



GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
 TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title:	Enhancing conjunctive management of surface and groundwater resources in selected transboundary aquifers: Case study for selected shared groundwater bodies in the Nile Basin		
Country(ies):	Burundi, Ethiopia, Kenya, Rwanda, Sudan, United Republic of Tanzania, Uganda	GEF Project ID: ¹	9912
GEF Agency(ies):	UNDP (select) (select)	GEF Agency Project ID:	5783
Other Executing Partner(s):	NBI, UNESCO, IAEA	Submission Date:	31-Aug-2017
		Resubmission Date:	28-Sept-2017
GEF Focal Area(s):	International Waters	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP	<input type="checkbox"/>
Name of parent program:	NA	Agency Fee (\$)	506,298

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(in \$)	
		GEF Project Financing	Co-financing
IW-1 Program 1 (select) (select)	GEFTF	1,929,452	8,850,000
IW-2 Program 3 (select) (select)	GEFTF	1,700,000	8,000,000
IW-2 Program 4 (select) (select)	GEFTF	1,700,000	8,000,000
Total Project Cost		5,329,452	24,850,000

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: Project Objective: *To strengthen knowledgebase, capacity and cross-border institutional mechanisms for sustainable use and management of selected transboundary aquifers in the Nile Equatorial Lakes and Eastern Nile sub-basins.*

The transboundary aquifers that will be covered by the study and beneficiary countries sharing these aquifers are given in section describing the 'alternative'. Final selection of the aquifers will be made during the PPG phase of the project.

Project Components	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Co-financing
Component 1: Enhance current understanding and the knowledge on the resources base, threats and options for sustainable management and utilization of shared aquifers	TA	Outcome 1: Improved understanding and knowledge of groundwater and how it interacts with surface water and the types of pressures on them, building upon existing information	1.1 Shared aquifers diagnostic analysis reports for all selected shared aquifers that serves as baseline fact-based analysis of current status of the aquifers. 1.2 A regional groundwater	GEFTF	1,193,568	5,600,000

¹ Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

² When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#) and [CBIT guidelines](#).

³ Financing type can be either investment or technical assistance.

			<p>knowledgebase for all shared aquifers.</p> <p>1.3 Water balance models for the selected aquifers with quantified: recharge, outflows (base flow, deep percolation, etc) and withdrawals.</p> <p>1.4 Projection of groundwater availability and use under climate change for selected aquifers:</p>			
<p>Component 2:</p> <p>Development of action plans on groundwater resources governance, management, and protection for inclusion in national, and sub-basin: – also including consideration of surface water/groundwater resources conjunctive use;</p>	TA	<p>Outcome 2:</p> <p>Increased convergence of national approaches, policies and governance mechanisms for protection and sustainable use of shared aquifers.</p>	<p>2.1 Regional Shared Aquifers Integrated Management Action Plan will be developed. The action plan will cover the following:</p> <p>2.1.1. Actions for improving groundwater monitoring using ground and remote sensing based technologies.</p> <p>2.1.2 A suite of technical guides and manuals that support conjunctive use groundwater and surface water resources.</p> <p>2.1.3 Recommended institutional mechanisms for sustainable management and utilization</p>	GEF TF	598,787	3,000,000

			<p>of the groundwater resource.</p> <p>2.1.4 Measures for maintenance of groundwater to sustain groundwater-dependent aquatic ecosystems (wetlands, floodplains and river reaches) for selected ecosystems.</p> <p>3.1 Technical guide on integration groundwater aspects in NBI's subsidiary action programs for the selected sub-basins targeting key activities: watershed management, sub-basin integrated management plans, wetlands sustainable management activities. While the project doesn't directly cover larger wetlands in the Nile Basin, such as the Sudd and the Baro-Akobo-Sobat wetlands, the experiences and knowledge generated on groundwater-surface water interactions will help in advancing the understanding significance of larger wetlands in sustaining the hydrology of the connected rivers</p>			
		<p>Outcome 3:</p> <p>The Nile Basin Initiative (NBI)'s subsidiary action programs (Eastern Nile and Nile Equatorial Lakes sub-basin) will be strengthened through integration of groundwater aspects for selected sub-basins.</p>				

