	SADC Secretariat/ UNOPS	Effectiveness
3	Open US Dollar Deposit Account; Project Account and advise the Bank of authorized bank signatories/specimen signatures.	SADC Secretariat/ UNOPS	Effectiveness
4	Deploy qualified accountants and internal auditor to the PSA	SADC Secretariat/ UNOPS	Effectiveness
5	Initial capacity building in Bank procedures and computer applications completed.	SADC Secretariat/ UNOPS	Effectiveness
6	Appoint qualified independent external auditors	UNOPS	Effectiveness

Supervision Plan

33. Supervision activities will include review of quarterly FMRs; review of annual audited financial statements and management letter as well as timely follow-up of issues arising; annual review; participation in project supervision missions as appropriate; and updating the FM rating in the Project Status Report (PSR).

2. Audit Arrangements

Internal Audit

34. The Internal Auditor in the PSA will perform internal audit activities for the project. Regular internal audit reports will be submitted to the UNOPS, PSA, SADC-WD and SADC Secretariat.

External Audit

35. The Project's financial statements will be audited in accordance with internationally recognized auditing standards by independent auditors. The audit reports and financial reports will be submitted to the Bank within 6 months of the end of the fiscal year. In addition to an opinion on the financial statements expressed in their succinct report, the auditors will be asked to review in depth all expenditures and internal controls procedures used for their preparation during the period under review, in order to express a separate opinion on them. In addition to the audit report, the external auditors will be expected to prepare Management Letters giving observations and comments, and providing recommendations for improvements in accounting records, systems, controls and compliance with financial covenants in the GEF Grant agreement.

36. It is the responsibility of UNOPS to appoint independent auditors which are acceptable to the Bank. UNOPS is also responsible for: (i) having the Project's financial statements audited annually, and (ii) submitting to the Bank and SADC Secretariat the audited statements together with management letters.

3. Procurement Arrangements

37. For GEF Funds, the project will observe procurement procedures outlined in the Guidelines: 'Procurement under IBRD and IDA Credits and Guidelines for the Use of consultants by World Bank Borrowers and by the World Bank as Executing Agency.'

Annex 8: Procurement

AFRICA: Groundwater & Drought Management in SADC

A. General

Procurement for the proposed project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, and the provisions stipulated in the Legal Agreement. The general description of various items under different expenditure category is below. For each contract to be financed by the Grant, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame are agreed between the Borrower and the Bank project team in the Procurement Plan. The Procurement Plan will be updated at least annually, or as required, to reflect the actual project implementation needs and to reflect improvements in institutional capacity.

Procurement of Works: Works procured under this project, would include: Some contracts for borehole drilling, Pans, alluvial sand storage curtains etc whose scope and content will depend upon the designs emanating from the Pilot project work at the beginning of the project. The procurement will be done using the Bank's Standard Bidding Documents (SBD) for all ICB and NCB, to be agreed with the Bank. Some works of small value will be procured by requesting for price quotations from at least three qualified contractors. The request should clearly indicate the description of the works, the completion period and the modalities of payment. The bidder with the lowest evaluated quotation will be awarded the contract.

Procurement of Goods: Goods procured under this project would include: one vehicle and some office equipment. The procurement will be done using National Competitive Bidding satisfactory to the Bank. Some items will be procured through Shopping.

Procurement of non-consulting services: There is no requirement for non-consulting services.

Selection of Consultants: Consultants will be required for different assignments linked to design of the Pilot system, implementing activities and regional decision support activities. Consultants will also be required for construction supervision. Consultants will design the works requirements emanating from the Pilot phase activities. Some part time advisors will be hired to support specific components and tasks. A consultant will be appointed as a Project Services Agency to manage the project.

Short lists of consultants for services estimated to cost less than \$ 100,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. Consulting services may be provided by Universities, Government Research institutions, Training Institutions, NGOs and any special organizations. Although QCBS procedure has been followed, it did not give the

expected results in terms of participation as well as of suitability and qualification of the candidates. Ultimately, UNOPS has been awarded the Project Services Agency contract on a single source selection (SSS) basis. There is a need for an experienced provider of procurement, financial and management services and UNOPS has experience of exceptional worth for the assignment. In addition, the PSA will need to build these same capacities in the Groundwater Drought Management Institute to be established. UNOPS as a provider has available regional UN logistics and support facilities nearby in South Africa. It also has ability to assume liability on behalf of SADC (signatures of contracts with individual experts and consulting firms, handling of claims). The Agreement between SADC and UNOPS will be communicated to the Bank for non-objection

Operational Costs: Operational costs which would be financed by the project and procured using the implementing agency's administrative procedures as determined in the Project Services Agency's Management Services Agreement and Project Implementation Manual which will be reviewed for compliance with the Bank's requirements. This will include the initial operational costs of the Groundwater Management Institute of Southern African which will be established during the course of the project.

Others: There are no special arrangements such as *scholarships, Grants etc.*

B. Assessment of the agency's capacity to implement procurement

Procurement activities will be carried out by UNOPS, acting as the Project Services Agency. The agency will provide a complete team to undertake project management services including for procurement. The Procurement unit of this PSA will be staffed by appropriate, trained staff in terms of the Management Services Agreement (MSA) to be entered into between UNOPS and the SADC Secretariat and approved by the Bank. UNOPS will prepare a Project Implementation Manual which will include, in addition to the procurement procedures, the SBDs (including Request For Quotation, RFQ, forms) to be used for each procurement method, as well as model contracts for works and goods procured.

An assessment of the capacity of the Implementing Agency to implement procurement actions for the project does not need to be carried out as these activities will be undertaken by the Project Services Agency to be appointed as a condition of effectiveness. The MSA will include a suitable organization and staffing plan. The risk is that the staff actually deputed may not be adequately experienced in Bank procurement work. Special attention will be paid when reviewing organizational structure for implementing the project and the interaction between the project's staff responsible for procurement and the SADC Secretariat unit responsible for administration and finance.

Most of the issues/ risks concerning the procurement component for implementation of the project have been identified and include weak capacity and scarcity of experienced staff. The corrective measures, which have been agreed, are part of the MSA which will include that the PSA will provide technical assistance to build capacity and train staff to be deputed by SADCC

The overall project risk for procurement is HIGH.

C. Procurement Plan

The Recipient, at appraisal, developed a Procurement Plan for project implementation, which provides the basis for the procurement methods. This plan has been agreed between the Recipient and the Project Team on January 14, 2005 and is available at the SADC Secretariat Water Division, Private Bag 0095, Gaborone, Botswana. It will also be available in the Project’s database and in the Bank’s external website. The Procurement Plan will be updated in agreement with the Project Team annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

D. Frequency of Procurement Supervision

In addition to the prior review supervision to be carried out from Bank offices, the capacity assessment of the Implementing Agency would require six monthly supervision missions to visit the field to carry out post review of procurement actions.

Attachment 1

Details of the Procurement Arrangement involving international competition.

1. Goods and Works and non-consulting services.

(a) List of contract Packages that will be procured following ICB and Direct contracting

1	2	3	4	5	6	7	8	9
Ref. No.	Contract (Description)	Estimated Cost	Procurement Method	P-Q	Domestic Preference (yes/no)	Review by Bank (Prior / Post)	Expected Bid-Opening Date	Comments
There are no ICB or Direct Contracts expected in this project								

(b) However, ICB Contracts estimated to cost above US\$ 150,000 per contract and all Direct contracting will be subject to prior review by the Bank.

2. Consulting Services.

(a) List of Consulting Assignments with short-list of international firms.

1	2	3	4	5	6	7
Ref. No.*	Description of Assignment	Estimated Cost	Selection Method	Review By Bank (Prior / Post)	Expected Contract Start date after Project start	Comments
17	Project Services Agency	614,549	QCBS	Prior	Month 1	
5	Regional drought vulnerability assessment & capacity building	550,800	QCBS	Prior	Month 6	
8	Research contract into groundwater valuation and GDEs	505,500	QCBS	Prior	Month 6	
2	Consultant to Manage and monitor pilot testing	526,400	QCBS	Prior	Month 12	
11	Management Consultants to establish <i>GMISA</i> , capacity build	442,800	QCBS	Prior	Month 6	
1	Design & manage pilot testing	148,000	QCBS	Prior	Month 6	
9	Regional Awareness Creation consultants	103,250	QCBS	Prior	Month 24	
12	Events Management Consultant - Retainer	100,800	QCBS	Prior	Month 1	

***from Annex A of the Procurement Plan**

(b) Consultancy services estimated to cost above \$100,000 per contract and Single Source selection of consultants (firms) for assignments estimated to cost above \$50,000 will be subject to prior review by the Bank.

(c) **Short lists composed entirely of national consultants:** Short lists of consultants for services estimated to cost less than \$100,000 equivalent per contract, may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

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Annex 9: Economic and Financial Analysis

AFRICA: Groundwater & Drought Management in SADC

The Incremental Cost Analysis provides the economic analysis of the project as a GEF supported program. The project is of benefit as a ‘complimentary/supplementary’ contribution to the development of knowledge of the management and protection of groundwater and GDEs in transboundary drought prone areas, complementary to existing efforts in the region.

The economic value of groundwater and GDEs in the SADC region has generally not been determined. That these resources play a vital role in local economies (and collectively in national economies) is unquestioned as in many semi-arid rural areas in the region groundwater is the only dependable source of water without which there would be no economic activity at all, even of a subsistence nature. One of the main outputs of this project is therefore precisely to contribute to the regional and global knowledge of the value of these resources.

The activities in the pilot areas will be carefully analyzed to determine the most cost effective means of improving the management of resources and the security of services during drought events. The analysis will need to include offsetting the costs of management and physical interventions against the cost of failure of supply during drought and the destruction of GDEs and their ecological and economic benefits. Failure has a range of human, social and economic costs at local and national levels including food insecurity, rural – urban migration, environmental degradation and increased long-term risk aversion to investment at local level resulting in the persistence of rural poverty.

The primary financial concern within the project is sustainability of the Groundwater Management Institute for Southern Africa (GMISA). This will be addressed as a major concern in the establishment of the Institute during the project. The issue of financial sustainability of the Institute is more fully addressed in Section 4 above – “Sustainability and Replicability”.

Financial management of the project has been an issue of concern related to the capacity of the SADC Secretariat to undertake the administrative, financial management and procurement requirements of a project of this size. The capacity of the Secretariat to undertake these activities in relation to the project preparation phase (through the PDF-B Grant) was appraised by a World Bank Financial Management Specialist to be adequate for the preparation phase but not for the execution phase. This conclusion is supported by the SADC Secretariat on the basis that their function is not to execute projects but to coordinate and facilitate regional development issues. To ensure adequate financial management of the project, a Project Services Agency (PSA) will be contracted through the project to undertake these activities on behalf of the SADC Secretariat. The details of the functions of the PSA are provided in Technical Annex 6 – Implementation Arrangements.

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Annex 10: Safeguard Policy Issues

AFRICA: Groundwater & Drought Management in SADC

The project has pilot scale interventions in two pilot areas in the Limpopo River Basin, which are designed to test the application and replicability of methods of decreasing the vulnerability of local communities and GDEs to the effects of groundwater droughts. Project activities will not result in any appreciable negative environmental or social impacts. The small scale of the project activities and the nature of those activities (groundwater monitoring and pilot interventions for improving groundwater management) make it unlikely that resettlement or environmental damage will occur during implementation. Through improved understanding and management of groundwater dependent ecosystems (GDEs), the project is expected to improve environmental conditions in pilot areas, and contribute knowledge to management of GDEs throughout the region.

