Annex a)
Project Logical Framework

Project: Mainstreaming Groundwater Considerations into the Integrated Management of the Nile River Basin
Goal The development objective of the project is to provide the scientific basis and necessary institutional and policy support for incorporating a groundwater dimension into planning and management of the Nile basin ecosystem as an essential component of sustainable development of the Nile Basin.
Objectives 1. Improve the assessment of groundwater-surface water interactions towards strengthening protection of key ecosystem resources as well as the gains from and losses to groundwater on rivers and lakes in the Nile basin; 2. Enhance the characterization of the role of groundwater in wetlands and of the Sudd Swamps in the regional water cycle; 3. Improve the use of water balance models in estimating basin-wide annual and monthly water balances in the Nile basin as an input to water planning and management; 4. Facilitate the inclusion of groundwater considerations into integrated Nile basin water resources planning and management activities and ensure a common understanding of groundwater issues and analysis among the riparian countries.

Outcomes

1. Enhanced capacity in national and regional institutions to understand extent and impact of groundwater on selected rivers systems comprising the Nile basin
2. Enhanced capacity in national and regional institutions to assess the contribution of groundwater in sustaining wetlands in selected areas of the Nile basin, particularly where groundwater is important for ecosystem protection
3. Enhanced capacity in national and regional institutions to use water balance models that incorporate physical, chemical and isotope data to estimate annual and monthly water balance information that is essential for sustained management of wetlands and lakes in the Nile basin
4. Enhanced capacity on the part of national and regional institutions to integrate groundwater considerations into Nile basin planning and management activities
5. Project components implemented effectively and efficiently accordingly; appropriate implementation of agreed monitoring and evaluation plan and subsequently completed evaluation of project based on project objectives and performance indicators

Project Process Indicators:	**Means of verification**
1. Identification and adoption of a mechanism (specialist panel, GW specialist network) to sustain the inclusion of GW considerations in NBI processes; 2. Enhanced mainstreaming of GW consideration in national level water resource management	Annual reports and final project evaluation report as per Outcome 5 and Output 5.3

Outcome 1: Enhanced capacity in national and regional institutions to understand extent and impact of groundwater on selected rivers systems comprising the Nile basin.			
Outputs	**Inputs and Actors**	**Verifiable indicators**	**Means of verification**
		For Outcome 1: Continued investigation by national and regional institutions of groundwater using a combination of conventional and isotope hydrological methods to assess and monitor groundwater-surface water interaction. Incorporation of the findings from these investigations development and planning activities affecting the Nile wetlands.	National and regional assessment reports. Development impact assessment and management activities reports – specifically in relation to Nile wetlands.
1.1 Report on groundwater discharge to Lake Victoria (Kenya, Tanzania and Uganda)	• Financial and human resource inputs from National Governments, UNDP-GEF and IAEA • Institutional and	Sampling and data analysis plan prepared Multi-level piezometers from the shore inland at selected sites installed. Sampling and monitoring performed Estimation of groundwater discharge through scaled water balanced model	Reports Water balance model simulations

Outcome 1: Enhanced capacity in national and regional institutions to understand extent and impact of groundwater on selected rivers systems comprising the Nile basin.			
1.2 Report on the water balance of Equatorial Lakes (Uganda)	human resource inputs from national and regional institutions (including the NBI) as well as logistical support where needed • Consultants (national, regional and international)	Rainfall sampling stations installed Routine sampling and data analysis completed Estimation of surface water-groundwater through scaled water balanced model	Reports Water balance model simulations
1.3 Report on the water balance of Lake Tana (Ethiopia)		Routine sampling, rainfall measure and data analysis (Lake Tana area) completed Estimation of surface water-groundwater through a scaled water balanced model	Reports Water balance model simulations
1.4 Report on the fraction and age of groundwater contributing to the river flow of major rivers entering Lake Victoria (Kenya, Tanzania and Uganda)		Sampling and data analysis plan prepared Routine sampling completed Estimation of fraction of groundwater contribution to river flow through a scaled water balanced model	Reports Water balance model simulations

Outcome 1: Enhanced capacity in national and regional institutions to understand extent and impact of groundwater on selected rivers systems comprising the Nile basin.			
1.5 Report on the fraction and age of groundwater contributing to river flow of major rivers of the White Nile (downstream from Lake Victoria) (Ethiopia, Sudan and Uganda)		Sampling and data analysis plan prepared Routing sampling completed Estimation of fraction of groundwater contribution to river flow through a scaled water balanced model	Reports Water balance model simulations
1.6 Report on the fraction and age of groundwater contributing to Blue Nile (upstream from confluence with White Nile) (Ethiopia and Sudan)		Sampling and data analysis plan prepared Routing sampling completed Estimation of fraction of groundwater contribution to river flow through a scaled water balanced model	Reports Water balance model simulations
1.7 Report on the loss of river flow from the Blue Nile to groundwater (Sudan)		Sampling and data analysis plan prepared Routing sampling completed Estimation of loss of river flow contribution to river flow through a scaled water balanced model	Reports Water balance model simulations

Outcome 1: Enhanced capacity in national and regional institutions to understand extent and impact of groundwater on selected rivers systems comprising the Nile basin.			
1.8 Report on surface water-groundwater interaction upstream of the High Dam (Egypt)		Sampling and data analysis plan prepared Routing sampling completed Estimation of surface water-groundwater interaction through a scaled water balanced model	Reports Water balance model simulations
1.9 Report on the fraction of groundwater and approximate residence time of groundwater in rivers and lakes composing the Nile basin		Summary report on findings from outputs 1.1 to 1.8 prepared including implications for water management and ecosystem protection	Reports Water balance model simulations
1.10 Summary report indicating where groundwater is important for ecosystem protection of lakes and rivers as determined by appropriately scaled water balance models.		Report on the groundwater balances in the ecosystems investigated prepared including recommendations Map indicating areas of notable groundwater impact on lake and wetland systems made.	Reports Water balance model simulations Groundwater maps

Outcome 2: Enhanced capacity in national and regional institutions to assess the contribution of groundwater in sustaining wetlands in selected areas of the Nile basin, particularly where groundwater is important for ecosystem protection			
Outputs	**Inputs and Actors**	**Verifiable indicators**	**Means of verification**
		For Outcome 2: Continued investigation by national and regional institutions of groundwater/surface water relations using a combination of conventional and isotope hydrological methods to assess and monitor groundwater-surface water interaction. Incorporation of the findings from these investigations into water planning and water management activities.	Reports on national and regional findings on groundwater interaction with selected water systems in the Nile Basin
2.1 Report on the source of water to wetlands adjacent to selected rivers and larger lakes in the Nile Basin	• Financial and human resource inputs from National Governments, UNDP-GEF and	Sampling and data analysis plan prepared Sampling performed Estimation of surface water-groundwater interaction through a scaled water balance model	Reports Water balance model simulations

Outcome 2: Enhanced capacity in national and regional institutions to assess the contribution of groundwater in sustaining wetlands in selected areas of the Nile basin, particularly where groundwater is important for ecosystem protection			
2.2 Report on the source of water to the Sudd wetlands (Sudan)	IAEA • Institutional and human resource inputs from national and regional institutions (including the NBI) as well as logistical support where needed • Consultants (national, regional and international)	Sampling and data analysis plan prepared Sampling performed Estimation of surface water-groundwater interaction through a scaled water balance model	Reports Water balance model simulations
2.3 Report on the contribution of moisture from the Sudd Swamps to the regional water cycle, including precipitation in the Ethiopian Highlands		Regional atmospheric data evaluated Isotope data to quantify moisture sources in the Ethiopian Highland Precipitation integrated Potential changes in the Sudd Swamps on regional precipitation evaluated	Reports Isotope data results Model simulations

Outcome 3: Enhanced capacity in national and regional institutions to use water balance models that incorporate physical, chemical and isotope data to estimate annual and monthly water balance information that is essential for sustained management of wetlands and lakes in the Nile basin			
Outputs	**Inputs and Actors**	**Verifiable indicators**	**Means of verification**
		For Outcome 3: Continued application by national and regional institutions of the models using the latest water and isotope data to estimate annual and monthly water balances and interpret the results Incorporation of the findings from these investigations into water planning and management decision Integration of assessment results in the DSS and water models of the NBI	Findings and assessment reports on water balance Documentation of methodology for water balance estimation Documentation on workshops and training courses NBI documents and water models – WRMP
3.1 Report on sub-basin and basin models to be used in analyses undertaken under components 1 and 2	• Financial and human resource inputs from National Governments, UNDP-GEF and IAEA	Appropriate models to be used identified Specification of additional physical, chemical and isotopic data needed for model application Generic guidance document for sampling and data analysis	Report including data gaps Sampling and data analysis guidance document

Outcome 3: Enhanced capacity in national and regional institutions to use water balance models that incorporate physical, chemical and isotope data to estimate annual and monthly water balance information that is essential for sustained management of wetlands and lakes in the Nile basin			
3.2 Report on the availability, integration and application of water and isotopic data for estimation of the magnitude and timing of water fluxes to and from the Nile basin	• Institutional and human resource inputs from national and regional institutions (including the NBI) as well as logistical support where needed • Consultants (national, regional and international)	Model applications from components 1 and 2 reviewed Methodology for use in regional model applications identified Assessment of available data and identification of data gaps Identification of other data sources	Assessment report Methodology document Data sources to fill gaps identified
3.3 Report on the development and application of a regional water-balance model for the larger Nile basin		Regional water balance model developed, tested, applied and evaluated Interpretations of the implications of regional model results for water management and ecosystem protection	Water balance model developed Model and interpretation report
3.4 Report on training activities in support of modeling		Water balance model - training workshop Training courses on water balance modelling	Workshop on use of water balance models proceedings Training courses reports

Outcome 4: Enhanced capacity on the part of national and regional institutions to integrate groundwater considerations into Nile basin planning and management activities			
Outputs	**Inputs and Actors**	**Verifiable indicators**	**Means of verification**