			and the dependent ecosystems.			
<p>Component 3:</p> <p>Targeted pilot projects to explore conjunctive use of surface and groundwaters, and links to biodiversity conservation and climate change adaptation</p>	TA	<p>Outcome 4:</p> <p>Broad dissemination of the results from two pilot actions lead to scaled activities by NBI-Eastern Nile Subsidiary Action Program (ENSAP) and NBI-Nile Equatorial Lakes Subsidiary Action Program (NELSAP).</p>	<p>4.1 Up to 5 pilots illustrating appropriate innovative techniques for sustainable conjunctive use of groundwater and surface water resources. The pilots shall include the following:</p> <p>a) Managed Aquifer Recharge (MAR) interventions: the MAR will be piloted in two sub-basins of the Nile. At least one pilot will be integrated with improving water supply for a small – medium sized town dependent on groundwater.</p> <p>b) Pilot Water Funds for sustainable watershed services to improve groundwater recharge and upstream-downstream collaboration will be explored.</p> <p>c) Use of advanced remote sensing for monitoring and management of shared groundwater aquifers.</p> <p>d) Use of isotope hydrology technique for detailed modelling of interaction between ground and surface water for specific (selected) wetland</p>	GEFTF	2, 557,646	12,000,000

			<p>ecosystems. Under this pilot, a detailed model for surface water – groundwater interaction will be developed and linked to the Nile Basin Decision Support System (NB DSS).</p> <p>5.1 Scaling up strategy: based on the above pilots, a strategy and guideline will be developed for mainstreaming the most successful pilots into operational IWRM activities at national and regional levels.</p>			
		<p>Outcome 5:</p> <p>Pilots lead to overall enhanced conservation and efficient use of water resources and promote water-efficient land use activities, strengthening livelihoods status;</p>				
<p>Component 4:</p> <p>Further strengthening capacity to address groundwater issues at the national and regional levels</p>	TA	<p>Outcome 6:</p> <p>Technicians, academics, and senior planners at national, sub-regional and regional levels capacitated on key requisite techniques on groundwater monitoring and sustainable management;</p> <p>Outcome 7:</p> <p>Regional and national decision makers have increased their understanding on importance of</p>	<p>6.1 Relevant national agencies, academics and NBI staff, and the Lake Victoria Basin Commission (LVBC) representatives receive training on:</p> <ul style="list-style-type: none"> • Ground water assessment using ground based and remote sensing data sources • Hydrogeology and ground water recharge estimation • Ground water modelling • Aquifer mapping • Planning and implementing Managed Aquifer Recharge <p>7.1 Targeted knowledge exchange programs</p>	GEFTF	426,274	2,000,000

		groundwater and capacitated to develop and adopt recommendations emerging from the analyses related to groundwater governance and conjunctive management facilitating policies	and processes, including South-South cooperation, visits, exchanges, etc. The beneficiaries of this knowledge exchange programs will include universities and research institutions relevant to the specific sub-basins covered by the project. 7.2 Targeted training at various administrative levels in groundwater governance and management, applying the recommendations contained in the Framework for Action on Groundwater Governance (GEF/FAO/UNESCO/WB/IAH). Potential topics of the training include: <ul style="list-style-type: none"> ▪ Groundwater governance ▪ Conjunctive surface ▪ Groundwater management and protection ▪ water and gender for the promotion of gender equality and women empowerment, and on the collection of gender disaggregated data using the UNESCO WWAP Toolkit 			
Component 5: Communications and awareness raising	TA	Outcomes 8: Groundwater issues and conjunctive use management included in NBI communications and awareness raising	8.1 Up to 5 communication and awareness raising products generated and disseminated to national stakeholders through NBI	GEFTF	299,394	1,500,000

		activities;	communication platforms (website, Facebook)			
			8.2 A video documentary prepared by NBI to raise awareness on role of groundwater – surface water conjunctive use in integrated water resources management in selected sub-basins			
		Outcome 9:	9.1 Information leaflets and guidance on groundwater issues prepared for different groups of stakeholders			
		Lessons and experiences on conjunctive use management and the inclusion of groundwater considerations inform IW (and other) projects globally	<ul style="list-style-type: none"> • Website, use of virtual media (twitter, Facebook, etc.) to raise awareness • 1% of overall GEF budget used to support project participation in GEF IW: LEARN activities • Lessons and experiences documented and disseminated • Groundwater /water network, IW: LEARN, CoP • Active presence at Development Partners meetings and fora • Scientific conference 			
			National engagements			
			Subtotal		5,075,669	24,100,000
			Project Management Cost (PMC) ⁴	GEFTF	253,783	750,000
			Total Project Cost		5,329,452	24,850,000