The following safeguard policies are triggered:

International Waterways. The pilot areas are in an international water course – the Limpopo River Basin. Requirements of notification have been met through two ways: (i) the four countries involved in the Limpopo pilot areas (Botswana, Mozambique, South Africa, and Zimbabwe) have been represented in the Project Preparation Steering Committee, which has been the body responsible for over-seeing the preparation of the project and final approval of the selection of the pilot areas; and (ii) each of the four riparian countries noted above have sent project Letters of Endorsement, which fulfills GEF requirements. These are on file and attached to the Project Documents.

The following safeguard policies are not triggered:

Environmental Assessment. The primary objective of the project is to improve the sustainability of natural resources through the use of a groundwater-dependent ecosystem approach. Project design focuses on the implementation of specific components, which as a whole, are designed to improve long-term water resource sustainability specific to groundwater. The array of potential project activities, such as physical infrastructure (monitoring boreholes, extraction boreholes, pans, alluvial sand storage curtains, etc); non-structural measures such as improved government capacity, strengthening of groundwater user groups, heightened community awareness; and water conservation techniques, such as conjunctive use of surface and groundwater, and improvements, will be confirmed during initial phases of the project. Although some of the activities cited above may require further assessment, it is expected that few activities will have an environmental impact. A Strategic Environmental Assessment to be prepared and disclosed during initial phases of implementation will confirm the impact once specific pilot activities and sites are known.

Natural Habitats. The Limpopo River Basin Situation Analysis identified a number of groundwater-dependent ecosystems in the region, including the riparian areas of the proposed Limpopo-Shaste Transfrontier Conservation Area and the Greater Limpopo Conservation Area in the western and eastern pilot areas, respectively. Pilot activities will

not be implemented within protected areas, although interventions are intended to assist local communities during times of drought and thus reduce pressure on these ecosystems.

Forestry. Although the Limpopo River Basin includes a number of protected forest areas, they are not within or adjacent to specified pilot areas. It is unlikely that any project activities will have any significant effect on forest ecosystems.

Pest Management. The project will not finance or support the procurement or use of pesticides directly or indirectly.

Cultural Property. The project will not include areas of significant cultural value.

Indigenous Peoples. The project will be implemented with local communities but will not impact any indigenous peoples.

Involuntary Resettlement. The involuntary resettlement policy is not triggered because project activities are unlikely to result in significant alteration of land or changes in access for both communal and private land. Alteration or change in access is expected to be voluntary and any such changes will be small, with accordingly some potential for impacts. It is expected that project activities would result in minimal loss of income or livelihood for community members. Any interventions involving alteration of land or water resource practices will be taken by individuals to improve both environmental and economic sustainability. Likewise, community interventions are not anticipated to create circumstances leading to involuntary resettlement.

Safety of Dams. The project does not involve any dams or construction of dams.

Projects in Disputed Areas. The project area does not include any disputed areas.

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Annex 11: Project Preparation and Supervision
AFRICA: Groundwater & Drought Management in SADC

The key institution responsible for preparation of the project was the SADC Secretariat through the Water Division, supervised and assisted by the World Bank project team.

Preparation timing –

PDF-B Grant Letter of Agreement	- June 28, 2001,
PCD Review Meeting	- February 28, 2002,
PDF-B Grant completion date	- extended from 12/31/02 to 10/30/04

A GEF PDF-B grant for \$350,000 and the French government (\$25,000), was used for project preparation by the recipient to contract services for the following preparation activities:

- a) specialist groundwater advisor in support of SADC WSCU (now SADC-WD);
- b) a regional situation analysis for SADC region;
- c) a Limpopo basin situation analysis;
- d) support for a project preparation steering committee;
- e) support for a stakeholder workshop to gather views from affected stakeholders;
- f) support for meetings of the hydrogeological map steering committee;
- g) support for a Project Management Consultant to assist .

The grant was successfully carried out by the Implementing Agency. All planned outputs were completed and consultant performance was satisfactory. The client completed the PIP to the extended schedule and provided the information on which this PAD is based. In addition, support was received from GWMATE for specialist groundwater advice and from Sida for specialist water resources advice to the Bank TM.

Bank staff and consultants who worked on the project included:

Name	Title	Unit	Responsibility
David Grey	Sr. Water Advisor	AFTU1	Overall advice and guidance
Len Abrams	Sr. Water Resources Sp.	AFTU1	Task manager
Jakob Granit	Water Resources Sp.	AFTU1	Previous task manager
Senai Alemu	Sr. Water Resources Sp.	AFTU1	Initial task manager
Edith Mwendu	Sr. Counsel	LEGAF	Legal issues
Edward Olowo-Okere	Sr. Financial Mgmt Sp.	AFTFM	Financial Management
Slah Ben-Halima	Sr. Procurement Sp.	AFTPC	Procurement
Steve Gaginis	Financial Officer	LOAG2	Disbursement
Kristine Ivarsdottar	Sr. Social Development Sp.	AFTS1	Social Development
Robert Robelus	Sr. Environ. Assessment Sp.	AFTS1	Environmental Assessment
Serigne Omar Fye	Sr. Environmental Sp.	AFTS1	Safeguards Advisor
Christophe Crepin	Program Manager	AFTS4	GEF Regional Coordination
Ato Brown	Sr. Water and Sanitary Eng	AFTU1	Project Management, Institutions
Richard Cambridge	Operations Advisor	AFTQK	Quality Assurance
Richard Davis	Consultant		Water resources and environment

Annex 12: Documents in the Project File
AFRICA: Groundwater & Drought Management in SADC

World Bank Lending Preparation Documents

1. Minutes PCD review meeting
2. Integrated Safeguard Data Sheet
3. Project Information Document
4. Project Appraisal Document

GEF Documents

5. PDF (B) Grant Application
6. Project Executive Summary
7. Project Brief
8. Set of key SADC Government Endorsement Letters
9. GEF STAP Review
10. Incremental Cost Analysis

Project Preparation Documents

11. Project Steering Committee Minutes
12. Report on Pilot Area Stakeholder Meeting
13. SADC Region Situational Analysis
14. Groundwater Situation Analysis in the Limpopo River Basin
15. Limpopo Basin Social Assessment

Annex 13: Statement of Loans and Credits
AFRICA: Groundwater & Drought Management in SADC

NOT APLICABLE

Annex 14: Country at a Glance
AFRICA: Groundwater & Drought Management in SADC

Annex 15: Incremental Cost Analysis

AFRICA: Groundwater & Drought Management in SADC

Context

Countries in the region face **natural constraints** such as a high degree of spatial and temporal variability in the rainfall, and **imposed constraints** including a lack of basic data and knowledge, fragmented responsibility for management of water resources, lack of community involvement in management, outmoded policies, laws and regulations, and inadequate enforcement of existing regulations. These constraints are particularly apparent in the case of groundwater resources. Overarching these national issues is the regional issue of a lack of an effective mechanism to manage the numerous transboundary watersheds, both surface and groundwater, in the region.

Information presently available estimates that 33% of the population of the Southern African Development Community (SADC) region rely on formal or improved groundwater supplies and 27% on reticulated supplies from surface water sources. The remaining 40% rely on unimproved sources, which may be either groundwater or surface water, and which are generally unsafe and more often prone to drought. This clearly demonstrates the importance of groundwater as a resource.

Accordingly, the development of countries in the region is highly dependent on adequate and reliable water resources. The region's water resources influence all aspects of the region's social and economic development. Apart from domestic water supply and sanitation, it is essential for agriculture, pastoralism, hydro-power generation, mining, tourism and industry. About one third of the people in the region live in drought prone areas, where groundwater is the primary source of drinking water for the human population and livestock, and most other activities. Groundwater is also the prime source of water for many ecosystems and their wildlife in these dryland areas.

Groundwater resources in arid areas are under threat from over-exploitation, pollution, trampling, sedimentation and introduction of exotic species. These threats arise primarily because of poverty linked to an increase in population pressure, as well as from irrigated agriculture, tourism, mining and pollution from human waste and agricultural chemicals. The threat to the groundwater resources of these vulnerable areas also constitutes a major threat to the related groundwater dependant eco-systems (GDEs) in drought prone areas of the region. Currently there is very limited groundwater management in the countries of the region with inadequate resources dedicated to the task and a general lack of effective institutions and technical capacity. The impacts of exploitation of groundwater on GDEs is largely unknown, as is the resulting social and economic impact of the degrading of GDEs on the communities in the affected areas, especially the very poor. These problems are compounded by the cyclical nature and variability of climatic conditions in the southern African region. The implementation period of the project may or may not coincide with a drought event which requires that the outlook of the project must be one of assisting the region and SADC Member States to develop and maintain a long term perspective of groundwater drought management and the protection of GDEs

Related Development and Environmental Goals and Strategies

The overall objective of the Groundwater Management Programme (GMP) is to promote the sustainable development of groundwater resources at a regional level, incorporating research, assessment, exploitation and protection, particularly related to drought management. Consequently the Project Objective is: **"The development of a SADC regional strategic approach to support and enhance the capacity of its member States in the definition of drought management policies, specifically in relation to the role, availability (magnitude and recharge) and supply potential of groundwater resources"**.

The project concept is to meet the above objective and to produce the major output through implementation of activities at two different scales: the regional and the river basin levels (with the latter including studies at the level of the pilot area, as described below).

- a. *The regional scale* of the project will identify transboundary impacts of groundwater development in the various river basins within the region, identify priority groundwater drought prone areas and provide regional management tools (such as groundwater drought vulnerability maps, a monitoring network and a groundwater information system to support the mapping tool). The tools developed will be applied through the SADC institutional network, which is financed by the Member States and through the development of a Regional Groundwater Drought Management Institution (RGDMI).
- b. *At the river-basin scale* (i.e. the semi-arid Limpopo river basin) the role of groundwater in proactive drought mitigation will be demonstrated in the semi-arid Limpopo river basin on a conceptual scale and at the field-scale in a pilot sub-catchment simultaneously taking into account applicability and replicability for the region as a whole. The outputs will consist of physical infrastructure interventions (monitoring, bores, pans, sand dams, etc), and institution and social interventions such as improved government capacity, formation of groundwater user groups, and heightened awareness of the need to manage groundwater and dependent ecosystems on a long-term basis.

Consequently the project will address the need for the SADC Member States to develop cooperatively a strategic regional approach to support and enhance the capacity of its member States in the definition of drought management policies, specifically in relation to the role, availability (magnitude and recharge) and supply potential of groundwater resources (as a portion of the overall water resource). This will assist in reconciling the demands for socio-economic development and those of the principal groundwater-dependent ecosystems.

In addition to projects and initiatives undertaken in the region under the auspices of the SADC RSAP there are also numerous projects and initiatives undertaken within Member States (either financed under their own auspices or through donor support) (refer to Annex 2 of PAD).