Outcome 4: Enhanced capacity on the part of national and regional institutions to integrate groundwater considerations into Nile basin planning and management activities			
		For Outcome 4: Groundwater information generated under components 1, 2, and 3 are included in basin-wide projects carried out under the auspices of NBI, primarily NTEAP and WRPM, and in the Lake Victoria Environmental Management project; Existing Nile water management networks discuss and review groundwater issues on a regular basis and new structures (e.g. Nile Groundwater Working Group) established as deemed appropriate and functioning within the NBI as needed to ensure the inclusion of groundwater issues appropriately; National groundwater focal points and/ or other mechanisms for groundwater information exchange established within the NBI continue to function beyond the duration of the project	Institutional arrangements Documentation of groundwater information generated Proceedings of networking discussions, activities and reviews

Outcome 4: Enhanced capacity on the part of national and regional institutions to integrate groundwater considerations into Nile basin planning and management activities			
4.1 National Groundwater Reports and 1 Regional groundwater status report	• Financial and human resource inputs from National Governments, UNDP-GEF and IAEA • Institutional and human resource inputs from national and regional institutions (including the NBI) as well as logistical support	Format for reports established National reports on groundwater status and technical capacity produced Regional report on groundwater status and technical capacity prepared Regional stakeholders meeting held to review the report and to consider next steps	Report formats established National reports on groundwater status and technical capacity to assess groundwater issues Regional report on groundwater status and technical capacity Regional stakeholders meeting proceedings
4.2 Report on the planned and potential use for groundwater information in both Nile basin as well as related national aquifer planning and management projects		Groundwater considerations in on-going and planned regional planning projects reviewed. Recommendations for follow-up activities and training made Sub-regional training workshop held	Report on eview of Groundwater considerations in on-going and planned regional planning projects Recommendations report on follow-up activities and training Sub-regional training workshop proceedings

Outcome 4: Enhanced capacity on the part of national and regional institutions to integrate groundwater considerations into Nile basin planning and management activities			
4.3 Enhanced awareness of groundwater management issues among national and regional decision makers	where needed • Consultants (national, regional and international)	Standard package on groundwater assessment and management prepared Participation in relevant national water or economic development meetings Participation in annual meetings of NBI and Lake Victoria Basin Commission Regional meetings to review results of components 1, 2 and 3 and to determine necessary responses held Two sub-regional training/awareness workshops held	Standard package on groundwater assessment and management National water or economic development meetings' procedures Annual meetings of NBI and Lake Victoria Basin Commission proceedings Meeting reports Training workshop proceedings
4.4 Regional Nile Groundwater network (10 country) established to exchange information on groundwater planning and management issues as well as to assist in integration of groundwater considerations into Nile River Basin planning and management		Options for information sharing and networks reviewed Assessment of the network benefits for existing projects and programmes Regional network meetings held Regional and national resource centers equipped	Report on options for info sharing and approaches for developing a network Regional network meetings reports Resources centers equipment and resources

Outcome 5: Project components implemented effectively and efficiently accordingly; appropriate implementation of agreed monitoring and evaluation plan and subsequently completed evaluation of project based on project objectives and performance indicators			
Outputs	**Inputs and Actors**	**Verifiable indicators**	**Means of verification**
		For Outcome 5: Reports from national advisory and project steering committees submitted in a timely manner Corrective actions and adjustments recommended where needed Written reviews of the final summary reports prepared at the end of components 1 to 3 Monitoring and evaluation plans and reports prepared as required	Steering committee reports and reviews Project implementation plan framework Monitoring and evaluation framework and reports
5.1 Reports on the annual meetings of the project steering committee	• PMU • Financial and human resource inputs from National Governments,	Project inception meeting held and inception report prepared Project activities under all components reviewed by project steering committee on an annual basis and reports prepared	Inception report Steering

Outcome 5: Project components implemented effectively and efficiently accordingly; appropriate implementation of agreed monitoring and evaluation plan and subsequently completed evaluation of project based on project objectives and performance indicators			
5.2 Reports on the annual meetings of national project advisory committees Activities	UNDP-GEF and IAEA • Institutional and human resource inputs from national and regional institutions. • Consultants	National project advisory committee meeting held annually Meeting reports submitted	National project advisory committee meeting proceedings Meeting reports submission
5.3 Evaluation reports		Annual and quarterly progress reporting Regular updating of project execution plans and project budgets, Arrangement of one independent final project evaluation exercise	Annual and Quarterly progress Reports Updates of project execution plans and budgets Independent final project evaluation report

Annex b)

Award ID:	tbd
Award Title:	PIMS 3765_Egypt_Mainstreaming Groundwater Considerations into the Integrated Management of the Nile River Basin
Business Unit:	EGY10
Project ID:	tbd
Project Title:	PIMS 3765_Egypt_Mainstreaming Groundwater Considerations into the Integrated Management of the Nile River Basin
Implementing Partner (Executing Agency:)	IAEA

GEF Outcome/Atlas Activity**	Responsible Party / Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	"ATLAS Budget Description"	Year 1 (2007) USD	Year 2 (2008) USD	Year 3 (2009) USD	Year 4 (2010) USD	Total (USD)
OUTCOME 1: Enhanced capacity in national and regional institutions to understand extent and impact of groundwater on selected rivers systems comprising the Nile basin	IAEA	62000	GEF	71300	Local Consultants	0	19 440	17 280	0	36 720
	IAEA	62000	GEF	71200	International Consultants	0	0	0	0	0
	IAEA	62000	GEF	71600	Travel	0	4 536	6 048	0	10 584
	IAEA	62000	GEF	74500	National Meetings	0	0	0	0	0
	IAEA	62000	GEF	74500	Regional Meetings	0	27 000	27 000	0	54 000
					Subtotal GEF	**0**	**50 976**	**50 328**	**0**	**101 304**
	IAEA		IAEA		Experts	13 800	13 860	22 900	9 120	59 680
	IAEA		IAEA		Meetings				27 500	27 500

	IAEA		IAEA		Training, Sampling Campaigns & Data Evaluation		27 750	27 750	15 000	70 500
	IAEA		IAEA		Equipment		84 700			84 700
	IAEA		IAEA		Procurement (Lab sample Analysis & Assessment, etc.)		31 350	191 400	79 200	301 950
					Subtotal IAEA	**13 800**	**157 660**	**242 050**	**130 820**	**544 330**
					SUBTOTAL OUTCOME 1	**13 800**	**208 636**	**292 378**	**130 820**	**645 634**
OUTCOME 2: Enhanced capacity in national and regional institutions to assess the contribution of groundwater in sustaining wetlands in selected areas of the Nile basin, particularly where groundwater is important for ecosystem protection	IAEA	62000	GEF	71300	Local Consultants	0	18 360	16 200	0	34 560
	IAEA	62000	GEF	71200	International Consultants	0	10 584	8 856	0	19 440
	IAEA	62000	GEF	71600	Travel	0	3 780	3 780	0	7 560
	IAEA	62000	GEF	74500	National Meetings	0	8 100	8 100	0	16 200
	IAEA	62000	GEF	74500	Regional Meetings	0	17 280	17 280	0	34 560
	IAEA	62000	GEF	71300	Contractual Services	0	16 200	19 440	0	35 640
					Subtotal GEF	**0**	**74 304**	**73 656**	**0**	**147 960**
	IAEA		IAEA		Experts	9 200	20 790	13 450	28 880	72 320
	IAEA		IAEA		Meetings				22 500	22 500
	IAEA		IAEA		Training, Sampling Campaigns & Data Evaluation		35 000	30 000	14 500	79 500
	IAEA		IAEA		Equipment		36 300			36 300

	IAEA		IAEA		Procurement (Lab sample Analysis & Assessment, etc.)		25 650	138 600	80 800	245 050
					Subtotal IAEA	**9 200**	**117 740**	**182 050**	**146 680**	**455 670**
					SUBTOTAL OUTCOME 2	**9 200**	**192 044**	**255 706**	**146 680**	**603 630**
OUTCOME 3: Enhanced capacity in national and regional institutions to use water balance models that incorporate physical, chemical and isotope data to estimate annual and monthly water balance information that is essential for sustained management of wetlands and lakes in the Nile basin	IAEA	62000	GEF	71300	Local Consultants	0	34 560	32 400	14 040	81 000
	IAEA	62000	GEF	71200	International Consultants	0	43 200	43 200	21 600	108 000
	IAEA	62000	GEF	71600	Travel	0	16 200	16 200	8 722	41 122
	IAEA	62000	GEF	74500	Regional Meetings	0	26 568	26 568	0	53 136
	IAEA	62000	GEF	74500	Miscellaneous (software, equip for modelling, etc.)	0	5 400	5 400	0	10 800
					Subtotal GEF	**0**	**125 928**	**123 768**	**44 362**	**294 058**
					SUBTOTAL OUTCOME 3	**0**	**125 928**	**123 768**	**44 362**	**294 058**
OUTCOME 4: Enhanced capacity on the part of national and regional institutions to integrate groundwater	IAEA	62000	GEF	71300	Local Consultants	0	43 200	27 000	11 880	82 080
	IAEA	62000	GEF	71200	International Consultants	0	27 000	21 600	13 500	62 100
	IAEA	62000	GEF	71600	Travel	0	5 400	4 320	2 700	12 420
	IAEA	62000	GEF	74500	National Meetings	0	63 720	0	0	63 720

considerations into Nile basin planning and management activities	IAEA	62000	GEF	74500	Regional Meetings **	0	32 400	32 400	32 400	97 200
	IAEA	62000	GEF	74500	Miscellaneous (public information materials)	0	0	9 288	11 070	20 358
					Subtotal GEF	**0**	**171 720**	**94 608**	**71 550**	**337 878**
					SUBTOTAL OUTCOME 4	**0**	**171 720**	**94 608**	**71 550**	**337 878**
OUTCOME 5: Project components implemented effectively and efficiently accordingly; appropriate implementation of agreed monitoring and evaluation plan and subsequently completed evaluation of project based on project objectives and performance indicators	IAEA	62000	GEF	71200	Final MSP Review	0	0	0	32 400	32 400
	IAEA	62000	GEF	71400	Inception & Final Project Meeting	43 200	0	0	43 200	86 400
					Subtotal GEF	**43 200**	**0**	**0**	**75 600**	**118 800**
					Project Management (See Project Management notes)		0	0	0	0
					Subtotal IAEA	**0**	**0**	**0**	**0**	**0**
					SUBTOTAL OUTCOME 5	**43 200**	**0**	**0**	**75 600**	**118 800**