⁴ For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: (NA)

C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
Recipient Governments	Countries	In-kind	14,000,000
Others	NBI	In-kind	3,500,000
Donor Agency	UNESCO	In-kind	3,000,000
Donor Agency	IAEA	In-kind	3,000,000
GEF Agency	UNDP	In-kind	350,000
Donor Agency	GIZ	In-kind	TBD
Donor Agency	World Bank	In-kind	1,000,000
Total Co-financing			24,850,000

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA AND THE PROGRAMMING OF FUNDS ^{a)}

GEF Agency	Trust Fund	Country/Regional/Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) ^{b)}	Total (c)=a+b
UNDP	GEFTF	Regional	International Waters	NA	5,329,452	506,298	5,835,750
Total GEF Resources					5,329,452	506,298	5,835,750

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

E. PROJECT PREPARATION GRANT (PPG)⁵

Is Project Preparation Grant requested? Yes No If no, skip item E.

PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

Project Preparation Grant amount requested: \$150,000					PPG Agency Fee: \$14,250		
GEF Agency	Trust Fund	Country/Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee ⁶ (b)	Total c = a + b
UNDP	GEFTF	Regional	International Waters	NA	150,000	14,250	164,250
Total PPG Amount					150,000	14,250	164,250

⁵ PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to \$50k for PF up to \$2m (for MSP); up to \$100k for PF up to \$3m; \$150k for PF up to \$6m; \$200k for PF up to \$10m; and \$300k for PF above \$10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

⁶ PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁷

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	Hectares
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	Hectares
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	3 Number of freshwater basins
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	Percent of fisheries, by volume
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO _{2e} mitigated (include both direct and indirect)	metric tons
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	metric tons
	Reduction of 1000 tons of Mercury	metric tons
	Phase-out of 303.44 tons of ODP (HCFC)	ODP tons
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	Number of Countries:
	Functional environmental information systems are established to support decision-making in at least 10 countries	Number of Countries:

PART II: PROJECT JUSTIFICATION

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area⁸ strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

1.1 The global environmental problems, root causes and barriers that need to be addressed

The interaction between groundwater and surface water systems (rivers, wetlands, lakes) has not been adequately considered in most transboundary river basin management initiatives. In the selected sub-basins and countries, though groundwater is increasingly playing bigger role in urban and rural water supply, there is a substantial gap in knowledge on the groundwater resource base and its linkage with the watershed and aquatic ecosystems. Groundwater interaction with rivers/streams base flows, wetlands and lakes is critical for maintaining fauna and biodiversity on which livelihoods of millions of people in the selected sub-basins depend. Therefore, any meaningful water accounting for such sub-basins needs to adequately integrate groundwater in the overall water balance

⁷ Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF, SCCF or CBIT.

⁸ For biodiversity projects, in addition to explaining the project's consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving.

accounting. However, this has not been possible so far due to lack of knowledge on how groundwater interacts with surface water bodies.

Understanding these interactions is especially important for lakes and large wetland areas, which are an important component in the local/regional atmospheric water cycle. The Sudd wetlands presently are considered to be fed by river water. However, recent studies indicate that wetlands and lakes in the sub-basins selected for the project, such as the Baro-Akobo-Sobat, may in fact be fed by groundwater. Groundwater and evaporation from the wetlands may, therefore, play an important role in the surface water budget of the sub-basins. Thus, information about the role of groundwater, in particular its contribution to water balances in lakes, rivers, and wetlands is crucial for determining equitable and appropriate water allocations and water resource management strategies.