Further to this the World Bank's 1996 Africa Water Resources Management Initiative (AWRMI) seeks to support water resources analysis and policy reform at the national level and to assist riparian countries in the development of cooperative frameworks and programs in relation to shared water resources. The AWRMI builds, in turn, upon the World Bank's long term vision of supporting integrated water resources management programs and projects as stated in the 1992 Water Resources Policy and 2003 Water Resources Sector Strategy.

Outside of water-specific objectives, the project also contributes directly to the regional objectives of the SADC Policy for Environment and Sustainable Development by improving access to water and protecting water dependent ecosystems, and by providing regional tools and an institu-

tion for the improved management of groundwater in drought prone areas, including groundwater dependent ecosystem (GDEs).

GEF Operational Program and Focal Area

The proposed project falls under the GEF Operational Program 9 (Integrated Land/Water) which has the goal of “*helping countries utilize the full range of technical, economic, financial, regulatory, and institutional measures needed to operationalize sustainable development strategies for international waters and their basins.*” There is a particular focus on projects in the African region. The proposed project promotes this goal with its objective of improving regional technical capabilities and intervention strategies to promote better management of transboundary groundwater resources and groundwater dependent ecosystems.

The project meets the objective of the GEF's Strategic Priority IW-2: “*To expand global coverage of foundational capacity building addressing the two key program gaps (in particular that of water scarcity and competing water use) and support for targeted learning*”. The project will contribute to addressing important transboundary groundwater systems in the SADC region with direct global environmental benefits associated with the proper management of the Groundwater Dependent Ecosystems (GDEs).

Baseline Scenario

The baseline consists of many projects and initiatives being undertaken in the region that relate to water resources and specifically groundwater. However there is great disparity between the various Member States with respect to the degree of attention and financing allocated to groundwater management. Consequently the degree to which transboundary multilateral cooperation regarding groundwater management in currently undertaken is very limited.

Where groundwater projects are undertaken there is lack of attention given to environmental and sustainable development aspects of groundwater. There is also a tendency to address groundwater management issues reactively when crises arise as opposed to proactively to prevent problems. Consequently there is very little information available regarding groundwater management to enable SADC to promote and advocate the proper management of groundwater in the region, and a bias in the manner in which it is viewed as resource to assist in drought management. Moreover, there is a lack of attention given to the coordination of projects and sharing of knowledge related to groundwater throughout the region.

The baseline that is considered here is restricted to that of the water sector⁶, and is consequently a more conservative estimation as projects with a focus on relevant terrestrial resource management were not considered. Best estimates of the proportion of each of the projects and initiatives that form the baseline situation have been made. It is important to note that a number of projects and initiatives are parts of larger programmes that are in a constant state of flux, particularly in terms of budget status and allocation. In other words the relation of the alternate case to the baseline could fluctuate, making it difficult to accurately establish the potential unquantifiable costs associated with a future baseline drought scenario (in the socio-economic and ecological sense) that would be offset by undertaking these project components.

⁶ The baseline information considered has been obtained from the SADC Water Division, Member State representatives on the project steering committee and the consultants responsible for the regional and river basis assessments during PDF-B. .

Costs: Under the project, it is expected that the governments of the SADC region and interested donors will invest approximately US\$ 22.0 million in projects related to water and groundwater resource management in the project area over the project period.

Benefits: The baseline scenario would produce mostly local and national benefits as the majority of expenditures are targeting poverty reduction in poor communities. The baseline scenario will result in very few global environmental benefits, as the participating governments are seeking to cooperate under the SADC water unit, and so some basic collaboration in the Limpopo Basin and SADC region as a whole will begin to occur. The baseline will not address a) transboundary impacts of groundwater development in the various river basins within the region, b) identification of priority groundwater drought prone areas, or c) cooperative production of regional and national management tools for addressing important transboundary groundwater systems in the SADC region with direct global environmental benefits associated with the proper management of the Groundwater Dependent Ecosystems (GDEs).

GEF Alternative

The proposed GEF Alternative will provide a clear incremental enhancement of existing initiatives in the SADC Region. This will be demonstrated by the manner in which the components ‘complement/supplement’ existing initiatives, thereby contributing global environmental benefits.

System Boundary and Geographic Scope: The proposed Alternative has been under preparation since 2001 and will have a five-year implementation period (i.e. 2004 – 2008). Some of the benefits will clearly continue to accrue beyond this time boundary. Particularly beyond the pilot areas as these projects are replicated and/or lessons are transferred throughout the region. However, all the listed benefits will be achieved during the five-year implementation period.

The SADC region (inclusive of the following Member States – South Africa, Lesotho, Swaziland, Botswana, Namibia, Zimbabwe, Zambia, Malawi, DRC, Mozambique, Tanzania, Kenya) defines the broader geographic boundary of the Project. There is a small degree of attention given to the Indian Ocean Member States of Mauritius and Seychelles. Since the focus of the Project is primarily on transboundary drought prone areas the spatial extent of the influence will be more defined. In view of the fact that the project is also being carried out at a sub-regional scale vis a vis the Limpopo River Basin (with associated pilot project areas) it is anticipated that there will be a higher level of focus on the four Member States occurring in the basin, i.e. South Africa, Zimbabwe, Mozambique and Botswana.

The scope of this benefit analysis should include all other significant changes brought on by the decision to undertake the alternate project components instead of existing or proposed baseline activities. In the current context, certain project components (such as the pilots) provide elements of national benefits for those Member States, whereas the others have a more regional and global benefit. Although more benefits may accrue to these specific Member States, the Alternative has been developed to capture these lessons and replicate and scale-up these initiatives throughout the region. The replication and scaling-up is envisaged to manifest towards the latter part of the project period and after project completion. Further to this, the current design of the project components is such that there is an inter-relatedness among components aimed at ensuring that incremental improvements within the pilot areas can be transferred to the level of the region.

Component 1 – Development and testing of a groundwater drought management plan (GDMP) for the Limpopo River basin pilot areas. *(Total cost: US\$ 10.174; Increment US\$ 3.319)*

Sub-Component 1.1 Development and testing of a Groundwater Drought Management Plan (GDMP) for the Limpopo River Basin Pilot Areas

The purpose of Sub-component 1.1 is to a) develop and test a GW drought management plan and associated interventions at a hands-on pilot scale so as to obtain empirical information that could be replicated at the same scale elsewhere in the region, b) contribute to the scaling-up of the information obtained for use in the development of generic decision support guidelines and the region's knowledge base regarding GW drought mitigation (i.e. Sub-components 2.4), and c) to use the opportunity of Member State cooperation and donor funding on the project to undertake 'grass-roots' physical intervention to mitigate against GW drought (i.e. drought-proof an area by addressing poverty while still considering bio-physical environmental GW needs).

Component 2 – Regional Groundwater Drought Management Support *(Total cost: US\$ 17.621m; Increment: US\$ 2.466m)*.

Sub-component 2.1 Development of a Regional Groundwater Vulnerability Map (inclusive of data collation and database and associated systems development)

The overall purpose of Component 2 is to empower persons and organisations involved in the management of groundwater in the region, to be able to mitigate against or minimise the effects of GW drought. To this end sub-components that will contribute to the facilitation of decision support have been identified and will be developed and implemented. The first of these sub-components relates to GW drought vulnerability mapping. Through the integration of monitoring data storage/manipulation and mapping the value of establishing a groundwater database will become evident to the Member States in a transboundary setting.

Sub-component 2.2 Research of Groundwater Knowledge Gaps

The project preparation process has revealed that much is still to be learnt about GW drought aspects in the region, as well as its relevance in a biophysical and socio-economic context. In spite of the importance of groundwater for the region being known to some extent, and the fact that SADC policies support protection of the environment and poverty alleviation, the lack of information pertaining to groundwater still remains. Whereas surface water resources are generally well characterized in the region, there is a paucity of information relating to the region's groundwater resources.

Particularly for the purposes of informed management decisions relating to GW droughts and how they relate to the biophysical-social interface. Two key areas are that of groundwater dependent ecosystems (GDEs) and the value of groundwater in drought mitigation and management. Consequently the purpose of this sub-component is to undertake research into these fields with the intention of gaining a greater understanding groundwater drought management.

Sub-component 2.3 Regional Awareness Creation regarding Groundwater

Groundwater resources and related matters are seldom afforded the same attention as surface water resources. Due to the inter-related nature of the two, in the context of the hydrological cycle, and the role groundwater can play during drought periods, it is necessary for an awareness creation initiative to be undertaken within the region to raise the importance of groundwater. This is deserving of further attention when one considers that the SADC RISDP states that the ‘overall goal of the Water Sector is the attainment of sustainable, integrated planning, development, utilization and management of water resources that contribute to the overall SADC objective of an integrated regional economy on the basis of balance, equity and mutual benefit for all Member States. Further to this, in spite of the RISDP seeing water resources and drought related issues as key areas of intervention, it makes no mention of the word ‘groundwater’ anywhere in the document. Which further indicates the benefit of the project in making groundwater more noticeable.

Sub-component 2.4 Develop Decision Support Guidelines and a Knowledge Management System for Groundwater Drought Management in the Region

With the disparity in knowledge around groundwater between Member States there is a pressing need for SADC Water Division to assist in bringing all Member States ‘up to speed’ or ‘levelling the playing fields’ between the states. In addition to this changes in organisational developments and areas of political focus throughout the region have resulted in deterioration of certain Member States’ knowledge of groundwater related matters. With such factors set in the context of an ever burgeoning knowledge economy there is a need for knowledge and lessons learnt pertaining to groundwater to be coordinated and addressed so that such knowledge is not lost to the region. Further to this there is a need for tools to be developed that can provide decision support to groundwater managers.

To address this, this project sub-component focuses on the development of decision support guidelines for groundwater drought management and also the establishment of a knowledge management system on the same phenomena that can be adopted by the RGDMI in the longer term.

Component 3 – Establishment of The Regional Groundwater Drought Management Institution (RGDMI) (*Total cost: US\$ 2.579m; Increment: US\$ 2.579m*)

Sub-Component 3.1 Identification and Establishment Of the Regional Groundwater Drought Management Institution (RGDMI)

An underlying theme for the majority of these components in this project is to raise the awareness of groundwater and prioritise its use as a key resource with respect to sustainable development of much of the population of the SADC region. Furthermore it is intended that groundwater practitioners and decision makers be capacitated to mitigate against groundwater droughts and/or to minimise the ravages thereof.

Furthermore the responsibility for management of the basic resource is often fragmented between different government authorities and at various levels of government. A factor which has been exacerbated in recent years with the tendency of the region’s Member States move towards decentralization of management responsibility and a lack of personnel in many government offices with limited knowledge, training and experience in groundwater management. The result is that there is a limitation to undertaking regional initiatives due to the multi-country institutional arrangements involved.

In an attempt to correct this, there is a need to have dedicated resources allocated to the groundwater drought initiative. Consequently it is imperative that all stakeholders (users, suppliers, decision makers etc) have a specific regional groundwater drought management center of expertise they can access. Consequently the establishment of a Regional Groundwater Drought Management Institute (i.e. a centre of expertise within the region to deal with groundwater drought related matters). Furthermore this institution will not only initially assist SADC Water Division in the successful implementation of the GEF Project, but will also link with other groundwater projects that fall within the auspices of the SADC Water Division and individual states into the future (i.e. ensuring the sustainability of the project's intended influences).