**Linked to PSC meetings

TOTAL	**66 200**	**698 328**	**766 460**	**469 012**	**2 000 000**

Summary of Funds

GEF	43 200	422 928	342 360	191 512	1 000 000
IAEA (In-Kind)	50 000	100 000	100 000	100 000	350 000
IAEA(In Cash)	23 000	275 400	424 100	277 500	1 000 000
Government in kind (Egypt)	52 200	156 600	208 800	104 400	522 000
Government in kind (Ethiopia)	8 600	25 800	34 400	17 200	86 000
Government in kind (Kenya)	6 850	20 550	27 400	13 700	68 500
Government in kind (Sudan)	55 000	165 000	220 000	110 000	550 000
Government in kind (Tanzania)	18 350	55 050	73 400	36 700	183 500
Government in kind (Uganda)	13 080	39 240	52 320	26 160	130 800
TOTAL	168 400	954 928	1 075 260	673 412	3 890 800

Explanatory Notes for the TBWP table- IAEA/UNDP/ GEF Nile Groundwater MSP

For adaptive Management reasons, the above budget breakdown and below budget notes are only indicative. They will be subject to changes throughout the project execution, based on review of progress and changes in project conditions, risks and assumptions.

All contracts listed below will be procured as per UNDP/IAEA rules and regulations.

Outcome 1: The IAEA co-funding will support the majority of activities for this component. GEF funding will be used to for supporting field work (consultants, logistical support etc.) and for coordination of respective activities of national teams.

Outcome 2: The international consultant will provide technical guidance to national experts to prepare and carry out field work. Travel funds supports the travel of experts for the field work and meetings to analyze and assess results. Contractual services support sampling activities in remote areas (hiring of boats, equipment etc. in areas like the Sudd Swamps etc.)

Outcome 3: An international consultant will guide the implementation of this component including the work of national experts. The international expert will need to work closely with staff of the Nile Water Resource Management project and this will involve significant work on site with WRMP staff i.e. in Addis Ababa, to assure appropriate coordination of activities as well as the integration of this MSP results into the overall Nile Basin Decision Support System (DSS>).

Outcome 4: National consultants will be hired in each Nile Basin country and work under the guidance of an international groundwater policy expert. The travel budget is related to the international consultant's participation in regional groundwater/ Nile policy meetings (2) and where appropriate, participation in select national meetings. Miscellaneous budget is specifically to produce public information to communicate project outcomes to key stakeholders.

Outcome 5: An inception meeting and final project meeting (to assure integration of project results into overall NBI framework) will be supported with GEF funds in the 1st and final year respectively. The project steering committee will be established at the Inception Meeting. The PSC will then meet in the frame of other project meetings supported in project components 3 and 4 respectively.

Note to the Project Management Table
* Project management will be achieved via IAEA staff members. IAEA in-kind co-funding of 350000 USD will be provided for project support/coordination as needed. In-kind support will be documented and confirmed during project implementation. This demonstrates the complete integration of the project in IAEA's program.

Note to Travel Budget:
GEF funds will be used to support travel in relation to the field work, monitoring and evaluation meetings and necessary meetings for the delivery of outcomes. The GEF travel budget will be supplemented through the cash-contribution of the IAEA.

Annex c)

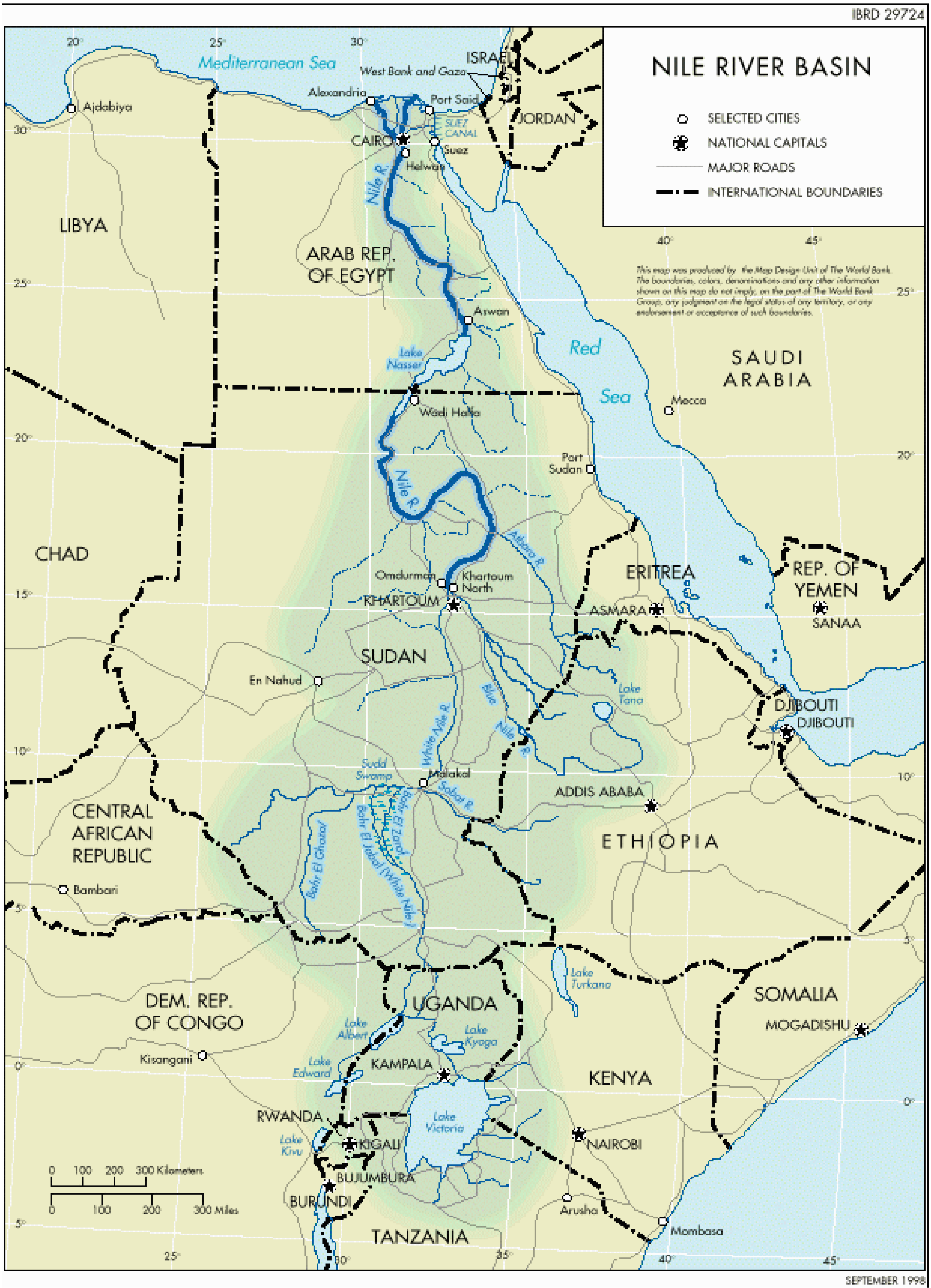
IMPLEMENTATION PLAN

The following represents the IAEA/UNDP/GEF "Groundwater in the Nile Basin" Project Time Frame. This assumes a project start up date of July 2007. A full Project Implementation Plan will be detailed during the first project inception meeting.

Table - Project Time-Chart 2007-2010

Project Components/Activities	Duration (months)	Jul-Sep 2007	Oct-Dec 2007	Jan-Mar 2008	Apr-Jun 2008	Jul-Sep 2008	Oct-Dec 2008	Jan-Mar 2009	Apr-Jun 2009	Jul-Sep 2009	Oct-Dec 2009	Jan-Mar 2010	Apr-Jun 2010	Jul-Sep 2010	Oct-Dec 2010
PROJECT	42														
Inception Period	6														
1. Assess groundwater in Nile lakes and rivers	16														
2 Assess Groundwater in Nile wetlands	20														
3. Data Synthesis with regional model	18														
4. Integrating groundwater considerations into Nile Basin management	36														
5. Project monitoring and evaluation	36														

Annex d)


IBRD 29724
NILE RIVER BASIN
SELECTED CITIES
NATIONAL CAPITALS
MAJOR ROADS
INTERNATIONAL BOUNDARIES
Mediterranean Sea
West Bank and Gaza
ISRAEL
JORDAN
Alexandria
Port Said
SUEZ CANAL
CAIRO
Suez
Helwan
Nile R.
LIBYA
ARAB REP. OF EGYPT
Aswan
Lake Nasser
Red Sea
SAUDI ARABIA
Mecca
Wadi Halfa
Port Sudan
CHAD
Atbara R.
ERITREA
REP. OF YEMEN
SANAA
ASMARA
Omdurman
Khartoum North
KHARTOUM
SUDAN
En Nahud
Lake Tana
Blue Nile R.
White Nile R.
DJIBOUTI
DJIBOUTI
Sudd Swamp
Malakal
Sobat R.
ADDIS ABABA
ETHIOPIA
CENTRAL AFRICAN REPUBLIC
Bambari
Bahr El Ghazal
Bahr El Jabal (White Nile)
Bahr El Zaraf
Lake Turkana
SOMALIA
MOGADISHU
DEM. REP. OF CONGO
UGANDA
Lake Albert
Lake Kyoga
Kisangani
Lake Edward
KAMPALA
KENYA
RWANDA
Lake Victoria
NAIROBI
Lake Kivu
KIGALI
BUJUMBURA
BURUNDI
Arusha
Mombasa
TANZANIA
0 100 200 300 Kilometers
0 100 200 300 Miles
SEPTEMBER 1998

Annex e)

REPORT ON

COORDINATION AND PROGRAMMING MEETING FOR THE FORMULATION OF AN IAEA/ UNDP/ GEF MEDIUM SIZED PROJECT PROPOSAL FOR “ADDING THE GROUNDWATER DIMENSION TO NILE RIVER BASIN MANAGEMENT”

VIENNA, 29 May to 2 June 2006

Project RAF/8/037: “Sustainable Development and Equitable Utilisation of the Common Nile Basin Water Resources”

TABLE OF CONTENTS

INTRODUCTION

The Nile Basin Initiative (NBI – see website www.nilebasin.org) was formed to address issues affecting the River Nile within a basin-wide context. Among these issues are the processes affecting the water balance within the basin, and the maintenance of acceptable water quality in all areas of the basin. In response to requests from Member States involved in the NBI, the Board of Governors of the International Atomic Energy Agency (IAEA) approved project RAF/8/037 to utilize isotopic techniques which are uniquely suited for addressing several of the outstanding hydrologic problems within the Nile Basin.