Parts of the selected sub-basins are prone to high rainfall variability and seasonal and periodic droughts. Further, climate change predictions indicate that this situation may worsen. It is broadly accepted that groundwater can provide some degree of buffering to this threat, supplementing surface water supplies, reducing risk and strengthening resilience, and reducing the vulnerability of the poor to water shortage. In fact, adequate, reliable water supplies are essential to economic development at all levels.

The groundwater systems of the Nile, like the river itself, do not conform to national and other political boundaries. Not all countries that are covered by the Nile Basin share the same one aquifer. Available knowledge indicates that at most 3 countries share a groundwater aquifer. Most transboundary aquifers are shared by 2 countries. Therefore, it is important to note that not all Nile Basin countries are involved in this project since the project focuses on few selected aquifers. Groundwater is the main source of drinking water in the selected sub-basins and countries⁹ (Masiyandima and Giordano 2007). The intensification in groundwater use and the uncertainties around future impacts of CO₂ induced climate change (Conway and Hulme, 1996) on the amount and its interaction with overlying watershed show there is an urgent need to characterize the groundwater resources of the basin.

Since its launch in 1999, the Nile Basin Initiative has had a co-ordination role addressing, predominately, surface waters. The current Nile -Sec Five-year Strategic Plan (2012-2017) includes the issues of understanding, protecting and identifying sustainable socio-economic exploitation opportunities for groundwater. The NBI is finalizing its 10-year strategy and the preparation of the next (2017 – 2022) Nile-Sec 5year strategic plan on progress and expected to be approved by its governance in August 2017. The strategic objectives of the 10-year strategy cover sustainable use, monitoring and protection of groundwater resources. In this regard, the proposed project is aligned and expected to support the operationalization of the 10-year strategy and the 5-year strategic plan.

Global environmental problems

In the countries that will be covered by the project, each of the countries regard groundwater as an insufficiently understood asset that can contribute to climate resilience to droughts as a supplement to surface waters. The importance is reflected in the significant populations that are dependent on groundwater in many parts of the basin (for example, 80% of the rural population in Ethiopia and 36 million inhabitants in Uganda; 86% of safe drinking water supply for rural areas of Rwanda).

The regional and national importance of groundwaters is further emphasized by the lack of knowledge, at all levels of society, about the extent, problems and solutions facing groundwater resources. There is a clear perception that groundwaters are under threat from unsustainable exploitation, potential climate change (affecting aquifer levels, recharge and changes in groundwater regimes); pollution (urban pollution and issues associated with high fluorides or salinization from); impacts of change of quantity and quality on dependent ecosystems; impact of groundwater on surface water; buffering of floods and droughts; etc.

⁹ Masiyandima M, Giordano, M. (2007) Sub-Saharan Africa: opportunistic exploitation, in *The Agricultural Groundwater Revolution: Opportunities and Threats to Development*. Giordano M. and Villholth K (eds), Comprehensive Assessment of Water Management in Agriculture Series 3, CAB, Wallingford, UK

Root causes

The root causes (other than those related to natural/climate change causes) are linked to lack of knowledge/understanding on aquifers and their extent (including the availability and inter-connection between groundwater bodies or between groundwaters and surface waters); poor or non-existing policies relating to groundwaters (and the differences/incompatibility of policies between countries); poor management practices that allow pollution (domestic, agriculture and industrial) or over exploitation to occur with inadequate enforcement controls to prevent, and; inadequate or insufficient monitoring systems, in some cases. These causes are made worse by an overall lack of infrastructure that would reduce the impact of wastewaters. Addressing these root causes will improve resilience to hydrological variability by improving (ideally, optimizing) the balance between surface and groundwater use. Further, lack of a governance regime for groundwater resources is a further impediment to a sustainable and cooperative management and utilization of transboundary aquifers. The Nile Basin Initiative, the only regional platform that brings together the Nile riparian states, is in its initial stage of integrating groundwater issues into its largely surface water focussed programs. As the first project focusing on groundwater, the focus of the project is on selected aquifers and sub-basins. The methodology and successful pilots will inform NBI's work program for scaling up the measures to wider scale in selected sub-basins.