Component 4 – Project Management and Administration (*Total cost: US\$1.543m; Increment: US\$ 1.543m*)

From the description of SADC WD's RSAP it is evident that SADC WD is responsible for a broad range of matters pertaining to water throughout the whole SADC region. Groundwater is only one such aspect of water they deal with, and groundwater drought an even smaller element thereof. With such a broad ambit it can be appreciated that SADC WD do not have the resources to undertake all project implementation and execution activities relating to such a specific area of focus. Consequently, such responsibilities are allocated to mandated party on their behalf. A similar arrangement has been proposed for this project.

As a consequence it is necessary for the management and administrative requirements of this project to be dealt with as a separate and distinct project sub-component. The purpose of treating management and administration as a component is to ensure that the associated activities are identified and resources allocated for the successful implementation and execution of the project (and its components). Without a clear understanding of the activities to be undertaken in setting up these (management and administration) support structures or making sufficient allocation of resources for this role on the project, there is a strong likelihood that the success of the project will be compromised.

There are three key parties who have been identified to be involved with the management and administration of the project, namely:

- Project Steering Committee (PSC)
- Project Services Agency (PSA)
- Project Management Unit (PMU).

Global Environmental Benefits of the GEF Alternative: The proposed alternative takes a regional approach to the management of globally important groundwater resources, providing inherent global benefits. The components are designed to enhance the region's capacity with respect to groundwater drought and the mitigation of associated impacts, through an integrated, collaborative process. Research and support to decision makers in policy formulation should assist in the development and implementation of long-term strategies for global environmentally-friendly resource management plans at the regional level.

In parts of the region the use of groundwater has on the whole been neglected and an over-reliance on reactive mechanisms to mitigate against drought has developed. The alternative proposed here focuses on ensuring that the value of groundwater is recognised and that water is used in a more proactive manner to address droughts. This aspect is further enhanced by the impor-

tance of groundwater being raised when adopting the proactive regional approach proposed in the alternative.

The broad 'knowledge management' related activities across the components (such as capacity building, training, data collection and hosting of information within a proposed sustainable institution) aids sharing national efforts across the region and helps to bring all Member States onto a more even footing, contributing to the long-term sustainable management of globally important groundwater resources. Since most groundwater projects are primarily focused on physical, social and economic environments the inclusion of the ecological environment in several components further contributes to global environmental benefits.

Incremental Cost Matrix:

The incremental costs required to achieve all outputs of the Project amount to US\$12,399,840, of which US\$ 7 000 000 is being sought from the GEF. The GEF contribution will be combined with the Sida contribution of US\$ 1 900 000 and allocated as follows:

Detailed Incremental Cost Matrix and Calculation for World Bank Implemented Outputs

Project Component	Cost Category	Cost (\$million)	Domestic Benefits	Global Environmental Benefits
<i>1. Development And Testing Of A Groundwater Drought Management Plan (GDMP) For The Limpopo River Basin Pilot Areas</i>				
1.1 Development And Testing Of A Groundwater Drought Management Plan (GDMP) For The Limpopo River Basin Pilot Areas	Baseline (Project #: 1, 2, 4, 5, 6, 10, 11, 12, 14, 15, 16, 17, 18, 19, 22, 25, 26, 27 of baseline project list)	6.854	From information that is available a number of projects relating to groundwater are being undertaken in Botswana and South Africa (portions of which overlap with the Limpopo Basin). This is not the situation in Zimbabwe and Mozambique. These projects provide benefits in terms of capacity building, monitoring (quality and quantity), awareness training, cooperative governance, stakeholder participation but in a very disjointed manner. In spite of the fact that work is being undertaken it is not focused on groundwater drought management per se, nor is extensive consideration given to the transboundary multinational context of groundwater management. Consequently the benefits for each state is not necessarily available for neighbouring states.	Since these projects take place in a multinational context certain regional benefits are derived for the associated Member States. The lack of coordination between the initiatives and weak focus on the environment means that specific benefits are tenuous at best. The Limpopo Basin Permanent Technical Committee (soon to become Limpopo Commission) will aid in improving coordination, however their focus at present is biased towards surface water.
	Alternative	10.174	Enhancement of water resource knowledge, on top of existing surface water knowledge. Improved knowledge of importance of groundwater in drought management and IWRM. Actual on-the-ground physical interventions to improve the water supply situation and drought preparedness of the pilot areas. Enhanced capacity of water resource managers to plan and utilize groundwater - improved ability to withstand the negative impacts groundwater droughts on water security and groundwater dependent ecosystems.	Information analysis and knowledge generation beneficial to LIMCOM operation. Attention dedicated toward ensured knowledge generated and lessons learned transferred to entire region. Improved ability to withstand the negative impacts of groundwater droughts on water security and groundwater dependent ecosystems. Improved cooperation between Member States to reduce downstream impacts and associated conflicts.
	Increment	3.319		
<i>2. Regional Groundwater Drought Management Support</i>				
2.1 Development of a Regional Groundwater Vulnerability Maps (inclusive of data collation and database and	Baseline (Project #: 3, 5, 6, 10, 15, 16, 19, 22, 26)	4.757	Hydrogeological mapping for use at the local/national level.	, Partial distribution of data throughout the region, benefiting some participant countries. Increased capacity at local and national level of some countries to interpret and use data on groundwater management.

Project Component	Cost Category	Cost (\$million)	Domestic Benefits	Global Environmental Benefits
associated systems development)	Alternative	6.275	Member states with transboundary aquifer situations will have new map layers for use in drought management and preparedness. Assistance provided in terms of where to allocate funds appropriately for drought management purposes. Enhanced competence for monitoring and mapping derived through knowledge transfer and capacity building.	Dynamic mapping tool to assist in regional cooperation. Multinational river basin organizations and SADC WD better enabled to understand regional and sub-regional picture compared with mismatched and disjointed in-country overview. Prudent project funding allocation to mitigate against drought – i.e. greater leverage. Early warning mechanism to enable proactive management of socio-economic impacts of drought thereby resulting in the minimization of impacts on the natural environment. Addresses some of the specific needs identified by the SADC Regional Groundwater Management Program. Attention dedicated toward ensured knowledge generated and lessons learned transferred to entire region.
	Increment	1.517		
2.2 Research of Groundwater Knowledge Gaps	Baseline (Project #: 2, 3, 4, 8, 11, 15, 16, 20, 21, 24)	2.375	Existing water resource research has a limited focus on groundwater value and GDEs. Limited ability to protect GDEs and understand importance of groundwater value due to an absence of knowledge. Existing research also geographically biased.	Limited to multinational river basin research. Economic value of water research partly beneficial but inadequately focused on the biological/ecological environment.
	Alternative	2.971	Knowledge generated through specific research regarding GDEs and groundwater value for Member States. Corresponding groundwater knowledge to supplement existing water resource knowledge base.	Appreciation of GDEs and groundwater value in a transboundary and regional context. Attention dedicated toward ensured knowledge generated and lessons learned transferred to entire region. Addresses SADC's Policy for Environment and Sustainable Development in terms of protecting groundwater dependent ecosystem (GDEs).
	Increment	0.595		
2.3 Regional Awareness Creation regarding Groundwater	Baseline (Project #: 2, 23)	1.655	Awareness creation focused on general water issues, particularly aimed at decision makers. Bias to certain countries.	Although benefit will be derived from awareness creation for decision makers focused on general water issues, it is not apparent what environmental benefits will be derived.
	Alternative	1.889	Supplementation of existing awareness raising initiatives to ensure a more complete picture of water resources is attained. Specific focus on GDEs and groundwater for drought mitigation will ensure greater awareness amongst decision-makers of groundwater role.	Specific focus on GDEs and groundwater for drought mitigation will ensure greater awareness amongst decision-makers of groundwater role. Promotion of improved groundwater and in turn water resources management to the benefit of all states. Attention dedicated toward ensured knowledge generated and lessons learned transferred to entire region.
	Increment	0.235		

Project Component	Cost Category	Cost (\$million)	Domestic Benefits	Global Environmental Benefits
2.4 Develop Decision Support Guidelines and a Knowledge Management System for Groundwater Drought Management in the Region	Baseline (Project #: 2, 3, 4, 7, 9, 13, 14, 15, 16, 20, 21, 22, 25, 27, 28)	6.366	The substantial number of projects and initiatives in each of the Member States provide domestic benefits, but there is an absence of information sharing, knowledge management and a paucity of information interpretation and dissemination to end users.	As for the domestic situation the environmental benefits derived from projects and initiatives have limited benefit outside of the individual projects and results are inadequately captured and shared between Member States and the greater global groundwater community..
	Alternative	6.486	Member states get to share in a wider knowledge base from the rest of the region. Coordination of knowledge and project outputs aids in the development of guidelines to ensure better management of groundwater-dependent ecosystems throughout region.	Enhanced knowledge base between Member States across the region and to the broader global groundwater community. Coordination of knowledge and project outputs (as well as this projects components) aids in the development of guidelines to ensure better management of groundwater-dependent ecosystems, groundwater and in turn water resources management to the benefit of all states
	Increment	0.119		
3. Establishment Of The Regional Groundwater Drought Management Institution (RGDMI)				
3.1 Establishment Of The Regional Groundwater Drought Management Institution (RGDMI)	Baseline (No baseline projects)	0	There is no baseline situation for a regional institution such as the one considered here. Instead it is more apparent that knowledge management, mapping and project facilitation functions envisaged for the institution would be spread through a number of institutions within each of the host countries.	None
	Alternative	2.579	Member states will all benefit from the establishment of the RGDMI.	Addresses the SADC GMP need for an institution (sub-project 6) to raise understanding of groundwater management through research, knowledge management, coordination and capacity building. Research funds availability for transboundary and multinational research which contributes directly to management planning and decision making. The RGDMI is a conduit for promoting improved groundwater and in turn water resources management to the benefit of all states.
	Increment	2.579		
4. Project Management and Administration				
4. Project Management And Administration	Increment	1.543	The provision of project management and administration functions separate to the SADC WD adds to SADC's capacity and ensures that the components are implemented correctly. In so doing there is a lowered risk of project failure and a greater assurance that other domestic benefits are achieved.	To ensure project success and provide a greater assurance that other global environmental benefits are achieved.
Totals	Baseline	22.008		
	Alternative	31.908		

Project Component	Cost Category	Cost (\$million)	Domestic Benefits	Global Environmental Benefits
	<i>France and Germany**</i>	1.3	Depending on how this co-financing contribution may be allocated, there is the potential for it to aid Member States to fulfill their mapping requirements for vulnerability mapping or other themes that are deemed valuable in the context of groundwater drought mapping.	The development and completion of regional mapping requirements deemed valuable in the context of groundwater drought mapping.
	<i>SADC Govt***</i>	1.2	The SADC Governments' contribution via assistance on the project and through the provision of personnel for direct involvement in the project will provide many domestic benefits in turn. These include technology transfer, exposure, a platform to communicate the Member States' needs and a heightened awareness of the importance of groundwater.	It is anticipated that the increased exposure of Member States' personnel to matters concerning groundwater and its relationship to the environment will bode well in terms of informed decision making into the future – particularly with regards to the protection of groundwater.
	Increment (GEF)	\$12.42 (\$7.0)		

NOTES:

** *Governments of France and Germany have allocated US\$ 80 000 and US\$ 1.22 million respectively for hydrogeological mapping. This amount is not allocated to any specific component or set of components as it provides a general input to the project as a whole.*

*** *SADC Governments will contribute US\$ 1.2 million. As with the Government of France's allocation, the exact manner in which this allocation will be spread across the components is not yet known.*

Baseline projects considered in component design and incremental costs analysis

#	Project	Value (US\$)	Agency	Relevance to this GEF project
1	The FET-Water programme (Framework programme for Education and Training for Water). Its key approach is one of networking educational institutions and clients of education and training, towards common objectives. The approach is presently piloted with the establishment of the first network in the 'water environment management' field	100 000	DWAF / UNESCO / WMO	This project is deemed to have relevance for the piloting component as education and training methods relating to water will be undertaken. Since the FET programme was a South African project, only a small portion of the value has been considered for the ICA calculations.
2	Programme on the sustainable development of groundwater resources under the community water supply and sanitation programme, in South Africa. The Programme targets local authorities and water service providers and consists of 7 interlinked projects including the auditing of water supply sustainability, resource protection, monitoring and management and appropriate technologies for the development of local resources.	4 000 000	NORAD	<p>The NORAD programme was aimed at raising awareness and improve local management of groundwater in South Africa. Among other things the project considered water supply sustainability, resource protection, monitoring and management and appropriate technologies for the development of local resources.</p> <p>It is anticipated that the outputs from this project will serve as lessons for the establishment of the pilot areas and the development of appropriate intervention technologies. Lessons from the SA context will be used for the other Member States that make up the pilot areas.</p> <p>This project also has relevance with component 2 in terms of research, awareness raising and knowledge management.</p> <p>As a South African project only small portions of the project value have been used in the ICA calculations</p>
3	Groundwater Resource Assessment Phase II. Quantification of groundwater resources of the country (RSA).	400 000	DWAF	With the exception of the subcomponent on awareness creation this baseline project has relevance for the remainder of Component 2 and Component 1. However its relevance is restricted to South Africa and the South African portion of the Limpopo Basin in the case of Component 1.
4	Assessment of Surface Water Resources of Southern African Development Community (SADC) The overall aim for the study is to improve the ability of the Member States to make surface water resource assessments: <ul style="list-style-type: none"> • that support environmentally sustainable social and economic development • through broad strategic water resource planning 	10 000 000	Various co-operating partners have been approached including SIDA and Netherlands Government	<p>Although this project is aimed at surface water the assessment of the surface water resource and compilation of data and development of methodologies and models for estimating the resources cannot be divorced from groundwater. This will also determine low flow regimes in the various river basin and this links closely to the ground water resources through base flow analysis.</p> <p>It is therefore relevant to Component 1, Component 2.2.</p>

#	Project	Value (US\$)	Agency	Relevance to this GEF project
	<ul style="list-style-type: none"> that are based on information and approaches that are reliable and mutually accepted within the region. <p>This aim is supported by five primary objectives.</p> <ul style="list-style-type: none"> (a) To generate monthly time series of naturalised river flow at the sub-catchment spatial scale (100 to 2500 km²), as well as at major river and basin scale. (b) To develop and distribute databases of the generated river flow and associated information (spatial data, rainfall, evaporation, water use, etc.) (c) To develop and distribute tools for accessing and applying the information contained within the databases. (d) To build capacity within the SADC water resources community to make use of the developed information and tools. (e) To improve inter- and intra-country, as well as international networking and to improve the ability of SADC Member States to develop water sharing programmes in a sustainable and equitable manner. 			(research) and Component 2.4 (guidelines knowledge management). Due to its bias towards South Africa and surface water only a small portion of this project value was considered for the ICA.
5	GRIP- Groundwater Resource Information Project. Introduces procedures to capture borehole point data at village level in the Limpopo Province and transfer the data into information that can be used for either water resources management and planning or water services sector. Aquifer and infrastructure information is captured.	2 000 000	DWAF	This baseline project is of major relevance to the GEF project because of its geographical location within the Limpopo basin (i.e. Component 1) and its relevance for the mapping exercise (i.e. Component 2.2) in terms of information provision.
6	National project on the upgrading and optimization of groundwater quality monitoring network.	500 000	DWAF	As for project # 5 with the exception that it is not specifically focused on the Limpopo basin. Therefore also Component 1 and 2.2.
7	A synthesis of the Hydrogeology of basement aquifers in Southern Africa: Research needs and priorities	85 000	DWAF	The relevance of this project is specific to Component 2.4 from the point of view that it adds to the overall knowledge base of groundwater within the region.
8	Model, software and database development to assist with implementation of PCN-14 – Assessment of Surface Water Resources of SADC	155 000	WRC	This is a portion of project #4 above but its relevance is primarily linked to the research component 2.2. particularly GDEs
9	Prediction of hydroclimatic variation at intra-annual and inter-annual time scales for water	125 000	WRC	The relevance of this project is specific to Component 2.4 from the point of view that it adds to the overall knowledge

#	Project	Value (US\$)	Agency	Relevance to this GEF project
	resource management			base of groundwater and drought related issues within the region.
10	The development of a proto-type implementation plan for a National Toxicants Monitoring Programme (on behalf of DWAF)	155 000	WRC	Information from the toxicants monitoring programme will be used for the purposes of the pollution analysis to be undertaken in the pilot areas (Component 1) and for the mapping exercise (component 2.1) since vulnerability is influenced by quality as well as quantity..
11	Review of research needs and priorities for water quality assessment studies and information systems	62 000	WRC	Information from the review may contribute to the pollution analysis to be undertaken in the pilot areas and for the purposes of the groundwater research.
12	Daily Rainfall Mapping over South Africa through radar, satellite and gauge measurements: Infrastructure and Capacity building	187 000	WRC and METSYS	The capacity building portion of this project is deemed to provide relevance to the capacity building activities to be undertaken in the pilot (Component 1). The link between this baseline project and the alternative is considered to be marginal and consequent an equivalently marginal portion of the value has been used in the ICA calculation.
13	Pilot Study: Setting resource directed measures for groundwater (RSA)	140 000	WRC	The relevance of this project is specific to Component 2.4 from the point of view that it adds to the overall knowledge base of groundwater
14	Global climate change and water resources in Southern Africa: Potential impacts of climate change and mitigation strategies	345 000	WRC	The relevance of this project is specific to Component 1 from the point of view of the mitigation strategies being considered and for Component 2.4 from the point of view that it adds to the overall knowledge base of groundwater
15	To calibrate and verify a predictive model for the occurrence of naturally occurring hazardous trace constituents in groundwater	125 000	WRC	With the exception of the subcomponent on awareness creation this baseline project has relevance for the remainder of Component 2 and Component 1. However its relevance is restricted to South Africa and the South African portion of the Limpopo Basin in the case of Component 1.
16	Improved methods for aquifer vulnerability assessments and protocols for producing vulnerability maps, taking into account soils information	540 000	WRC and CSIR	As for # 15.
17	Evaluation of the requirements and mechanisms for cooperative governance between catchment management agencies and local government	45 000	WRC	The results of the project will contribute to the design and development mechanisms to ensure pilot project sustainability (i.e. Component 1).
18	Stakeholder participation in the establishment and governance of catchment management agencies (CMAs): Best practice guidelines (RSA)	155 000		AS for # 17
19	SADC-HYCOS project, Hydrological Cycle Observing System (Phase 2).	5 000 000	DWAF-SA with funding from EU, Netherlands a.o	Provides real time data on river flows in the entire SADC region including the Limpopo. Aims at developing a monitoring network and data base system that can interface with component 2.1 of the project. It will also have relevance for

#	Project	Value (US\$)	Agency	Relevance to this GEF project
				the pilot in development the groundwater drought management plan.
20	Zambezi Action Plan (ZACPLAN) Project 6 phase 1.2 : Sector Studies.	5 800 000	Sida, DANIDA and NORAD	This baseline project is considered to be relevant to Component 2.2 (research) and 2.4 (guidelines and knowledge management) since it considers the following: environmental, hydrological, pollution and land use planning studies, some direct groundwater information.
21	Maputo Basin Scoping Study	700 000	RSA, Mozambique and Swaziland	This project will undertake a comprehensive study of water related issues in the Basin that will assist the countries in negotiating the equitable sharing of the resources. Due to the extent of protected environmental areas in this basin the project is considered to be relevant to Component 2.2 (GDE research) and Component 2.4 (general knowledge acquisition)
22	Bobonong Groundwater Investigations and Resources Evaluation - Botswana	2 600 000	Botswana Government	This project is investigating the Ntane aquifer around the Bobonong villages. This aquifer extends into Republic of South Africa and Zimbabwe. The intention is to delineate the aquifer around so that land allocation in the area should be done in a manner that would not pollute the resources. Data produced by Rural Village Water Supply Programme within the vicinity of Bobonong, which can be used for the GEF project (Component 1, Component 2.1 and 2.4).
23	Awareness Creation on Water Issues: <ul style="list-style-type: none"> • Consultative forums on Water Issues • Awareness Building for Decision Makers Involving the Media in Water Issues 	1 310 000	SADC Water Division & IUCN, SARDC IMERCESA and GWP-SA as Implementing Agents	To strengthen and broaden regional awareness of IWRM concepts and principles at all levels to facilitate their practise in the region, contributing to equitable and sustainable utilisation of water, land and related resources This is relevant to the awareness component of the Ground Water Project (Component 2.3)
24	Economic Accounting of Water Use	2 000 000	SADC Water Division	The development of methodologies for estimating the economic value of current water use and to investigate alternative water use practices and their implications on river basins in national and transboundary water. This will provide methodologies for estimating the economic value of current water use for use by member States. Relevant to the component on ground water valuation (Component 2.2).
25	Support for the Implementation of the SADC Protocol on Shared Watercourses	3 364 000	USA, Germany, Netherlands, Denmark, Sweden, Norway, Finland, Switzerland, EU, FGEF, World Bank, GEF, UK, Italy, FAO	The overall objective of the Protocol is to develop closer cooperation for judicious, sustainable and coordinated management, protection and utilization of the water resources of shared watercourses and to advance the economic integration agenda of the SADC region. Such an initiative is relevant to Component 1 and Component 2.4.

#	Project	Value (US\$)	Agency	Relevance to this GEF project
26	Capacity Building of the Water Sector <ul style="list-style-type: none"> • Training in Surveying, Mapping and Geographic Information Systems • Human Resources Development Programme 	1 275 000	UNDP, Belgium, USA, UNESCO, Germany, Netherlands, Sweden, SADC	To strengthen the human resource capacity of water resources institutions in the SADC region to enable them to contribute effectively to the sustainable integrated water resources development and management in the region. In terms of the GEF project capacity building is undertaken as part of Component 1 and 2.1.
27	Consultation and Participation of Stakeholders in Water Resources Management <ul style="list-style-type: none"> • Promotion of Stakeholder Participation in Water Resources Management • Feasibility Study for Creating a Fund to Support NGO and CBO Participation in Water Resources Management Issues • Programme on Means to Empower Women in Water Issues 	312 500	UK, UNDP, USA, World Bank, GEF SADC	The deliberate and sustainable participation of stakeholders in policy and strategy formulation and implementation of matters relating to water resources development and management at local, intermediate, national and regional levels. Such an initiative is relevant to Component 1 and Component 2.4.
28	Development of a Programme on Water Supply and Sanitation for the SADC Region	257 000	WB WSP(ESA), Denmark, Belgium, Sweden, UK	The long-term objective is to contribute to the socio-economic growth of the SADC region through promotion of good public health and provision of sufficient water for economic activities while protecting the environment. The immediate objective is to develop a regional programme addressing water supply and sanitation. This programme is deemed to be relevant to guideline and knowledge management component (i.e. Component 2.4)

NOTES:

There are numerous other projects that are related to the GEF project components as can be evidenced in Annex 2 of the PAD. Unfortunately no accurate financial information was readily available at the time of compiling this document. The exclusion of these projects from this table is consequently due the absence of this information and is deemed to not be of material significance due to the low level of accuracy associated with costing the baseline situation. These projects are nevertheless still remain relevant and have been considered in component design.