A pre-project formulation meeting was held in the Agency Headquarters in Vienna from 20-24 August 2002 during which participants from Egypt, Ethiopia, Sudan and Uganda discussed the potential applications of isotopic data in Nile Basin management and concluded that there were important issues related to improving the estimates of water balance in the Nile Basin that are not well understood at present. The use of isotopes can improve this understanding on a basin-wide scale and the Agency was requested to formulate a proposal for an IAEA-supported regional project to begin in 2003. The project is being implemented in two phases. The project activities being carried out under phase I (2003-2004) focus on the White Nile and Lake Victoria basins. The activities carried out in phase II (2005-2006) are covering the Blue Nile and Main Nile basins. The first phase of the project has addressed the water balance of Lake Victoria and investigated the interaction between the lake and the surrounding groundwater.

The First Coordination Meeting of the project was held in Entebbe, Uganda, in April 2003 and was attended by representatives of Egypt, Ethiopia, Kenya, Sudan, Uganda and the United Republic of Tanzania as well as participants from the Agency, The Nile Basin Initiative and the Lake Victoria Environmental Management Project. The meeting designed the workplan for phase I of the project focusing on water balance studies for Lake Victoria.

The Second Project Coordination Meeting was held in Vienna from 22 to 26 November, 2004. The participants reviewed progress made and updated workplans.

At the first Coordination Meeting held at Entebbe, Uganda (2003), sampling priorities and strategies were set to study the water balance of the Nile Basin using isotopes. It was decided to begin the project on the Lake Victoria Basin with the cooperation of Kenya, Uganda and the Tanzania. The project included providing training in isotopic methods, support for sampling, analysis of samples as well as the assessment of the resulting data. Samples were collected of water from Lake Victoria, groundwaters along the border of the lake, and surface waters that feed the lake. Some rainfall stations were also set up. Further meetings and training sessions were held at Mwanza and Kisumu to continue the progress of the programme. The data resulting from these efforts have been assessed and the importance of groundwater input into the surface waters of the basin was clearly evident. Initial sampling was carried out in the second phase (beginning in 2005) of the program along the Blue Nile in the Sudan, in the Lake Tana region of Ethiopia, and along the lake behind the High Dam in Egypt.

The initial programme was successful and many of its results are detailed below and in the reports appended to this report. It was felt that further work was needed to improve the understanding of the importance of groundwater to the Nile River Basin. It was decided to hold a meeting with a view to developing a medium sized project proposal that could be presented to the United Nations Developmental Program Global Environmental Facility (UNDP/GEF) for funding to be matched with a follow-up IAEA Technical Cooperation project for the time-frame 2007-2010. This meeting brought together representatives of six of the countries involved in basin management, and representatives of relevant Nile Basin projects along with IAEA staff and experts (see Annex 1 for the list of participants).

The objectives of the meeting were as follows:

- To reach common understanding of the knowledge gap concerning groundwater inter-linkages with the Nile and relevance to Nile River Basin management activities;

- To review the relevance and need for assessing the groundwater- surface water inter-linkages in the Nile River Basin in light of the results of the on-going IAEA technical cooperation project (RAF8/037) that is investigating groundwater linkages in the Lake Victoria and Blue Nile basins
- To gain agreement amongst project partners about the objectives, expected outputs & outcomes, activities and needed inputs for the IAEA/GEF/UNDP new initiative for adding the groundwater dimension to Nile River Basin management activities;
- To prepare the draft document for a Medium-sized Project Proposal to be considered for co-funding by UNDP/GEF and the IAEA in the frame of an expanded cooperative project based on the current IAEA project (RAF/8/037);
- To reach agreement on the approach and time frame for finalizing the project proposal, roles and responsibilities in project preparation as well as for implementation, etc.

The meeting provided an opportunity to discuss the feasibility and value of using isotopes to help understand the importance of groundwater within the basin and represents an important step in developing a program to continue and improve on the work begun in 2003. The project has been directed at both finishing the work started and completing aspects of the original programme that have been identified.

The meeting was held at the headquarters of the International Atomic Energy Agency in Vienna, Austria of 29 May – 2 June, 2006. Representatives from Egypt, Ethiopia, Sudan Uganda and the United Republic of Tanzania participated in the meeting. The representative from Kenya was unable to attend the meeting but sent his report, which was presented at the meeting. Other representatives from stakeholders including the Nile Basin Water Resources Management Project (also designated to represent the Nile Basin Initiative,) the Nile Transboundary Environmental Action Project, and the Lake Victoria Basin Commission, were present as well as IAEA staff and external experts. The meeting was opened by the Mr. Karol Skornik, Acting Section Head in the Division of Africa (Department of Technical Cooperation) and Mr. Pradeep Aggarwal, Section Head of Isotope Hydrology Section.

Mr. Skornik emphasised that the Nile Basin represents a trans-boundary resource to be shared and that groundwater impacts both the water quality and quantity. This is an area that has been identified as important for proper management of the water resources and ecosystems of the basin. Mr. Aggarwal discussed the on-going IAEA TC project and noted the constraints on what the Agency could fund. Thus, he emphasized the importance of cooperating with another organization(s) to fund other aspects of adding groundwater to Nile River basin management activities.

Mr. Ghany was selected by the meeting to be Chairperson and Mr Michel was designated rapporteur for the meeting .

RESOURCE MATERIAL

The following inputs were provided to the meeting (these presentations are collected in Annex B):

A. Garner – IAEA/ Water Resources Programme: Mr. Garner presented an overview of the water activities of the IAEA including past and present work in the Nile Basin. The agency is charged with the development of the use of isotopes for peaceful processes. A part of this programme is to promote the use of isotopes in hydrology to assist in water management activities. Increasingly IAEA water activities are including involvement in international water projects with other agencies where practical. There is presently a partnership in the frame of a GEF project, between the IAEA, UNDP and GEF on the Nubian Aquifer that should be beneficial to all 4 countries involved. The proposal, that would be the focus of this meeting, would also be a Medium Size Project Proposal (MSP), and would attempt to attain the same level of cooperation and funding to add the groundwater dimension to the Nile including determining the groundwater interactions within the Nile Basin. The current proposed project would include using isotopes on a basin-wide scale to understand the role of groundwater in sustaining the water levels and ecosystems in the basin as well as support the integration of groundwater into institutional and policy related activities in the Nile.

N. Jarvis - IAEA / Technical Cooperation Programme: Mr Jarvis discussed the role of the technical cooperation programme in IAEA Member States. This has included technology transfer, capacity building, training, advice and the supply of equipment within the context of addressing national priorities clearly defined as such in the respective Country Programme Frameworks (CPF) established for each country to guide IAEA cooperation. The initial project, RAF/8/037, was funded by the IAEA through its technical cooperation programme

Hesham El-Ghany – Nile Basin Initiative: Mr Ghany gave a presentation explaining the function of the NBI on behalf of the NBI whose representative could not attend the meeting. The NBI is composed of the 10 basin countries which work jointly to manage the basin in the best manner. This must be done in cooperation with the appropriate stakeholders to make sure that all important issues are represented.

J. Omwenga – Nile Transboundary Environmental Assessment Project: Mr Omwenga noted that the basin has a population of 160 million people. It includes 100,000 km^2 of wetlands of which 30 000 km^2 are in the Sudd. Water quality issues have become very important for the members of the NBI. Several trans-boundary stations have been agreed on as sampling and monitoring stations by the member nations. These stations are part of a basin-wide quality monitoring system to track the present state of water quality and how it is changing with time. It is important to understand the response time of water quality to changes in the water balance, and especially to changes in management practices that may occur. As of the present time, potential water quality problems resulting from groundwater input into the surface water system have not been considered.

H. Ghany -Water Resources Planning and Management Project: Groundwater issues are not yet an integral part of the NBI even though most people now agree on its importance. There is a need to develop analytical tools to assist managers in decision making regarding water resources. Guidelines need to be developed for the use of such tools. A computer-based Decision Support System (DSS) will be developed to assist in this effort. The question is how best to develop this system and how the data will be shared. This is important so that all countries will accept and have confidence in the decisions made. A discussion was held on how the groundwater element could be added to the NBI and how it might be included in decision making. Information on groundwater/surface water would be a useful input into the DSS.

Current State of Knowledge - R. Michel, IAEA Expert: Mr Michel discussed the current state of isotopic knowledge in the Nile Basin, with emphasis on what was found in the 2003-2006 sampling programme. Prior to 2003, very little isotopic sampling had been carried out on a large scale in the Lake Victoria basin, with only one IAEA project, studying mostly groundwater in Kenya, producing a significant data base within the basin. A few academic studies had been carried out which included a small amount of isotopic data.

Early sampling in this project concentrated in the Lake Victoria area as noted. Samples were collected of stable isotopes of water, tritium and some tritium/helium-3 and strontium samples. Wells of opportunity were used for sampling of groundwater, which was not the ideal situation for some cases. Samples were also collected of lake water and rainfall.

Results from Lake Victoria indicate that it is a highly-evaporated water body with a relatively uniform isotopic content. It is not yet possible to construct a complete water balance for the lake due to a lack of information of the isotopic concentration of evaporated water. The data sets did indicate that lake water does not flow out to local groundwater with one exception.