Barriers to be addressed

Apart from the inadequacy of financial resources available to address the root causes, significant barriers include: policy differences between countries or different administrative jurisdictions in the same aquifer system; lack of appropriate policies, legislation and management institutions; lack of capacity; low public awareness; overall lack of knowledge on aquifer systems and their interaction including with surface waters. Thus, the main drivers for such water management reform at both the national and sub-basin levels include (i) the need to meet supply/demand imbalances for the future; (ii) water quality deterioration and associated health and environmental risks; and (iii) weak service delivery, reliability, and transparency and associated quantity and quality measurements along with financial sustainability and cost recovery issues.

All Nile Basin countries do not share one aquifer rather different aquifers underlying watersheds in the Nile Basin are shared by a constellation of 2 to three countries. Therefore, as a first step, the project shall focus on selected transboundary aquifers underlying watersheds in the Nile Basin. The transboundary aquifers included in the project were selected in consultation with the Nile Technical Advisory Committee (Nile-TAC).

The **proposed project** is designed to **reduce or minimize many of these barriers**, addressing the root causes of the overall environmental problems, by increasing knowledge, awareness and management capacity of groundwaters (and the conjunctive management of surface and groundwaters).

For enhancing the project impact on the ground, the project interventions will focus on selected shared aquifers in the Nile Basin rather than stretch over the entire Nile Basin. Based on the results of the project, future/follow up projects will be designed with basin-wide coverage. Further, to enhance effectiveness of project impact, it is critical that groundwater issues are not dealt with in isolation from surface water management issues in the sub-basins covered by the project. Therefore, the Nile Basin Initiative (NBI) will be the main execution agency for the project to enable mainstreaming groundwater issues into the deliberations on surface water. However, given the complexity of addressing transboundary water resources issues in the Nile Basin, as a first step, the project shall focus on studies and pilot schemes that are of Technical Assistance nature in selected aquifers.

1.2 The baseline scenario or any associated baseline projects

Regional Actions

- **The Nile Basin Initiative (NBI)** is a partnership among the [Nile](#) riparian states that “seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace

and security". The NBI began with a dialogue among the riparian states that resulted in a shared vision to "achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources." It was formally launched in February 1999 by the water ministers of nine countries that share the river: [Egypt](#), [Sudan](#), [Ethiopia](#), [Uganda](#), [Kenya](#), [Tanzania](#), [Burundi](#), [Rwanda](#), the [Democratic Republic of Congo](#) (DRC), as well as [Eritrea](#) as an observer. From its beginning, the Nile Basin Initiative has been supported by the [World Bank](#) and by other external partners. NBI has three centres, the secretariat (Nile-Sec) located in Entebbe, Uganda; the Eastern Nile Technical Regional Office (ENTRO), located in Addis Ababa, Ethiopia; and the Nile Equatorial Lakes Subsidiary Action Program Coordination Unit (NELSAP-CU), located in Kigali, Rwanda.

The NBI has three core functions, namely:

- **Facilitating Basin Cooperation:** This core function is led by the Nile-Sec and has the objective to facilitate dialogue, support and nurture cooperation amongst the Nile Basin countries so as to promote timely and efficient joint actions. It focuses on providing and nurturing the Platform for Cooperation; Strengthening Member States Capacity; Strategic Planning as well as Strategic Communication and Media engagement.
- **Water Resources Management:** The overall Goal of the Water Resources Management core function is to strengthen cooperative water resources management in the Nile Basin. To contribute to this Goal, its objective is to assess, manage, and safeguard the water resources base that supports the peoples of the Nile Basin through applying the principles of knowledge-based IWRM to water resources development planning and assessment. Key activities under this core function include: Water Resources Analyses, Knowledge Services, Water Resources Assessment, Trans-boundary Policies and Program Technical Support (core). Capacity development is considered a cross-cutting activity and is embedded in all program components. This core function is led by the Nile-Sec.
- **Water Resources Development:** This core function focuses on promoting multi-country investments with the primary objective of developing the Nile Basin water resources in an equitable, efficient and sustainable manner to reduce poverty, promote economic growth and integration among countries, increase resilience to climate and water related disasters and reverse environmental degradation. The water resources development core function is led by the Eastern Nile Technical Regional Office (ENTRO) for the Eastern Nile sub-basins and the Nile Equatorial Lakes Subsidiary Action Program Coordination Unit (NELSAP-CU) for the Nile Equatorial Lakes sub-basins.
- [Mainstreaming Groundwater Considerations into the Integrated Management of the Nile River Basin](#) (IAEA/UNDP/GEF). Further details and key achievements of this initial project are presented in Annex 1.