- *Value – Project value presented is the total project value and not the portion of the project that is specific to this GEF Project.*
- *US\$ value – In instances where projects were valued in local currencies the end- November approximate exchange rate was adopted for the conversion.*

Annex 16: STAP Roster Review

AFRICA: Groundwater & Drought Management in SADC

[Note to STAP Review. It was decided to undertake the STAP review in two steps to gain maximum use of the process to the benefit of the project. The STAP Reviewer was sent an initial draft for early comments which were worked into the document. The final draft was then reviewed again and the following STAP Review submitted. The response to the initial and final reviews are included at the end of this Annex.]

TECHNICAL REVIEW OF THE PROJECT ON THE PROTECTION AND STRATEGIC USE OF GROUNDWATER RESOURCES IN THE TRANSBOUNDARY LIMPOPO BASIN AND DROUGHT PRONE AREAS OF THE SADC REGION.

SECOND VERSION.

Document prepared : November 28, 2003.

Supporting documents:

- First version of the Project Technical Review, with comments of the Project developers.
- Latest version of the Project Document. (November 2003).

General: Paragraphs from the first version of the Review, which have been already agreed upon, are presented in an abbreviated form.

Key issues:

Questions related to the scientific basis and proposed technologies.

The project is concerned with the groundwater resources exposed to the impact of prolonged drought periods which periodically affect the Limpopo basin. The remedial of drought's negative consequences will be solved under a complex strategy, concerned with the conjunctive management of surface and subsurface waters in the Zambezi and Limpopo rivers.

In principle, the project is technically and environmentally sound.

1. The definition of the climatic background of the project has been clearly presented by using the explanatory Box (page 4 of the Project). The definition of the groundwater drought is also clear. The revised name „Groundwater Management Institute of Southern Africa“ covers proposed activities.

2. I agree that it is too early to specify accurately the mandate of the Institute which will come into existence sometime in the middle of the Project. Let's hope that for the time being a risk „...that countries will continue to focus on national activities“, can be at least partly eliminated through institutional measures such as using the pressure of the Steering Committee.

3. It has been agreed that proposed Sectoral Committee of Senior Officials and Ministers of Water will be a useful tool in the sectoral approach - under the presumption that the participation of high level officers can be guaranteed.

It is understood that from eight pilot areas in the Limpopo basin, mentioned in the Project, two have been chosen for the initial phase. A schematic map of their location is very helpful.

From the same version it is understood that the Zambezi basin does not belong under the umbrella of this Project. It has been only mentioned (page 3) with reference to the establishment of respective River Basin Commissions

4. Comment to the inter-comparability in Review 1 was focused on the data which may be acquainted in the Limpopo basin on the water level fluctuation, water quality etc. Perhaps we can agree that such data should be processed uniformly in all pilot projects, so that the data analysts will have consistent materials at their disposal. Any other inter-comparability of the pilot components has not been proposed.

5. Protective measures in the first Review (as stated by the Project developer „...presumably not implemented under this groundwater project“) have not been meant at this stage as a protection of the GDEs, but as a protection of the recharge areas, surface of which has a significant impact on the formation of groundwater resources. Other relevant problems, such as any kind of the groundwater mismanagement, belong to other important issues.

No doubt that at the latter stage an introduction of other protective measures will be necessary for GDEs and may require some assistance from the donors.

As for the dambos, there was no attempt to advertise once accomplished research work, merely I wanted to emphasise that a solid survey of the literature relevant to GDEs behaviour in the region, can provide useful and inexpensive results.

6. The tools and methodologies for TDA and SAP are reasonably covered.

7. The ecological carrying capacity, even if not directly discussed, can be assessed from the materials published in the Technical Annex 1, p.21 - 25

8. The project scope is adequately covered.

9. The project components (page 4) have been presented in separate lines as suggested.

10. The components (not exactly technologies), mentioned under 9, do not pose any environmental threat.

Questions related to the use of technology.

Relevant problems have been agreed upon accordingly with the first version of the review.

Questions related to the institutional arrangements..

The description of the institutional arrangements is adequately covered in the latest version of the Project under C 2 and does not require further comments. Role of the World Bank in the institutional system has been also explained - under A 2 and C 2.

Other questions.

1. Explanatory notes about the hydrogeological features have been provided in the first Review.

2. It is understood that at the initial stage the project can not go to a great detail. Specific technical aspects, such as about monitoring and measurements, will be incorporated at the latter stage.

3. With properly equipped and systematically monitored pilot areas the project scope can be considered as adequate. As the proposed survey in the pilot areas will be rather laborious, it has been agreed as useful to look for a participation of local universities and academic institutions.

4. A special Tab. has been prepared, which identifies so called critical risks and possible controversial aspects as the issues of conflict.

Identification of the global environmental benefits.

Perhaps some globally applicable experience can be obtained through the demonstration projects - if properly equipped and maintained. Although direct results are specific for each site, professional experience and methodology can be shared with similar projects elsewhere. A utilisation of the pilot areas as training sites for technicians and postgraduates is under consideration.

How does the project fit within the context of the goals of GEF?

GEF general strategy is maintained throughout the project. This is because the support is given to the group of countries sharing an extensive international basin and willing to co-operate. The capacity of existing institutions, concerned with various aspects of groundwater, will be strengthened. Last but not least, the supported project is focused on specific problems of the trans-boundary aquifers.

Regional context.

The Southern African Development Community - SADC has the goal of fostering co-operation and mutual benefit from the natural resources of the region, formed by fourteen African states. Four of them, namely South Africa, Botswana, Zimbabwe and Mozambique, are actively involved in a region defined by the boundaries of the Limpopo international basin, with respectable size of about 440,000 km².

Replicability of the project.

While the Limpopo basin has been chosen as a site of eight pilot areas, a replicability is anticipated for other areas located in the same basin and in the basins of neighbouring rivers north and south of Limpopo.

Sustainability of the project.

Perhaps more than other natural resources, groundwater is very vulnerable to human interventions. Once it is disturbed in terms of quality and/or quantity, the remedial is difficult if not impossible. Protecting groundwater against irreversible damages and preserving it for future generations requires, first of all, protective measures in the recharge areas and legal / juridical measures for the determination of exploitation limits.

Secondary issues.

Linkages to other focal areas.

A path for the utilisation of Southern African experience in conjunctive use has been opened in second paragraph of C 2.

Linkages to other focal programmes and action plans at regional and sub-regional levels.

Comment from the first version remains valid.

Other beneficial or damaging environmental effects.

The evaluation remains the same as in the first version of the Review.

Degree of involvement of Stakeholders in the project.

A question about the incorporation of the water pricing, raised under the Review 1, has been re-considered with following conclusion of the project developers: *It should be mentioned as one possible approach out of many - but it would be uncomfortable to give the impression that water pricing is a management methodology. The detailed review of the use of groundwater resources in the pilot areas would have to include the current practices which may or may not include water pricing issues.*

Capacity building aspects.

A recommendation to train the bailiffs has been accepted.

REVIEW OF THE PROJECT APPRAISAL DOCUMENT AND ANNEXES.

Document accomplished: December 19, 2003

Supporting document: Project Appraisal Document (PAD) on a Proposed Loan/Credit from the Environment Facility Trust Fund. (December,2003)

The pages 1 - 26 of the PAD have been already reviewed twice - as requested. Few remaining comments to those pages also refer to the new text in PAD.

1. On page 23 there have been listed three types of the groundwater formations (in the text called GDEs ?). From the description of the pilot areas (Page 71) it follows that another important water bearing units are the sandstone formations at WPA. It would be useful to add that aquifer to the list, because in case of prolonged drought it may provide an alternative supply of water, extracted temporary from non-renewable groundwater resources.
2. With reference to the floodplains in the Limpopo basin, particularly in the EPA (page 74), I wonder whether on the list of projects in Annex 2 (p.26), does not belong another operational project (or a project in the GEF pipeline), called: „ Enhancing Conservation of Critical Network of Wetlands Required by Migratory Waterbirds on the African Eurasian Flyways.“
3. Page 28, third of the Results Indicators: It might be very helpful to extend that result as „.....75% of stakeholders indicate confidence in measures to reduce vulnerability and willingness to participate in the implementation of protective measures.
4. Page 32. I recommend to incorporate, perhaps under 4: „...develop management plan for drought oriented early warning system, based on the analysis of the climatic situation.“ Of course, that the term „early“ in this context is a matter of weeks, perhaps months.
5. Page 32: Under 5 I recommend to incorporate as another activity monitoring of groundwater level in selected boreholes.
6. Page 33. Sub-component 2.1: Perhaps it should be also included: „.....Collate and analyse historical climate events resulting in groundwater deficiency.“
7. Page 33: It would be beneficial to the project (Sub-component 2.2) to include one more activity beyond 2, namely: “... Determine how GDEs distribution and vulnerability can be mapped in workable dynamic timeframe.“ This is because an existence of such map can facilitate, *inter alia*, the transfer of knowledge from the pilot areas to other parts of the Limpopo basin.
8. Page 37: Isn't the term „Research endowment“ somehow vague? Perhaps proposed / planned research activities should be somewhere clearly specified; otherwise the allocated sum may not be effectively used (See also page 35, bottom).
9. Page 43: Last of the Financial management functions and activities: Based on my experience from Kenya, once so called independent audit of local project, made by a local auditor was a disaster. I recommend to specify the service of „external audits.“
10. A mechanism should be formulated on how to control that the purchased vehicles, instruments and other items will not be used for other purposes than for the determined projects.
11. Page 62, Project Component 3 / Alternative / Domestic Benefits: Is a single word „Each“ sufficient for an explanation of a wider context?
12. Page 63: Second explanatory note: „.....respectively for hydrological mapping.“ Should be „.....respectively for hydrogeological mapping“?

13. Pages 64 -68: The values given for individual projects seem to be mutually unbalanced. However, I understand that it is unlikely at this stage to amend those values.
14. Page 66. Similar project as the project No. 19 would be much needed for selected groundwater boreholes /wells.. Real time data on the groundwater level fluctuation can significantly help to the groundwater management.