Much less data are available for the Nile Basin between Lake Victoria and the Egyptian border. Almost no isotopic data are available for most of the White Nile and the Sudd. What is available for the White Nile show large seasonal swings. There is evidence for the outflow of water from the Blue Nile to the groundwater in Northern Sudan. By contrast to other parts of the basin, a vast data base exists for Egypt, especially downstream of the High Dam.

Modelling of the Basin – G. Leavesley, IAEA Expert: Mr Leavesley indicated that identifying the extent of uncertainty in water fluxes was one of the important results of modelling. Initial modelling is used to determine what parameters are missing in a data set and which unknowns could be most important for reducing the uncertainties. A water balance model has been developed, in cooperation with the IAEA, which uses isotopes to assist in understanding the flux of water within the system. The model determines the importance of groundwater as well as precipitation and surface flow.

For the Nile Basin, it would be useful to apply an appropriate model early in the study to determine what the uncertainties were in the water fluxes, and what information is needed to reduce these uncertainties. As more data become available, additional modelling would assist in determining what sampling strategy to employ to continue to firm up an understanding of the basin fluxes.

Mr. Okrut - Lake Victoria Basin Commission: Mr. Okrut discussed the role of the Commission in both preservation of the Lake Victoria basin water supplies and in the economic development of the area. He noted that economic development and the benefits to the local residents have to be considered when discussing water usage in the basin. Issues facing the Commission include ecosystem degradation in various catchments, decrease in water quality, dropping water level in the lake, maintenance of the fishing industry which is crucial to the countries, and loss of surface springs that feed the rivers and ultimately the lake. In spite of many efforts taken independently by various countries and agencies over the years, it became apparent that a regional legal framework was necessary. Six critical requirements were identified at the establishment of the Commission: (1) securing political commitment; (2) promoting regional coordination; (3) strengthening existing institutions; (4) involving stakeholders; (5) formulating partnership with interested parties; and (6) funding by partner states. The aim is to harmonize the policies concerning the lake system among the countries involved. It is anticipated that the Democratic Republic of the Congo, Rwanda and Burundi will ultimately be involved in the Commission and efforts are presently underway to accomplish this goal.

COUNTRY REPORTS

The following country reports (see Annex C) were presented to the meeting and summarised below:

Lake Victoria Study

Kenya: The Kenyan delegate was unable to come to the meeting but submitted a powerpoint presentation for his country. The presentation identified only one sample of groundwater (from Modi) could possibly have any influence of lake water in it. All other data indicated that groundwater flux was toward the lake system. The presentation requested additional effort to determine why Modi was different. They also through that it would be beneficial to obtain more rainwater data to understand the isotopic input function better.

Uganda (Mr. Tindimugaya): Mr Tindimugaya discussed the fact that the geology of the area was weathered rocks over fractured basement rocks. The isotopic results from Uganda were very similar to those from the other lake basin countries. There was no indication of the lake water penetrating into the groundwater system. He discussed that fact that the current trans-boundary basin programs do not adequately address groundwater issues. In part this is due to the traditional structure of the agencies where groundwater agencies are frequently different from those agencies that deal with surface water issues. Also, groundwater interactions are poorly understood making it difficult to add this component to the decision making process. It was hoped that findings from this program and subsequent programs would remedy some of these problems. As in other basin countries, sampling of deeper groundwater and of groundwater at the edge of the lake was not possible because of the lack of funds to drill appropriately sited wells. It was not possible to fund wells with the funds from the last program. Drive-point piezometers did not function well due to the geology of the area. This is a flaw in the sampling design that could be eliminated if funding was secured in the GEF proposal.

Tanzania (Mr. Mabula): Mr Mabula discussed the groundwater system of the URT with respect to the geology and climatology of the region. He also showed the results of the first sampling campaigns in the groundwater, river waters and lake water of URT. The data were focused on the area of the Kagera and Mara rivers and around Mwanza. There were no groundwater samples that showed any lake water influence during the sampling campaigns. The lake waters were all very similar and indicated that variations in lake waters are generally within the uncertainty of the measurements. River waters were slightly more evaporated than rainwater but were very distinct from lake waters. There was also a desire for sampling of deep groundwater. He stated that more data is needed from stations closer to the lake and that more emphasis needs to be spent on analyses of the river systems. The lake itself appears to be well mixed and sampling of lake water can now be reduced to routine monitoring .

Blue Nile Study

Sudan (Mr. Taha): Mr Taha stated that the initial sampling programmes on the Blue Nile have begun. The first set of data was delivered the day of the meeting and he did not have time to analyze the results yet. The program was aimed at looking at the flux of river water into the groundwater system along the banks. This seems to be the main groundwater/surface water interaction along the Blue Nile also some samples of rainfall from location on the Blue Nile were taken and sent to Nienna for analysis. Very little has been done on the White Nile and no sampling has been carried out in the Sudd due to problems with security. It is hoped, due to recent political changes, that this problem will be alleviated in the next year or two. Some sampling on the White Nile will be possible at major cities a few times per year, but the ability to sample within the swamps is still uncertain.

Ethiopia (**Mr Yimenu):** Mr. Yimenu noted that the Ethiopian section of the Blue Nile is divided into 12 basins of which four could be considered major basins. One of these flows into the White Nile ultimately as the Sobat. The other basins flow to the Blue Nile or Atbara. An important issue is in what happens to waters in Lake Tana when its volume seems to decrease every year. Does it go into the groundwaters or is it simply lost through evaporation or outflow? Also, the water level in the swamps adjoining the Pero and Sobat systems seem to drop every year and it is not clear where that water goes. Sampling within this swamp system would be important to define the role of groundwater/surface water interaction in this system. Rain sampling systems have been set up and samples of groundwater, lake water and river water have been taken for the Lake Tana basin. Results are not yet available. It is hoped that increased sampling will occur of both precipitation and river waters within the next year.

Lake Nasser Study

Egypt (Mr Mohamed): Mr. Mohamed stated that samples have been collected from Lake Nasser and the adjoining groundwater systems. These samples have not yet been analyzed so there were no data to report. It is hoped to determine if groundwater flows into the lake or visa versa using these data. It is known that major evaporation (and corresponding loss of water) occurs in the lake behind the High Dam. The extent of evaporation from the lake may also be better determined by these data. There is also an interest in seeing if similar exchange processes are occurring between groundwater and river water in the barrages that lie below the dam and impound waters for brief times. It is thought that groundwaters may flow into and out of the river in these locations. However, the question of whether isotopes are the proper techniques to study this issue was raised.

POSSIBLE FUTURE THRUSTS FOR THE USE OF ISOTOPES IN STUDYING GROUNDWATER/SURFACE WATER INTERACTIONS IN THE NILE BASIN

After having considered the above material, the following inputs on possible future directions for the project were presented (see Annex D):

Mr. Michel, IAEA expert: Mr. Michel discussed the way that future projects might use isotopes to elucidate the importance of groundwater to the water balance of the Nile Basin. As noted, groundwater appears to be entering Lake Victoria along most of its shores, with very limited or no flow of water in the reverse direction. Previous sampling was carried out using wells of opportunity, which was acceptable at that point in the program. However, this limited the depths that were sampled to mostly shallow waters. Being wells used for local water supply, most wells were also 1-3 km away from the lake. No sampling of groundwater at the lake edge was possible. It would be good to remedy both of these shortcomings in a new program by installing wells in locations up to or slightly beyond the lake shore to confirm earlier findings that no lake water is lost to the groundwater system at any depth.

Isotopic data could also help determine the role of groundwater in maintaining swamps and wetlands within the basin. What limited data does exist (including data from the IAEA program) suggests that one of the sources of water to the wetlands is groundwater. This is in accord with many theories of wetland formation and maintenance at the present time. It would be useful to install shallow wells within and near to the wetlands to sample the waters under these systems. This data could be compared to data derived from the surface water sampling and would indicate how similar the swamp waters are isotopically to adjacent river or lake waters. It would also indicate if lake or river water is penetrating into groundwater in these areas. The answer to these questions would be crucial to maintaining ecosystems in these areas.

There is also a need to understand the age of the baseflow that enters the different river systems within the basin. This baseflow is composed of groundwater and its age indicates the ability of the river to maintain a minimum flow during periods of low rain fall. This requires routine sampling of rain and river systems.

Mr. Michel outlined a potential sampling strategy that the countries need to review to help answer these questions. Work in the Lake Victoria region would consist of estimating the influx of water from the groundwater into the lakes, and estimating the age of the base flow component that enters the various river systems. Isotopes used would be stable isotopes of water, tritium, and possibly tritium/helium-3 dating.

In the upper lakes region of Uganda and the White Nile, data are needed to begin to assess the importance of groundwater in feeding the swamps and wetlands. This included reconnaissance sampling of the systems, possible installation of wells in selected locations, as well as establishment of some rainwater stations to determine isotopic input data. Sampling would be for stable isotopes of water, tritium and strontium isotopes. Strontium isotopes have been shown to be a powerful analogue to other isotopic data in this region.

Along the Blue Nile, two important issues were identified: (1) extent and age of base flow feeding the Blue Nile (and the Sobat River) from the Ethiopian highlands and (2) rate of loss of water through bank recharge to the lands along the Blue Nile in Sudan. Stable isotopes of water, tritium and tritium/helium dating were identified as potential tracers for these problems. The main use of isotopes for the Egyptian Nile would be to determine losses by evaporation in the lake behind the High Dam, and loss through bank recharge of river water. Stable isotopes of water, tritium and possibly tritium/helium-3 dating were considered the most useful tracers for these problems.

Mr. Khater – Egypt: Mr. Khater discussed the overall importance of groundwater throughout Africa. He noted that many countries rely on groundwater and that some countries within the basin have major groundwater reserves that could be used to supplement their use of water from the river. He suggested that a major assessment of groundwater could be helpful in mitigating water shortage during periods of drought. He also mentioned that saline water intrusion into the Nile Delta aquifer in Egypt is a major issue of concern.

PROJECT FORMULATION

Having considered all the above inputs, the meeting proceeded to formulate the Medium Size Project (MSP) proposal. The draft document, including updates made subsequent to the meeting and after consultation with GEF personnel is found in Annex E.

