SUSTAINABLE DEVELOPMENT OF GROUNDWATER RESOURCES (RAF/8/029) F4

New

MODEL PROJECT

CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US $	US $	US $	m/d	US $	m/d	US $	US $	US $	US $	US $
1999	5/0	73,500	0	160,000	0/0	0	2/0	21,600	0	60,000	0	315,100
2000	4/0	61,800	0	110,000	0/0	0	2/0	22,800	0	58,000	0	252,600
2001	2/0	32,400	0	20,000	0/0	0	0/0	0	0	30,000	0	82,400

FOOTNOTE a/ FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US $	US $	US $	m/d	US $	m/d	US $	US $	US $	US $	US $
1999	13/15	208,575	120,000	320,000	6/0	20,700	0/0	0	70,000	0	21,000	760,275
2000	12/21	205,740	120,000	20,000	8/0	28,800	0/0	0	62,000	0	21,000	457,540
2001	12/10	209,050	30,000	0	0/0	0	0/0	0	14,000	0	29,135	282,185

First Year Approved: 1999

OBJECTIVES: Development objective: to optimize the long term performance of water sector investments by governments and external donors in several Sub-Saharan countries. Specific objectives: (i) to assess recharge, mixing, storage, and vulnerability to pollution of local water resources using isotopic techniques in pilot areas; (ii) to develop frameworks, including management plans, for equitable and sustainable use of groundwater resources, based on the pilot study findings; (iii) to implement management plans through co-ordination of investment in the water development sector by national governments, UN agencies, the World Bank, and other project partners; and (iv) to establish regional co-operation in water resource assessment and management fostered through TCDC, using shared resources now applied to national problems for developing the capacity to address water issues affecting the region as a whole.

BACKGROUND: Shortage of water is a key issue in much of Sub-Saharan Africa. Eleven Sub-Saharan countries are listed as water scarce today and four more are expected to become so by the year 2000. Hundreds of millions of dollars are being invested in new water supplies across Africa. Current water investment budgets in South Africa and Zimbabwe alone exceed US $175 million. However, results are often disappointing, and management problems remain the single greatest cause of misallocation and waste according to the World Bank Policy Paper on Water Resource Management. Sound decisions about water management require detailed technical information, especially in the context of the large investments and the time critical actions necessary. Inadequate and unreliable data constitute a major limitation for development. Proactive resource planning, based on thorough assessment, is essential to ensure that the future resource base is not degraded or that the existing resources are rationally used. Isotopes can provide unique information on recharge rates and locations of recharge, mixing of water bodies, and sources of salinization, especially in arid and semi-arid areas. Isotopes also provide independent data useful for constraining and validating groundwater models used for water management. Such information is seldom available from conventional hydrogeological investigations, the only means available to most developing nations, but is essential for determining the long term productive capacity of an aquifer, protecting sensitive recharge areas from pollution, or limiting salt water intrusion. An enhanced regional capacity to apply isotope techniques in an integrated manner with conventional hydrogeological tools will help prevent overexploitation and degradation of groundwater resources. Recognizing the indispensable role of isotope techniques in understanding the nature of many of these problems, several African countries sought the Agency's assistance. Areas have been identified in each country by end users where adequate assessment of scarce water resources is crucial to the water supply of large population centres and development activities: Kenya - Project activities will help define recharge from the Ewaso-Nyero River to regional aquifers, providing a basis for equitable distribution of water supplies. At Merti, the Ewaso-Nyiro river disappears underground; the fate of its water past this point is unknown. Some 80 kilometers east of Merti, groundwater from boreholes completed in the early 1970s supports local herders. The sources and rates of recharge to these aquifers are unknown, as are the relations between them and the Ewaso-Nyiro river. Conventional hydrogeology, geophysics, and remote sensing have been employed, but have not determined the locations of recharge, the genetic relationships between the aquifers and the river, or their rates of recharge. Madagascar - Improved water supply is a critical need in southern Madagascar. However, the UNICEF-funded "500 Wells" project has a failure rate of nearly 50% for wells drilled in the region. Most wells are completed in fractured rock aquifers that are poorly understood in terms of recharge and storage capacity. At this time, insufficient information on these aquifers is available to design a coherent strategy for use of isotopic techniques.