Based on this and a number of other previous studies, the following key challenges and recommendations have been identified:

Challenges:

- Limited availability and lack of no access to existing hydrological, meteorological and hydro-geological data (data sharing)
- Shortage of expertise in data compilation, interpretation and report writing in counterpart institutions
- Inadequate spatial and temporal sampling coverage for isotope data generation
- Some gaps in Project implementation and coordination
- Lack of matching funds in counterpart organizations to carry out fieldworks

Recommendations

- Estimate evaporative losses along flowing rivers such as Atbara and investigate the sources of isotopic enrichment
 - The Sudd affects the Nile hydrology in terms of surface and groundwater flow as well as a source for precipitation in the surrounding areas. Bahr El-Ghazal and Sobat contribute to the wetland. The Sudd wetland stands out as a vital regional project to which the Nile basin countries may contribute and benefit from.
 - Improved groundwater dating method for some selected areas (^3H - ^3He , ^4He)
 - Better monitoring stations and data sharing arrangements;
 - Construction of monitoring boreholes close to lakes and rivers to better assess groundwater -surface water interaction and wetlands
 - Precipitation isotope sampling especially in Bahr El-Ghazal and the Sudd
 - Improved understanding of groundwater resources availability, safe yield and vulnerability for more sustainable use of the resource;
 - With improved understanding of the groundwater resource base, reduce conflict potential (such between famers and pastoralists) on use of groundwater resources and ecosystems that very depend on it;
- Nile Transboundary Environmental Action Project, (UNDP/WB/GEF): this was one of the seven projects under the NBI Shared Vision Program. The project's aim was to protect critical Nile Basin ecosystems from transboundary threats through the provision of a strategic environmental framework and the engagement of stakeholders according to the principles of Integrated Water Resources Management (IWRM). As part of the project several small-scale community led land and water management projects were implemented that benefited several thousand people across the basin; the first NBI wetlands strategy was formulated; an NBI wetlands inventory was prepared; under this project school environmental education curricula were developed to raise awareness of school children on the environment. This project was closed in 2009. However, some of its activities have been mainstreamed into the current NBI programs. Examples of these include preparation of wetland inventory, and water quality monitoring.
 - SIP: Eastern Nile Transboundary Watershed Management in Support of ENSAP Implementation (WB/GEF). This project focuses on rehabilitating degraded watersheds and conservation of those in relatively good condition through community livelihood focused interventions. The project conducted sub-basin level analysis (known as Cooperative Regional Assessment) to quantify the costs and benefits of watershed management across countries that share the sub-basin. The project has supported watershed rehabilitation in Ethiopia and Sudan and sediment monitoring in Egypt. This project has been closed. However, watershed management has continued to be one key program area in the NBI Subsidiary Action Programs.
 - **Biodiversity Conservation and Sustainable Utilization of Ecosystem Services of Wetlands of Transboundary Relevance in the Nile Basin:** this is a 6 M EU project that is currently being executed by the NBI. The project finance is obtained from the Government of Germany through GIZ. The project overall objective is to strengthen the technical and institutional capacities of NBI and its member countries for sustainable management of wetlands of transboundary relevance in the Nile basin. The project outputs include enhanced knowledgebase, capacity, policy frameworks and sub-basin level project implementation aiming at community – driven sustainable management and utilization of wetlands of transboundary significance.
 - Lake Victoria Basin Commission and supporting projects
 - Formulation of an Action Programme for the Integrated Management of the Shared Nubian Aquifer (IAEA/UNDP/GEF)