Mr Garner discussed what was to be expected in writing the project document. It was agreed that the project should be restricted to only groundwater within the Nile Basin and was not to be an assessment of groundwaters beyond the limits of the basin. It would also support how groundwater should be included into policy and management level discussions in Nile Basin activities It was expected that it would be a three-year program involving sampling and analysis of the scientific meaning of the results, both on a local and regional scale, and development of a multi-tiered approach to communicate the results to the interested stakeholders.

The MSP would consist of desired objectives, the components of the project that would meet these objectives and outputs that would indicate the success of the efforts. Objectives were identified and six components were outlined as needed to meet these objectives (please see the MSP proposal.)

Each country at the meeting was asked to develop a sampling program based to extend their knowledge of the interaction of groundwater and surface water within the Nile basin. The regional projects were also asked for input on what they felt was needed. A list of stakeholders were identified that would need to be kept informed of the progress of the work. These included basin-wide entities, national and local governmental groups, private consulting agencies and local universities that might be involved in basin work, citizen and business groups that interact along the basin, and other entities that might depend on water from the basin. International funding agencies that have an interest in the overall basin management (World Bank, African Development Bank, etc) were also identified as stakeholders.

A time line was established which envisioned sending a draft project document to the countries by early July. Comments from the various countries would be solicited. The appropriate agencies in the various countries would have to furnish letters: (1) indicating their willingness to participate in the project and (2) what in-kind support they could contribute for carrying out of the project. The project proposal would then be submitted formally to GEF with an anticipated start date of January, 2007. The issue of having a project manager was discussed, but it was decided that it was not needed to have a full time manager at this time.

Mr. Aggarwal noted that the data to be collected were needed to try to develop an overall model for understanding the interaction of surface waters and groundwater in the basin. Ideally, this output could be used as part of the 'decision support system' for the Nile basin.

The attendees divided into two working groups to address the issues identified as required for the proposal. One group focused on sampling design for identifying where groundwater is important in sustaining the surface water flow. The group noted that there were large areas of the basin where data were lacking and instituting a sampling and monitoring program would help bridge this gap.

Development of a successful model could help focus the sampling campaigns and predict changes brought about by changes in management practices.

The second group focused on the issues of integrating groundwater considerations into the present structure of the basin planning and management and overseeing the implementation of the MSP. It was noted that the groundwater component in the basin has not been considered as part of the overall water budget by most national and regional water planning and management organizations. All members agreed that it is generally acknowledged that groundwater is an important issue in managing the basin but it has not been formally included in most inter-basin agencies up to this time for a series of reasons.

Working Group 1: Development of the sampling programme (Mr. Leavesley, Mr Michel, Mr. Mohamed, Mr. Yimenu, Mr. Taha, Mr. Tindimugaya and Mr. Mabula)

The working group agreed that the sampling and data analyses program should focus on three components:

1. Impact of groundwater/surface water interactions in the lakes and wetlands and its implications for the ecosystem.

2. Determining the extent and age of groundwater input into the river systems.

3. Synthesizing the data and information using water balance modelling.

The five countries present submitted a work plan and a budget to be part of the MSP. The countries detailed their needs for sampling, support and training to meet the goals in their work plans. The work plan involved standard and isotopic measurements as well as application of a water balance model(s), which can be used to help managers with their 'decision support systems'.

Working Group 2: Incorporating groundwater into the Nile Basin Plan (Mr. Garner, Mr. Ghany, Mr. Khater, Mr. Luken, Mr. Omwenga, and Mr Orkut)

The working group agreed that there needs to be a concerted effort to incorporate the groundwater element into the current structure for basin management. A format must be found to make the data available to all potential stakeholders. Oversight of the program must be part of the process to make sure it is meeting the needs of the basin management and complements the activities of other on-going national and regional water planning and management efforts.

An initial report of what is known about the regional groundwater should be carried out early in the program. A management structure needs to be established for seeing that information is disseminated to all interested parties, including regional and national committees. There needs to be an enhanced understanding of groundwater management issues for decision makes.

Regular progress reports would be given to the funding agencies to make sure that all parties are complying with the program to the best of their abilities.

CONCLUSIONS

The meeting made the following conclusions:

1. The Nile Basin is a crucial shared resource that needs to be monitored and carefully used to maintain its value to the countries of the basin. The system is important for both socioeconomic and ecosystem issues for many of the countries within the basin. Many of the states within the basin are arid and depend on the basin waters for a large fraction of their water supply;

2. At the present time, groundwater/surface water interactions are known to be a major factor in the basin, but are not explicitly included in most basin planning efforts and management strategies. In part this is so because this interaction is not well understood. In particular, the

importance of groundwater in maintaining the ecosystems of the various swamps (including the Sudd) is totally unknown and needs to be determined if proper management strategies are to be instituted;

3. The IAEA project that was undertaken between 2003 and 2006 has been important in understanding some of the groundwater interactions with Lake Victoria and has served as "proof of concept", but many issues have yet to be resolved. More work needs to be carried out in the Lake Victoria region and its adjoining wetlands as well as in areas that to this time have not been adequately studied. In particular, the Sudd and the Ethiopian Highlands require more study and proper selection of isotopic samples that would enhance understanding of the water balance of these areas;

4. There is a need for a continuing study of the basin in all areas, using both standard hydrologic and isotopic methods, as well as developing proper modelling. An improved understanding of the groundwater component of the basin should result from this program. This information should be communicated to stakeholders and decision makers within the basin so that the results can be added as a component of the Nile basin 'decision support system'. Activities are included in the MSP to accomplish this.

5. In addition, assistance is needed to demonstrate to Nile countries how groundwater should be included in current activities as well as to build understanding as to how groundwater should be included in policy and management decisions in Nile Basin Management.

6. It was agreed that the above issues should be addressed in the frame of the IAEA/UNDP/GEF Groundwater Dimension of the Nile MSP.

Annex f)
Relevant Information On Wetlands from Nile River Basin 'Transboundary Environmental Analysis' (2001).

Development Challenge

Efforts to reduce poverty and to stimulate sustainable economic growth in the Nile basin are being undermined by a variety of environmental problems e.g. soil erosion, degradation of agricultural lands, desertification, loss of forests and wetlands, overgrazing of pastures, declining water quality, over-exploitation of fisheries, eutrophication of lakes, invasive water weeds, inadequate urban waste management, waterborne diseases, declining biodiversity and the threat of climate change. As a result, there is an urgent need to integrate environmental concerns into poverty alleviation and economic development strategies.

Transboundary Issues

Physical or chemical impacts that can cross national boundaries downstream. Deforestation and soil erosion can increase vulnerability to drought and lead to increased sedimentation and greater flood risks downstream, while sediments also accumulate in wetlands and reservoirs. Urbanization, industrialization and increased use and improper application of pesticides and fertilizers lead to increased runoff and pollution that harm downstream water users.
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Loss and degradation of wetlands and lakes. Water-dependent ecosystems throughout the Nile basin contribute to the stability, resistance and resilience of both natural and human systems to stress and sudden changes. Significant transboundary benefits flow from various ecosystems, such as maintaining water quality, trapping sediment, retaining nutrients, buffering floods, stabilizing micro-climates and providing storm protection.

Need for transboundary cooperation to protect key habitats. Many key plant and animal species have habitats in adjoining countries, often requiring cross-border protected areas and other conservation measures for effective management. For example, the Nile is a principal flyway for birds migrating between central Africa and Mediterranean Europe, and Nile wetlands in a variety of countries provide indispensable habitats for these birds.

The Wetlands

Wetlands are among the most productive ecosystems in the world and they cover at least 100,000 square kilometers in the Nile basin. Found at a variety of altitudes, they range from montane bogs and upland valley bottoms, through mid-level swamps and floodplains down to riverine wetlands and eventually to the delta at and below sea level. The Nile wetlands include a variety of swamps, marshes, seasonally inundated grasslands and sedgelands, swamp forests, floodplains and the wetland edges of lakes and rivers. About 3 percent of the Nile basin is covered by wetlands, compared with 2 percent forest and 1.4 percent irrigated croplands. The greatest concentration of wetlands is in Uganda, with around 12 percent of the country made up of wetlands. The 20,000 square kilometers Nile Delta in Egypt includes lakes, freshwater and saline wetlands and intertidal areas as well as large agricultural areas and towns. Of particular importance are the wetlands of Fayoum located on the river system.

The buffering qualities of the Nile wetlands make a critical contribution to maintaining river flows despite strong seasonal variations in rainfall patterns. For example, the Machar wetlands in

Sudan receive the floodwaters of the Baro River as well as local rainfall and the flows of numerous torrents from the Ethiopian highlands. This water moves slowly across the marshes in braided channels and small streams to reach the Nile system much later in the season, maintaining the river flow long after the rains have passed. In the same sub-basin, the high altitude wetlands of Ethiopia store water after the rains have ceased and then release it slowly over the dry season into the Didesa River which feeds the Blue Nile, as well as into the Baro River and thence the Sobat and the White Nile. Many Nile wetlands also reduce the energy of stream flows by absorbing their force on the millions of bending reed and grass stems. Papyrus and a variety of other large grasses and sedges provide this service, which is of critical importance during floods. Other wetlands contribute to water quality by trapping sediment among the stems and roots of emergent plants. Water flowing from the agricultural areas of Mount Elgon in Uganda is brown with sediment, while fifty kilometers downstream the water becomes clear after passing through the Butaleja and Tirinyi swamps upstream of Lake Kyoga. Wetlands can also play a key part in purifying wastewater from agricultural, industrial and urban areas. For example, the Nakivubo Swamp receives partially treated sewage from Kampala and manages to remove most of the nutrients and biodegradable pollutants from the city before that outflow reaches Lake Victoria. Finally, wetlands are thought to have an important influence on the local microclimate and large wetlands, like the Sudd, can impact regional rainfall patterns.