Further minor corrections:

1. Please, decide whether you prefer to call the river Zambezi or Zambesi. I prefer Zambezi, however, sometime the name Zambesi has also been used - as in the latest version of this PAD - see pages 8, 24, 25.
2. On page 4, line 2, the geographical name should be probably written as Southern Africa (and not southern Africa), similarly like it is written elsewhere in the Project.
3. Page 19, line 8 from the bottom: requiremnts, write requirements.
4. Page 24, Second line from the bottom: Should it be towards instead to wards?
5. Page 33 / 2.1. / 7. Please, check the whole sentence „Provide pertinent...“
6. Page 42, line 6: The sentence is not clear (should the last word be ecology or ecological „something“?)
7. Page 68. Second line from the bottom „specific to theis GEF Project“?
8. Page 72, third and fourth para: The rivers named Luvubu (once) and Levubu (twice) is probably the same river. Please, check.

Congratulations to a perfect Project, much needed in Southern Africa!

Jaroslav Balek Ph.D.

Consultant. Tabor, December 19 , 2003.

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Responses to STAP Review

Initial review of first draft

Main issues raised during the review of first draft of Project Document and responses. *Responses in Italics.*

Questions related to the scientific basis and proposed technologies.

1. The term groundwater drought management requires clarification. *Agree – Text Box added with clarification of the meaning of “groundwater drought”.*
2. For reasons of clarity it would be more appropriate to modify the name of the Regional Groundwater Drought Management Institution. *Agree – name changed to Groundwater Management Institute of Southern Africa (GMISA)*
3. Information on sectoral problems of society and economy is briefly mentioned in the Appendix D, page 14, as: „...a risk that countries will continue to focus on national activities rather than take up the regional opportunities for socially and environmentally beneficial groundwater.“ It is felt that such risk should be eliminated at a very early stage of the project. Perhaps the solution of social and economic aspects should be incorporated into the mandate of planned „Regional Groundwater Drought Management Institution“, as it is called in the project. *This risk arises from the Regional Situation Analysis report wherein a number of water resource agencies stated to the consultants that they didn't place much priority on the Institute since they were focussed on national water management problems. Placing wording about this risk into the mandate of the Institute, which won't come into existence until mid-way through the project, will help reduce the risk. Rather, building support for regional approaches to groundwater management seems to be a better way of lowering this risk (see Risk Table C.5) and possibly by using the Steering Committee for influence. Thus, STAP reviewer suggestion not taken up.*
4. Clarification needed regarding the selection of the Limpopo River Basin pilot areas in terms of the inter-comparability of data. *The selection of the pilot areas is clarified in the text of the PAD and Technical Annex 17: Determination of Pilot is added for clarity.*
5. The project claims that the threat to the groundwater resources of these vulnerable areas also constitutes a major threat to the related groundwater dependent ecosystems (GDEs) in drought prone areas of the region. The project also claims that the implementation will lead to the protection of water dependent ecosystems in the pilot areas during the times of drought, and to the development of regional tools and institutional measures for improved management in groundwater dependent ecosystems (GDEs). It should be taken into the account that some of the tackled problems, concerned with GDEs, will require long-term approach and final solution may be not be available at the final stage of the project. *True – should make the claims more realistic. This also relates to the issue of the project period being possibly 'out of synch' with drought cycles, particularly within the pilot areas, thus reducing the effectiveness and value of the studies although the areas are perennially arid – this is one of the reasons why the Institute is so important – to provide long-term consistency.*
6. An economic impact of the GDEs degradation on the communities in affected areas is stated in the project. At the same time, a reverse effect, i.e. an impact of the communities, for in-

stance pastoralists or charcoal burners, on the GDEs should be also taken into the account and protective measures proposed. *It is true that charcoal burning, soil erosion from over-grazing, etc could be affecting the. The STAP reviewer is proposing that these degradation issues be noted and protective measure be proposed (but presumably not implemented under this groundwater project). The Reviwer is correct that merely focussing on groundwater issues wont be sufficient to protect GDEs. The issue is whether adding this to the project description will be merely a symbolic action and whether the project should not actively campaign with donors, national land mgmt bodies, etc to fix these non-groundwater issues. The environmental degradation and related problems mentioned above are primarily a consequence of poverty. The overuse and mismanagement of groundwater is at least an exacerbating factor if not also an impact of poverty. It may therefore be inevitable that the pilot studies will link these factors. We need to keep the balance between addressing related issues and ensuring that the project is feasible and doable.*

7. The ecosystem classification covered in the Technical Annex 1 reflects present knowledge of GDEs in the region but needs to be extended to properly include dambo wetlands. *Agreed – the definition of GDEs will be thoroughly studied as a key area of initial research under the project. The tools and methodologies for TDA and SAP are reasonably covered.*
8. Various layout and textural suggestions were made and acted upon to clarify the document.

Questions related to the use of technology.

9. One can expect that the teams preparing hydrogeological maps will be equipped with innovative technology, including GPS. Monitoring of the water level in the boreholes, data transmission, acquisition and analysis should be also based on modern technologies. Perhaps groundwater data transmission through satellite should be considered as another innovative alternative. *This is largely the task of the French and German parallel projects, although there is some data collection envisaged in 2.1 and 2.2. Points will be addressed through the detailed project design and implementation (note cost and training implications).*

Questions related to the institutional arrangements..

10. The implementation of the over-all water related strategy should remain in the hands of SADC, particularly its Water Sector. It is understood that the establishment of the Limpopo Basin Commission has been negotiated and is under preparation. Supposedly, this will facilitate the project implementation at all stages. The transboundary groundwater management should be also incorporated into the Commission's mandate. The Commission should also serve as a centre of acquisition and dissemination of technical and public information relevant to the project. *The Limpopo Commission is on the Project Steering Committee – the long term institutional arrangements will be determined during the course of the project.*
11. Clarity of the roles of all involved institutions is needed including official organisations and NGOs, and the World Bank. *Agreed*

Other questions.

12. It is mentioned in the project that the pilot areas have been already selected, however, for the time being their location has not been explained in the project. *Map indicating pilot areas added.*

13. For a systematic analytical approach in the pilot areas it would be feasible to establish an inventory of existing observed and unobserved boreholes, to activate the monitoring network with adequate data acquisition, processing and analysis. Equally important will be to develop sampling system for groundwater quality observation. The survey should be also concerned with the pumping tests, basic hydrogeological characteristics, calculation of the safe yield under variable climatic conditions and identification of the recharge areas. Meteorological / climatological data should be also available for each pilot area. *Detail added to Component 1 description.*

14. With properly equipped and systematically monitored pilot areas the project scope can be considered as adequate. As the proposed survey in the pilot areas will be rather laborious, it might be useful to look for the participation of local universities and academic institutions. *Agreed and added to text.*

Secondary issues.

Linkages to other focal areas.

15. A project linkage can be identified in relation to climatology, particularly to the analysis and prediction of the climatic extremes as affecting groundwater regime. *Agreed, particularly related to drought monitoring Centre in SA. Added to text.*

16. Further linkage, which perhaps should have been more emphasised in the project, is the optimisation of conjunctive use of surface water and groundwater resources under various strategies. In this field a solid experience is available in South Africa. *Agreed – this will be addressed during implementation when all options will be pursued.*

Other beneficial or damaging environmental effects.

17. Because the project is focused on the groundwater resources, it is recommended to initiate the implementation of environmental protection measures in the recharge areas. *Agreed and added to text.*

Degree of involvement of Stakeholders in the project.

18. In this relation a question is raised: Are the principles of water pricing desirable in the pilot areas of this project? In other words, have they been already considered as another mechanism leading to the effective groundwater management? *The detailed review of the use of groundwater resources in the pilot areas will include the current practices which may or may not include water pricing issues. Similarly, investigation of the range of possible future management options may also include the water pricing issue. Therefore it would inevitably come up if the process is adequately implemented. It is one possible approach out of many.*

Capacity building aspects.

19. Capacity building aspects are well covered in Technical Annex 1: Regional and sector background. Perhaps it should be added that a significant part of the capacity building program will be the training of technicians in situ and focused on the field work. *Agreed and added to text.*

Final review of final document

Responses are given to the section entitled “Review of the project appraisal document and Annexes.” Responses correspond to the numbering in this section of the STAP Review above.

1. *Done*
2. *Could not identify the project referred to in the GEF database.*
3. *Added*
4. *It would be more appropriate for the project to provide information to other established SADC drought early warning systems than to duplicate processes.*
5. *Monitoring in this context is results monitoring of the project itself, not monitoring of physical elements such as borehole water levels etc.*
6. *Added.*
7. *Added.*
8. *This has been changed to Groundwater Drought Management Fund.*
9. *Audits will be undertaken by independent auditors approved in terms of World Bank procedures and fiduciary standards, and financed by the project.*
10. *The PMU will be subject to financial management controls through the independent Project Services Agency.*
11. *Changed as suggested.*
12. *Changed as suggested.*
13. *The values are the costs of the actual projects as stated in the project documents.*
14. *Agreed - No response required.*

Further minor corrections:

All corrections are addressed.

Annex 17: Determination of Pilot Areas

AFRICA: Groundwater & Drought Management in SADC

Groundwater drought management strategies will be tested in two pilot areas chosen during project preparation.

Selection of Pilot areas

Twelve criteria were selected for assessing the potential pilot areas:

- Representivity & replicability throughout SADC countries
- Drought-prone area (climatic drought) and drought vulnerable aquifers.
- Impact of abstraction on biodiversity, including cumulative and/or downstream effects.
- Aquifer with high competition between water users or user groups.
- Transboundary/shared resource (including downstream/cumulative impacts).
- Knowledge and data available
- Promote socio-economic poverty alleviation.
- Water-use predominantly rural and for agriculture.
- Maximum size 10 000 km² and preferably within the same hydrogeological unit.
- Priority rating in SADC WSCU groundwater management programme.
- Local and provincial or district water management structures in place.
- Stakeholder commitment to Integrated Water Resource Management (IWRM)

The ecological dimensions were included in the representativeness and replicability criterion. Very little information was available on these ecological dimensions and so they were interpreted using the hydrogeological settings and the likely occurrence of GDEs. Thus, dolomitic settings were rated as important because of the occurrence of cave and solution cavity systems which may support diverse and unique fauna; and the extensive alluvial systems along the Limpopo and its tributaries were also rated highly because of the high probability of groundwater dependent ecosystems.

Each of the eight potential pilot areas was evaluated against these criteria by the consultants developing the Limpopo Situation Analysis report. The overall score for the individual sites varied from 21 to 28.5. These scores were then assessed by the project Steering Committee and two of the high scoring sites were selected as the preferred pilot areas. These are referred to as Western pilot Site and Eastern Pilot Site (see Figure 1).

Further information, especially socio-economic information, was gathered about these two sites during a field visit. A workshop was held in May 2003 to provide input from stakeholder groups into the selection of the pilot areas. Industry, central and local government, conservation interests, and catchment managers were represented at the workshop. The two preferred pilot sites were endorsed by the workshop.

Western Pilot Area

The western pilot area (WPA) covers approximately 17,000 km² centred on the junction between the Limpopo and Shashe rivers which form the boundary between South Africa, Botswana and Zimbabwe. These rivers and their tributaries, the Thune and Motloutse Rivers in Botswana and the Tuli and Umzingwani Rivers in Zimbabwe, are ephemeral. Both the Motloutse and Shashe Rivers contribute significantly to the flow in the Limpopo main stem and to the shared alluvial aquifer.