- IAEA's Water Availability Enhancement (IWAVE) Project aimed at helping Member States improve the long-term access to freshwater by using science-based, comprehensive assessments of national water resources.
- UNESCO-IHP has been working since the seventies to foster scientific knowledge on hydrogeology and groundwater resources studies. During the last ten years it has teamed with UNDP, IAEA, GEF, etc. to develop activities that would promote a new approach to groundwater management, better integrated with land use planning, ecosystems protection and basin management. Thanks to this cooperation a number of highly representative projects have entered the GEF portfolio, and the GEF has come to the forefront as the lead funding institution in the management of large transboundary groundwater basins. UNESCO has executed or partnered with several GEF projects such as the "Transboundary Water Assessment Programme (TWAP/Groundwater component)", "Protection and sustainable use of the Dinarik Karst Transboundary Aquifer System (DIKTAS)", "Medpartnership /Costal aquifer component" and the "Groundwater Governance: A framework for action", NWSAS, Nubian aquifer, Iullemeden that deal with issues ranging from the protection of groundwater dependent ecosystems and drought management in the arid areas to building knowledge and capacity in the Sahel and Saharan regions of Africa, where shared aquifers represent the major, and at times the only source of water.

UNESCO-IHP has more than 50 years of experience on hydrogeological mapping activities, and is extremely active on assessing the impacts of climate change on groundwater, developing policy and institutional guidelines, recommendations and best practices designed to improve groundwater management at country/local level. UNESCO-IHP launched in 2002 a global multi-partner initiative dedicated to Internationally Shared Aquifer Resources Management (ISARM) aiming at providing support to Member States in conducting an inventory of transboundary aquifers globally by assessing their hydrogeological characteristics, as well as addressing the socio-economic, environmental, legal and institutional aspects; and providing guidance to Member States towards the sustainable management of shared groundwater resources. Since its start in 2002, ISARM has launched a number of global and regional initiatives. These are designed to inventory, map, delineate and analyse transboundary aquifer systems and to encourage riparian states to work cooperatively toward mutually beneficial and sustainable aquifer development. So far, more than 600 transboundary aquifers have been identified by UNESCO IHP in coordination with Member States and IHP National Committees. In 2008, the 63rd session of the UN General Assembly (UNGA) adopted Resolution A/RES/63/124 on the Law of Transboundary Aquifers, which includes in its annex the draft articles of that law, prepared with the scientific support of UNESCO-IHP. The Resolution "...encourages the States concerned to make appropriate bilateral or regional arrangements for the proper management of their transboundary aquifers taking into account the provisions of the draft articles, and calls upon UNESCO-IHP to offer further scientific and technical assistance to the States concerned.

UNESCO and IAEA have already closely co-operated in several projects and in particular in the identification of major challenges and analysis of the Nubian sandstone system.

- UNESCO IHP will also contribute to the project through mobilizing its regional network of centres and chairs:
- Regional Centre on Capacity Development and Research in Water Harvesting (RCWH) in Sudan
- Regional Centre for Groundwater Resources Education, Training and Research in East Africa (RCGRE) – Kenya
- African Regional Centre for Eco-hydrology (ARCE) – Ethiopia

National projects and policies

Burundi: Many surfaces water analysis studies have been carried out, and water management strategies have been developed and published, such as the national water master, water policy, a decision support system tools for the water sector, river discharges analysis and others. However, the groundwater dimension has not been taken into account. This has contributed to a lack of an effective water resources management tool for socio-economic sectors,

such as agriculture, industry, urban water supply, energy and so on. Since 2012, a German project by BGR has been implemented in some provinces such as Gitega, Kirundo, and Rumonge. The main objective of the project is groundwater resources management. The main activities undergoing are groundwater quantity and quality monitoring and evaluation. The Institutions involved in BGR project are IGEBU, Ministry of Energy, Ministry of Water, Environ, Land Management and Urban planning, Urban and rural Water supply agencies. The project is planning to extend its activities in others zones next year.