The 30,000 square kilometer Sudd in Sudan is the largest wetland in Africa and supports many people, livestock and fisheries. Even though much remains to be understood about the hydrology and ecology of this extensive and valuable wetland, it is clear that the lakes, swamps and marshes of the Sudd do buffer stream flows and thus help spread the flow of the Nile over the entire year. The Sudd consists mainly of papyrus swamps with water grass plus a complex network of channels and lakes, some permanent and others seasonal. This wetland is extremely flat, with a slope of only 0.01 percent or less for 400 kilometers from south to north. Annual floods are a key feature, gradually expanding and running over the banks of the main Bahr El Jebel River, then sweeping northwards. The permanent swamps become deeper and the seasonally inundated grasslands upon which pastoralists depend become flooded. The floodwaters continue northward and reenter the main river channel, supplemented by the Bahr El Ghazal River. Less than half of the water entering the Sudd flows out of it into the White Nile as a result of evapotranspiration as well as water absorption by seasonally flooded areas. This loss of water from the Nile system has received attention since ancient times, culminating in the proposed 360 kilometer Jonglei Canal to bypass the Sudd with the objective of increasing the downstream flow of the Bahr El Jebel River into the White Nile by 50 percent. Construction of the Canal began in 1978 and was suspended in 1984 due to the civil war in Sudan, with about 240 kilometers completed. In recent years the importance of better understanding the impact of the canal on the Sudd and the people who depend on the wetland ecosystem has been widely recognized.

Proximate or Immediate Threats: Wetlands, Lake Degradation and Biodiversity

Wetlands in the Nile basin are threatened by drainage (for agriculture, industry and settlements), filling (for solid waste disposal, roads and settlements), dredging and stream channelization (for navigation and flood protection), hydrological alteration (for canals, roads and other structures), groundwater abstraction, siltation, and discharges of pesticides, herbicides, and sewage. All of these reduce the value and productivity of wetlands. In some cases waste loads have increased to such an extent that the wetlands' natural capacity as buffer and filter for sediments and certain pollutants is exceeded.

The Nile basin's most polluted wetlands are in the Nile Delta, where irrigation drainage water, untreated or partially-treated urban wastes and industrial effluents have destroyed several forms of aquatic life, reduced the productivity of fisheries and contaminated the fish catch. Elsewhere, Uganda's rich and extensive wetlands have been seriously degraded by conversion to agriculture, overexploitation for timber (for construction and fuel), papyrus (for construction, fuel and handicrafts), grasses and sedges (for thatch), and wild food plants and medicines. Shifts to use as pastureland followed by overgrazing have caused soil erosion on former reed swamps, while many former papyrus wetlands are no longer able to protect pastures, croplands and settlements from flooding. Other wetlands in Uganda have been lost or degraded by drainage and reclamation for dairy farming and rice growing, by burning, by clay extraction for brick making, by conversion to industrial sites and by pollution from sewage, industrial effluents and garbage dumping, especially in and around Kampala.

Although irrigation schemes often replace wetlands, they can also result in new artificial wetlands. Certain irrigated rice paddy schemes have reproduced some of the same ecological characteristics as natural ecosystems, such as Doho and Kibimba in Uganda and Ahero in western Kenya. This has supported biodiversity conservation to the extent that wetland animals and plants can colonize these schemes without becoming a threat to the crops being grown there.

Lake Victoria and the Kagerabas basin receive significant quantities of raw or partially treated sewage and industrial effluents from rapidly expanding lakeshore settlements. Overflowing pit-latrines and septic tanks as well as contaminated storm water also pollute the lake and its feeder rivers, increasing the incidence of waterborne diseases. Breweries and factories processing sugar, paper and textiles discharge their pollutants directly into the rivers and lake. Most of the factories have yet to install pollution control equipment. Heavily polluting, small-scale gold mining is also increasing in the basin and small quantities of other heavy metals such as chromium and lead have been detected in Lake Victoria.

Lake Victoria itself has undergone substantial ecological changes and deteriorating water quality during recent decades. The number of economically important fish species in the Lake has declined during recent decades from about twenty species to only two or three, mainly the introduced Nile perch and tilapia. The primary cause of the changes in water quality is not known, although it is probably related to nutrient enrichment. Eutrophication is now considered to be the greatest threat to the lake and the Kagera basin; it has been accompanied by the proliferation of aquatic weeds, including water hyacinth, elephant grass and algal blooms. The greatest contribution of water hyacinth plants to Lake Victoria originates from the Kagera River. Water hyacinth has spread rapidly over an area of several thousand hectares, choking important waterways and adversely affecting fishing, navigation, hydropower generation, water supply, tourism and recreation. The main problem associated with water hyacinth is that it forms dense mats of entangled plants that impede light penetration to the waters below and so denies the growth of other plants; decaying water hyacinth mats further reduce oxygen for other organisms in the lake. Increased eutrophication due to the abundance of rotting plants is a major problem in the lake. Water hyacinth mats also lead to increased evapotranspiration, which means that more water is lost than would be from an open water surface alone. The overall impacts include reduction in shore fisheries; interference with all fisheries operations; disruption of water transport; decreased access to water for domestic, industrial and agricultural purposes; obstruction of waterways, dams, and hydropower generation facilities; and threats to many other lakeshore activities and biodiversity in the lake. Some improvements and a decrease in the extent of water hyacinth mats have been observed in recent years. This has been attributed to various factors, including successful biological weed control supported by the Lake Victoria Environmental Management Project.

Biodiversity losses are experienced in all the Nile's lakes, wetlands, savannas and dry and wet forests. While in Lake Victoria the introduction of alien fish and plant species plays the major destructive role, loss and fragmentation of habitat as a result of conversion, destruction or exploitation are the main threats in other areas. Pollution is a major threat in the Nile Delta and plays an important secondary role elsewhere.

Most Nile countries have established extensive protected area networks to conserve their most important species, habitats and ecosystems. But these areas have only rarely been adequately protected, mostly because resources for management are inadequate, incentives for illegal encroachment and exploitation are strong, and enforcement has been limited. The majority of important biodiversity assets are located outside formal protected areas, where they receive even less protection.

Strengthened Wetland and Lake Management

The diversion of water from wetlands should only be done after a full assessment of minimal flow requirements and wetland dynamics, and an evaluation of the value and contribution of the wetland to the economy, the environment and the livelihood of those using it. Measures to protect quantity and quality of water entering wetlands should be taken, with special attention to critical periods of water availability for local people and their economy, as well as aquatic and terrestrial species in these areas. Use of wetlands as disposal sites for liquid and solid wastes must be minimized. Important wetlands should be protected from land reclamation and should be included in protected areas. Where viable, traditional conservation systems should be revived and supported. Direct and indirect impacts to the ecological values of wetlands should be considered in all environmental assessments prepared for water resources development programs in the Nile basin. Specific conservation programs for wetlands and other key habitats should be developed, perhaps using Uganda's National Wetlands Program as a model. An efficient means of habitat conservation is establishment of a network of multiple use wetland protected areas supported by effective management and planning.

Annex g)

Water Balance Modeling

The water and isotope data collected in the various components of this project would be used to improve the understanding of the temporal and spatial variability of the hydrological processes within the Nile basin. This knowledge coupled with the measured data will guide the development and testing of monthly and annual water-balance models to simulate water and isotope storages and fluxes within the basin. This work would be developed in close cooperation with WRPMP so as to optimally support the Nile DSS.

The general water balance equation can be written as

$$dS/dt = \text{Inflow} - \text{Outflow} \qquad (1)$$

where S is volume of storage and t is time. In many applications of equation 1, inflow and outflow are treated as aggregate values with no distinction of the various sources that may compose inflow and outflow. To consider these various sources, equation 1 can be rewritten for a lake or river reach as

$$dV/dt = Gi + P + Si - Go - E - So \qquad (2)$$

where Gi and Si are ground-water and surface-water inflow rates, Go and So are ground-water and surface-water outflow rates, P is the precipitation rate, E is the evaporation rate, V is the volume of water in storage, and t is time (Krabbenhoft et al., 1990).

Similarly the isotope mass balance equation can be written as

$$d(V\,\delta_L)/dt = Gi\delta_{Gi} + P\delta_P + Si\delta_{Si} - Go\delta_{Go} - E\delta_E - So\delta_{So} \qquad (3)$$

where the delta notation δ followed by a subscript represents the isotopic composition of each component defined in equation 2 above. The term δ_L refers to the isotopic composition of a lake or river reach.

For lake and river applications, equation 3 is typically rewritten to solve for Gi and Go, as these terms are the most difficult to measure or estimate. Evaporation is solved using meteorological data and isotopes values are measured or estimated from regional values. Another simplifying assumption that can be made is to assume that the lake or river is at steady state so that dV/dt is equal to zero. However, this is generally not a valid assumption for monthly or longer time periods. Rewriting equation 3 to solve for Gi gives

$$Gi = ((P\delta_P + Si\delta_{Si} - Go\delta_{Go} - E\delta_E - So\delta_{So}) * dt - d(V\,\delta_L)) / (\delta_{Gi} * dt) \qquad (4)$$

For applications where ground water is being lost from a lake or river, δ_{Go} can be assumed to be equal to δ_L. For applications where ground water is gained and lost from a lake or river, the ratio of Gi to Go and their individual values can be estimated using their δ values and the measured isotopic value of δ_L .

For example, in a lake application, rewriting equation 2 as

$$Gi - Go = dV/dt - (P - E) \quad (6)$$

enables one to solve for what the difference between Gi and Go need to be match the physical change in lake stage. Estimates of Gi and Go can be computed using lake stage measurements, the hydraulic gradient based on water levels in nearby wells, and an assumed value for hydraulic conductivity.

Equation 4 can also be rewritten to solve for δ_L at the end of a given time step as

$$\delta_{L2} = (V_1\ \delta_{L1} + Gi\delta_{Gi} + P\delta_P - Go\delta_{Go} - E\delta_E)\ /\ V_2 \quad (7)$$

where the components are as defined above and the subscripts 1 and 2 on V and δ_L are the volume and delta 18O of the computational volume of the lake at the beginning and the end of the computational period. Estimates of the magnitude of Gi and Go can be made by using the measured values of of δ_{Gi} and δ_{Go} , and adjusting the values of Gi and Go to match the computed and measured values of δ_{L2} .