The area experiences warm summers and cool dry winters. Temperatures typically reach $>40^{\circ}\text{C}$ in summer in the Limpopo valley. The average annual rainfall varies between 250 mm and 500 mm with the majority of the rain occurring in summer between the months of October to April. The mean annual potential evaporation is very high (1 450-1 500 mm) in the central portion of the area, decreasing slightly in southern Zimbabwe. Most of the western pilot area is classified as semi-arid.

Most of the WPA is classified as bushland, a roughly 50:50 mixture of woody species (trees and shrubs of varying heights) and grasses. There are substantial areas of cultivated land on the southern side of the Limpopo in South Africa. The pilot area contains floodplain forest and woodland types, which are particularly prominent on the floodplains of the Limpopo and its major tributaries. The forests on the river banks themselves are important as a habit and refuge for many other species.

In Zimbabwe large areas of land are classified as communal land with a low density rural population undertaking small-scale subsistence farming. Some land closer to Beit Bridge and the Limpopo River is set aside for large scale commercial farming. To the west of the Thuli River a large area, known as the Tuli Safari area is set aside for controlled hunting. The government developed Shashe, Bili Jarukanga and Kwala irrigation schemes utilize groundwater from the alluvial aquifers associated with the Thuli, Shashe and Umzingwane Rivers. These cover an area of some 260 ha.

The part of the study area in Botswana is almost exclusively used for stock farming, with small areas where crops are cultivated on a small scale for subsistence farming. Some irrigation farming takes place along the banks of the Limpopo River in an area referred to as the Tuli Block. In the eastern corner of the study area in Botswana the triangle formed at the confluence of the Shashe and Limpopo Rivers, is a declared Nature Reserve known as Northern Tuli Conservation area or Mashutu Reserve.

The part of the study area in South Africa is characterized by commercial game and stock farming, and large areas are set aside as Nature and Game Reserves (i.e. Vhembe, Venetia Limpopo and Kimburger) or Conservancy areas. At several places large commercial farms use groundwater from the alluvial aquifers along the Limpopo River. The Venetia diamond mine, situated in the Venetia Limpopo Nature Reserve, extracts large quantities of water from the alluvial aquifer of the Limpopo River for its operation.

A proposed Limpopo-Shashe Transfrontier Conservation Area, centred on the Shashe Limpopo confluence, is being discussed by the three governments. This would link the Northern Tuli game Reserve in Botswana, the proposed Vhembe-Dongola National Park in south Africa and the Tuli Circle safari Area in Zimbabwe.

The population densities are low throughout the area with less than 25 people per hectare. There are population concentrations in the vicinity of the main towns shown on the map. In South Africa most of the land is under commercial agriculture or game farming and the people are concentrated in small farm settlements. The workers at the Venetia Mine are bussed in from Messina each day.

Groundwater Resources of WPA

The sedimentary rocks in the Tuli Basin in the center of the pilot area are capped with a thick layer of basalt. During times when water demand was still relatively low, this fractured basalt was the main drilling target. Borehole yields from this aquifer are generally low ($<2 \ell/\text{s}$) compared to that from the underlying sandstone aquifers, and the Total Dissolved Solids (TDS), are often found to be in excess of 1 000 mg/ ℓ . In addition this aquifer is more vulnerable to pollution. As a result, attention has lately shifted towards the underlying Tsheung sandstone aquifer. The depth to the top of the sandstone varies over short distances and can be in excess of 400 m in places. However, yields are significantly higher than in the basalt and the quality is also better. The best water strikes are normally encountered at the fractured zone just below the contact with the overlying basalt, but continually increasing yields are observed with deeper

penetration into the sandstone. From the experiences to date, it is therefore concluded that the two most prominent aquifers in this pilot study area would be the alluvial deposits associated with the Shashe and Limpopo Rivers, and the confined fractured sandstone aquifer underlying the basalt in the Tuli Basin.

In Botswana the sandstone aquifer has been the target of geohydrological investigations to locate sustainable water resources for towns and villages in the region. The villages of Bobonong, Gobojango, Semolale, Tsetsebjwe, Pont Drif, Mathatane, Motlalatau, Mabolwe, Lepokole in Botswana are totally dependant on groundwater for their water supply.

Eastern Pilot Area

The eastern pilot area (EPA) is centred roughly on the intersection of the borders of Mozambique, South Africa and Zimbabwe. Major tributaries include the Buby from Zimbabwe, Levubu from South Africa and Munezi from Zimbabwe via Mozambique. All make substantial contributions to flow in the middle and lower Limpopo. The Levubu River maintained quite a strong perennial flow regime until the early 1990's when over-abstraction for irrigation in the upper reaches and droughts caused the river to become seasonal.

The topography of the EPA is generally fairly flat to gently undulating, rising northwards towards the escarpment in Zimbabwe and the eastern Soutpansberg in South Africa. The northern end of the Lebombo mountains crosses the area, roughly following the South Africa - Mozambique and the Zimbabwe - Mozambique borders. There are extensive alluvial floodplain deposits along the Limpopo, beginning about 20 km upstream of the Levubu confluence and extending into Mozambique.

The EPA generally has a higher rainfall than the WPA, with only a small part in South Africa having 250-300 mm per year and fairly large areas with more than 450 mm. A small portion of the Soutpansberg in South Africa receives more than 500 mm. Most of the EPA has a mean annual potential evaporation of 1 450-1 500 mm per year, the maximum being 1 500-1 550 in Mozambique in the northeastern part. The aridity index for the EPA is 0.30-0.40 over much of the catchment, reaching 0.20-0.30 in the low-lying areas central part of the Limpopo valley in the western part and in Mozambique.

Much of the EPA is classified as woodland vegetation, interspersed with bushland. Grassland areas occur in the north-western and northern parts of the Mozambican part of the EPA. Cultivated land occur as scattered patches throughout the EPA except in the former hunting areas of Mozambique and the Kruger National Park in South Africa. The most extensive and important azonal vegetation types are the floodplain forest and woodland types, which are particularly prominent on the floodplains of the Limpopo and Luvuvhu Rivers. The forests are important as a habit and refuge for many species. Another distinctive type is the salt tolerant vegetation, which occurs where there is groundwater discharge originating in the patches of high salinity in the marine deposits in Mozambique.

The main land-uses in the South African and Zimbabwean sections of the EPA are extensive commercial farming, game ranching or communal lands. There are large areas of irrigated land in the Luvuvhu catchment but they fall mainly outside the boundaries of the Pilot Study Area. The proposed Greater Limpopo TFCA occupies about 35% of the EPA. It includes three national parks, Gonarezhou in Zimbabwe, the recently proclaimed Limpopo in Mozambique and Kruger in South Africa. Negotiations for further expansions are underway, particularly the corridor that will link Gonarezhou and the Kruger. It also has a number of African Iron Age settlements, including Thulamila in the park and at Gumbu and Mabyeni in the Madimbo area to the west of the Kruger Park.

Population densities in the eastern area are generally higher than those in the WPA, with more than 25 people in the Sengwe area of Zimbabwe and as high as 100-500 per hectare in the former Venda home-

land in South Africa. The major conservation areas in South Africa have very low population densities because the people were removed at the time the parks were established. Populations in the Mozambican section are concentrated along the Limpopo Rivers where there are several small villages and a population of roughly 14 000 people between the border in the north and Mapai in the south.

Groundwater Resources of EPA

From a geohydrological perspective, the Karoo age sedimentary rocks, the younger Cretaceous and Tertiary sediments in Zimbabwe and Mozambique, and the alluvial deposits associated with the Limpopo, Levubu, Bubybe and Nuanetsi rivers are the most important features in this study area. Borehole data are only available for the South African portion of this pilot area, with a few records in Mozambique.

Groundwater Dependent Ecosystems in the two Pilot Areas

From the hydrogeological characteristics of the areas, there is reason to believe that groundwater plays an important role in maintaining the ecosystems. However, very little quantitative information is available about the groundwater dependence of ecosystems in the two pilot areas. Three main types of GDEs can be expected from the geo-hydrology:

- Shallow, localized regolith aquifers with a limited amount of water storage. Discharge is likely to vary seasonally and be unreliable during droughts. There is little information available on these GDEs in the pilot areas.
- Spring-type discharges associated with fault zones, dykes and sills, and contacts between rocks with different aquifer characteristics. The sensitivity of these GDEs will vary with the degree of storage; GDEs associated with major aquifer discharges will be strongly to entirely dependent on groundwater. Some of these systems may be associated with discharges from confined aquifers. There is little information available on these GDEs in the pilot areas.
- Floodplain systems with shallow unconfined aquifers which can be reached by the root systems of the trees in the woodlands and forests that typically develop on these floodplains; these systems are sustained mainly by recharge during periods when there is surface flow or flooding. These systems have, historically, been very reliable groundwater sources and the vegetation is likely to be highly dependent on access to groundwater; the plants will be particularly sensitive to sudden and rapid drops in water levels. These systems already sustain economically important enterprises and are well suited to development for drought backup supply systems.

In the WPA, the floodplain ecosystems have been heavily disturbed, at least in South Africa, and the levee forest has been cut off from the adjacent terrestrial environments by agricultural developments. However, no detailed studies are available in this area.

In the EPA, thicket vegetation usually associated with drainage lines accounts for about 15% of the Limpopo National Park. Characteristic tree species of riverbanks include *Acacia robusta*. Scrub thickets on sodic clays associated with the basalts on the floodplain margins include *Azima tetracantha*, *Cordia sinensis*, *Acacia tortilis* and *Ximenia caffra*. Fever tree (*Acacia xanthophloea*) woodlands occur in depression on cut-off meanders with leadwood (*Combretum imberbe*), *Acacia tortilis* and lala palm (*Hyphaene benguellensis*). Open mopaniveld is found on the older flood-plain surfaces, with *Kirkia acuminata*, *Commiphora africana*, *Combretum hereroense* and *Terminalia prunioides*. Forty nine species of fish are known in this area. Three species deserve special conservation status because of their rarity and limited distribution, these being the two small seasonal pan inhabitants *Nothobranchius orthonotus* and *Nothobranchius rachovii*, as well as the lungfish *Protopterus annectens*. Thirty four species of frogs are known from the area. The Sandveld Pyxie (*Tomopterna krugerensis*) was discovered within the Kruger Park and has its main area of distribution within the Transfrontier Park area, although it has also been recorded in Kwa-Zulu Natal, South Africa.

The floodplain and pan communities around the Limpopo-Levubu confluence also support a wide variety of species. The floodplain communities of this area are very similar to those described above for the Limpopo National Park with the addition of grasslands dominated by *Sporobolus consimilis* in the outer parts of the floodplain. The Madimbo section to the west of Kruger National Park also is a unique landscape with an accompanying wilderness character. The riverine vegetation of this area includes two of the four most endangered plant communities in the Limpopo River system. The two remaining pans in this area, Nyawadi/Banyini and Klein Pannetjie, are important historic migratory routes for elephants and buffalo from Zimbabwe to the Transvaal Lowveld. The transborder floodplains are considered to be of international importance, particularly for breeding waterbirds, 38 species of fish and 33 species of amphibians. The floodplain forests also provide a habitat for eight species of bats and other mammals such as the Samango monkey, Nyala antelope, Suni antelope, Four toed elephant-shrew, woodland mouse and a range of bird species. An application for Ramsar status is being developed at present for this area.