Limited project development work is planned to determine if isotopes can contribute to the ongoing UNICEF effort. Namibia - The Stampriet aquifer supports agricultural development across a large portion of the Kalahari desert. Previous isotope studies found Stampreit water to have ages of up to 14,000 years, indicating that much of the aquifer contains fossil water. Modern recharge may be occurring during infrequent but intense rain events in areas where Stampriet outcrops are covered by Kalhari sands, but the nature and volume of recharge, which defines the sustainable yield of the aquifer, is unknown. Limited project development work is planned to determine if isotopes can add unique information to help define the recharge mechanisms. South Africa - The recharge and storage capacity of fractured rock aquifer systems in the northern province are poorly known, although the aquifers are the main water supply for the 3.6 million inhabitants of the region. Previous hydrogeological work in S. Africa, including isotope studies, has focused on aquifers in sedimentary rock in the Kalahari region. New investigation and modeling approaches are needed for the fractured rock systems, as well as an expansion of human and technical capacity to meet the demand for new community services in the former homelands. Tanzania - Ongoing investigation of pollution and depletion of groundwater resources in the Mokutapora basin, the sole source of water for one million people in the city of Dodoma, has not succeeded in defining specific pumping limits or groundwater protection zones around the city well field. Isotope data are sought to provide a clear basis for regulatory action and resource management. Uganda - Wells installed as part of DANIDA's US $11.3 million water resources assessment project and the US $47 million rural towns water and sanitation programme have targeted deep fractured rock aquifers to avoid rapid contamination from surface sources. As many of these wells have low yields or are dry, better knowledge of the connection between shallow and deep aquifers and their recharge patterns is sought to improve well design. Isotope data will help refine a drilling strategy and establish borehole protection zones. Zimbabwe - Heavy agricultural use of water from the Save river and bordering aquifers threatens salinization and pollution of the resource for both local farmers and downstream users. Interaction between river flows and aquifer recharge or discharge is poorly understood. Isotope data will help define surface water-groundwater interactions and sources of recharge and salinization.

PROJECT PLAN: The formulation of this regional undertaking builds upon the experience and tangible practical results from a similar programme involving nine other African countries and which was initiated by the Agency in 1995 under Model Project RAF/8/022. The present project was formulated as a series of parallel national subprojects focused on field activities at the country level. The regional component of the project was designed to promote co-operation and exchange of information and experience among the countries concerned. Project activities will be implemented by country teams under the supervision of a national manager. Agency support will focus mainly on provision of isotope analysis through subcontracting and guidelines for fieldwork, data gathering and interpretation. Expert services will be made available, as necessary, to assist in site reconnaissance and plan development. An initial project workshop, structured as a group training exercise, will be held to evaluate the conceptual models and finalize the workplans developed from them. Analysis of samples collected in the second year of the project will be carried out as an applied training exercise, with national counterparts performing the work at the South African regional analytical centre under the guidance of the local counterparts. This innovative training strategy will mitigate the workload on the South African counterparts, foster a sense of regional ownership of the facilities, and provide a more effective forum for training. The final stage of the project will build on the groundwater modeling results, using this information to help develop groundwater management plans in close co-ordination with all project partners.

NATIONAL COMMITMENT: The national projects included in this regional undertaking are part of high priority government efforts to improve and manage water supplies. In general, assistance is sought to enhance ongoing projects where firm conclusions cannot be reached with conventional hydrogeological techniques. In many of the participating countries, recent changes in water law and resource allocation are also motivating increased technical understanding of the available water supplies so that equitable and efficient distribution can be accomplished. To implement the activities planned under this project, government authorities have undertaken to provide the necessary scientific and technical staff, analytical laboratory facilities, capacity for hydrogeological investigations, drilling and sampling equipment, and operating costs.

AGENCY INPUT: Expert services for co-ordination, monitoring and support to implementation of project activities; equipment and consumables for laboratory and field work, including setting up regional analytical facilities; isotope measurement services; training through fellowships, scientific visits, organization of technical workshops, and exchange of project staff; annual co-ordination meetings.

PROJECT IMPACT: The implementation of project activities will enhance professional opportunities in the water sector in the countries concerned through training and experience with the international scientific community. The data obtained from the project will be used in addressing practical problems in the development and management of groundwater resources in fractured hard rock aquifers and alluvial aquifer systems where the issues of salinization, pollution and overexploitation are of major concern. The project findings will enable water authorities and end users to devise appropriate policies and strategies for optimum management of the existing resources. The expected social and economic impact is through better access to clean and reliable water supplies for people in the study areas and, as follow-on studies are completed, in the region as a whole.