The isotope value for δ_E is the most difficult component to measure or estimate. Using an equation from Hostetler et al. ( ), δ_E can be computed by

$$\delta_E = (R_E - 1.) * 1000. \quad (5)$$

$$R_E = ((R_{air} / alpha) - rhavg * f * R_{lake}) / (((1.- rhavg) / alphak) + (rhavg * (1. - f)))$$

$$R_{air} = (\delta_{air} * 1000.) + 1.$$

$$R_{lake} = (\delta_L * 1000.) + 1.$$

$$\text{alpha} = \text{EXP}\ (\ 1137./\ T^2\ -\ 0.4156\ /\ T\ -\ 0.00207)$$

where T is lake surface temperature in K, rhavg is average relative humidity, alphak is 0.994, δ_{air} is -21., and f is 0.1. R_{river} can be substituted for R_{lake} for application to river water balance applications.

References:

Hay, L and G. McCabe (2002) Spatial Variability in Water Balance Model Performance in the Coterminous United States, *Journal of the American Water Resources Association*, 38:3.

McCabe, G. and M. Ayres (1989) Hydrological Effects of Climate Change in the Delaware River Basin, *Water Resources Bulletin*, 25:6.

Wolock, D and G McCabe (1999) Estimates of Run-off Using Water Balance and General Atmospheric Circulation Models, *Journal of the American Water Resources Association*, 35:6.

Annex h)
Tentative List of National and International Consultants

The list refers to those consultants which are hired through the GEF contribution to the project. The table gives the approximate number of consultant weeks[1] according to present planning.

Title/Type	Reference (output)	Main Tasks	Nat. Consult. (weeks)	Int'l Consult. (weeks)
Outcome 1				
National Hydrologists/ Hydrogeologists	Outputs 1.1 to 1.9	• Assist to design sampling campaigns (sites, frequency and methodology) • Undertake sampling campaign as planned • Contribute to the analysis of sampling results • Support the preparation of reports (water balance, fraction and age of GW in surface water etc.)	80	
International Hydrologists/ Hydrogeologists	Outputs 1.1 to 1.9	• Lead the design of sampling campaigns (sites, frequency and methodology) • Provide guidance for the respective sampling campaigns as planned • Guide the analysis of sampling results • Facilitate the preparation of reports (water balance, fraction and age of GW in surface water etc.) • Provide training on sampling approaches, data evaluation etc.)		12
Outcome 2				
National Hydrologists/ Hydrogeologists	Output 2.1 to 2.3	• Assist in the design of the sampling campaign for the Sudd • Organize logistical support and carry out sampling campaign • Contribute to the analysis of results • Support the preparation of reports	64	
International Hydrologists/ Hydrogeologists	Output 2.1 to 2.3	• Guide the design as of the sampling campaign for the Sudd • Provide constant feedback on the implementation of the campaigns • Monitor the analysis of results • Oversee final reports and guide the preparation of the component final workshop • Provide training on sampling approaches for groundwater/surface water/ wetlands interactions		14
International GW/Surface water interaction specialist	Outputs 2.1 to 2.3	• Input and guidance to sampling campaign in relation to data needed for the modelling activities (component 3)	18	2

/ modeller				
Outcome 3				
National/ Regional Researchers with modelling experience	Output 3.1	• Assessment of baseline situation in terms of water modelling in the Nile Basin • Preparation of report on data, activities, models and analysis • Compilation of data/ information needed at the regional level	54	
International GW/surface water modeller	Output 3.2 and 3.3	• Selection, adaptation and or development of appropriate water balance model • Close collaboration with the Nile Basin Water Resources Management Project • Input of assessment data to the model • Running scenarios and interpreting results • Articulating results to inform decision making Preparation of model and interpretation report • Training of national and regional modellers, especially NBI team, national and regional institutions		15
Outcome 4				
National GW specialists	Output 4.1 and 4.2	• Preparation of national GW status report • Aggregation of national GW status reports into regional GW status report • Review of level of integration of GW into national and regional water-related interventions • Recommendations on furthering GW integration in the Nile Basin and riparians	130	
Regional Groundwater specialist	Output 4.1 and 4.2	• Prepare guidance for national groundwater specialists • Facilitate the Integration of results from Components 1, 2 and 3 into Nile Basin Management Framework • Develop a synthesis report on Groundwater in the Nile		10
Groundwater policy specialist	Output 4.3 & Output 4.4	• Assessment of current status of regional cooperation on GW in relation to the NBI • Identification of most adequate tools and practices for networking and knowledge management in the frame of the NBI • Recommendations for establishing and sustaining the most suitable institutional approach for integrating groundwater considerations in Nile Basin Management. • Preparation and submission of policy papers on GW integration into Nile Basin Initiative framework		10
Public information specialist	Output 4.1 -4.4	• Development of outreach materials • Collaboration with groundwater specialist and policy specialist		7

		• Prepare and help deliver training and awareness-raising workshops • Recommendations for future training and capacity building		
M&E				
Terminal evaluation consultant	Output 5.3	• Undertake a terminal evaluation of the project as per standard UNDP/GEF practice		6
TOTAL			**346**	**76**

Annex i)
Overview of Major Project Meetings

Outcome	Donor	"ATLAS Budget Description"	2007	2008	2009	2010	Total	Comments
1	GEF	National Meetings	0	0	0	0	0	None
	GEF	Regional Meetings	0	27 000	27 000	0	54 000	The objective of these coordination meetings is to plan sampling campaigns (sampling needed, approach, logistics etc.) Second, results from previous campaigns will be reviewed and be the basis for future work. These meetings will be augmented by training that is to be supported by IAEA co-funding.
	IAEA	Training, Sampling Campaigns & Data Evaluation		27 750	27 750	15 000	70 500	The IAEA co-funding will support training in groundwater assessment, isotopic techniques as well as data evaluation. Some training will be linked to the coordination meetings, other training will be individually tailored to specific country/campaign needs.
	IAEA	Meetings				27 500	27 500	IAEA co-funding will be used for the final coordination meeting.

2	GEF	National Meetings	0	8 100	8 100	0	16 200	Two national meetings are foreseen to be held in southern Sudan i.e. in the Sudd Swamp region due to the significant logistical challenges of trying to conduct groundwater assessments in this region which was, until recently, insecure. There is also the challenge of coordinating activities with both the regional government of Southern Sudan with the National Sudan representatives. The objective of the two meetings is to plan groundwater assessment activities i.e. sampling, logistics etc. and then to assess results.
	GEF	Regional Meetings	0	17 280	17 280	0	34 560	Regional meetings will bring in other country representatives and stakeholders to assess the greater inter-linkages to the Nile Basin, to provide guidance on sampling and coordinate with related sampling in neighbouring countries.

	IAEA	Training, Sampling Campaigns & Data Evaluation		35 000	30 000	14 500	79 500	Training will be provided in groundwater assessment including sampling, analysis etc. Training components will be added to GEF supported meetings (length extended) and individual training will be provided. Training related to modelling in this component would be jointly to support modelling efforts in component 3.
	IAEA	Meetings				22 500	22 500	IAEA co-funding will support a final meeting for this component to highlight results, potential next steps (outside the frame of the project) and to assure appropriate integration into other NBI activities and related initiatives (Ramsar etc.)
3	GEF	National Meetings	0	0	0	0	0	

	GEF	Regional Meetings	0	26 568	26 568		53 136	The objective of the first meeting is to plan activities, assure cooperation with key partners (e.g. Nile WRMP project-DSS) and to clarify modelling approach. The second meeting would review initial results, show relevance to overall NBI activities and plan steps for finalizing the modelling component. The final results would be presented at other project meetings (see component 5)
	IAEA	Meetings					0	
4	GEF	National Meetings	0	63 720	0	0	63 720	The objective of these national meetings is for national groundwater experts, relevant Nile partners/stakeholders review the respective national groundwater reports and to consider next steps for integrating groundwater considerations into NBI cooperation

	GEF	Regional Meetings	0	32 400	32 400	32 400	97 200	These meetings would serve to identify approaches for integrating groundwater considerations into NBI cooperation, explore network opportunities and appropriate institutional arrangements and identify sustainable means to include groundwater in Nile management. Second, these meetings would provide the forum to integrate results from components 1, 2 and 3 into Nile cooperation (requiring a greater range of participants from partner projects and institutions.) A day would be added to each of these meetings to serve as the Project Steering Committee meetings.
	IAEA	Meetings					0	

5	GEF	Inception & Final Project Meeting	43 200	0	0	43 200	86 400	A project inception meeting would be held at the beginning of the project to plan in even greater detail, project activities, time frames (depending on when the GEF MSP portion of the project is approved and becomes operational) to assure broad stakeholder involvement and to solidify linkages with other relevant NBI programme activities. A final project meeting would be held at the end of the project, to assess results achieved and lessons learned, to assure integration into existing Nile management framework and to consider potential next steps at the respective national and regional levels.

*Meeting costs will include: travel of participants, DSA, some local organization costs (to be shared with the government) and other items needs for the meeting (i.e. transport for equipment, translation when necessary etc.) Expert costs will only be included if the expert is needed exclusively to conduct that meeting. Travel for international experts is included under the Travel budget line (as per the norm). Travel budgets are estimates based on previous IAEA and NBI experience in organizing and holding national, regional and sub-regional meetings.

Meetings related to components 1 and 2 will held in locations where groundwater investigations will be undertaken. Meetings related to component 3 are planned to be held in Addis Ababa to assure coordination with the Nile Water

Resources Management Project which is based there. Meetings under components 4 and 5 will be chosen in consideration of other Nile Basin management meetings and efforts will be made to coordinate to the extent that this is efficient and rational.

Depending on the purpose of the meeting some national meetings will be undertaken in all nine countries while others will focus only on countries where assessments and sampling are being undertaken. The same applies to regional meetings; the number of participating countries will depend on the objectives and involvement of the Nile riparians in specific activities of the component. The regional coordination meetings will involve all nine countries along with selected NBI stakeholders from the different SVP projects.