Ethiopia: The current focus is on exploration and exploitation with less emphasis given to GW management. Currently mapping shallow and very shallow groundwater is being undertaken by the Ministry of Water, Irrigation and Electricity, and the Agriculture Transformation Agency. There is a policy-push for shallow groundwater development for use in small scale (as well as conjunctive rain fed – groundwater fed) irrigation at household level to enhance household food production. The main policies relating to groundwater include: GTP II: Growth and Transformation Plan [2015-2020]; Universal Access Plan: Ethiopian Water Resources Management Proclamation 197/2000. A number of ministries and institutes have an interest in groundwaters, including: Ministry of Water Irrigation and Electricity; Geological Survey of Ethiopia; Ministry of Environment. Key national and regional projects include: Sustainable Land Management Programme (World Bank, DFID, GIZ, EU etc.) to reduce land degradation and improve land productivity in selected watersheds in targeted regions in Ethiopia; Agricultural Growth Program (AECID, CIDA, USAID, WB, FAO, UNDP etc.) to increase agriculture productivity through sustainable land management program, groundwater use and technology innovation; Feed the Future Innovation Lab for Small-Scale Irrigation (US)- to benefit farmers of Ethiopia, Ghana and Tanzania by improving effective use of scarce water supplies through interventions in small-scale irrigation; The Agricultural Transformation Agency's Initiative to map shallow groundwater across Ethiopia; Uppro Program 1: Hidden Crisis (DFID): unravelling current failures for future success in rural groundwater supply; Uppro Program II: GroFutures (DFID): Groundwater Futures in Sub Saharan Africa, a research program on groundwater features, uses and impacts; REACH program: Improving Water Security for the Poor (DFID); and, a number of [>10] large projects of mapping deep groundwaters for irrigation in high prospect areas of the country by the Federal Ministry of Water Irrigation and Electricity; Abbey Basin Authority's a River Basin Organization planning to conduct River Basin planning for Abey (Blue Nile in Ethiopia} including groundwater.

Kenya: The groundwater potential not well understood and the government has initiated country wide groundwater mapping programme; There is a draft groundwater policy; Conjunctive surface/groundwater management is implemented through Water Resources Management Authority (WRMA) and at sub-catchment level by Water Resources Users Associations. In addition, key policies and legislation include: Water Act 2002; Draft Groundwater Policy; the Environmental Management and Coordination Act (EMCA) 1999; WRMA Rules,2007; These policies are in place but the enforcement capacity is inadequate. A number of ministries and institutes are involved with the management of groundwaters, including: Ministry of Water and Irrigation, WRMA, Water Towers agency; Kenya Forest Service, Kenya Wildlife Service, National Environmental Management Authority. Relevant national and regional projects include: National / regional projects addressing GW; National Groundwater mapping programme; Groundwater-Surface water interaction on the Kilimanjaro aquifer system.

Rwanda: the 2011- 2015 water resources management sub-sector plan identifies meeting increasing multiple water demands, in the face of declining water quantity and quality, and inadequate governance framework is the main challenge facing the country. According to the strategic plan, ground water accounts for 86% of safe drinking water supply for rural areas. Establishing the nature, physical and geo-chemical characteristics, discharge capacities of the aquifers and main recharge areas is one of the main issues that have been cited in the 2011- 2015 strategy for improved management and sustainable use of groundwater aquifers. One of the identified shared aquifers covered by the project lies in Rwanda. In this regard, the proposed project through its special focus on enhancing the knowledge and capacity for sustainable management groundwater resources will be of high relevance to the management of groundwater aquifers in Rwanda.

Sudan: There is limited surface and groundwater conjunctive management in some areas in Sudan for agriculture and domestic supply. A new regulation for permitting groundwater extraction has just received ministerial approval and will be implemented later this year. The Ministry of Water Resources, Irrigation and Electricity (MWRIE) has overall management of all waters and other ministries involved include: Ministry of Agriculture; Ministry of Animal

Wealth; Ministry of Forestry; State Ministries of Water Resources; and, the Ministry of Environment. Currently the only groundwater ODA project is the UNDP/GEF Nubian Aquifer Strategic Action Programme (SAP) implementation.

Tanzania: Groundwater management is insufficient due to inadequate information on resources, threats and potential for exploitation. All sources are managed separately (no conjunctive management) and inter-dependencies between surface and groundwaters are not clear. The main groundwater related policies include: National Water Policy (NAWAPO) of July 2002, Water Resources Management Act No 11 of 2009 and Environment Management Act Number of 2004. Key ministries and institutes include: Water and Irrigation, Vice President's Office Environment Department, President's Office- Regional Administration and Local Government. Relevant national projects include: Water Sector Development Programme (WSDP) –phase 2; -DFID funded projects in Rufiji and Dodoma.

Uganda: A few studies have been conducted or are underway on the interaction between groundwater and surface water in the country. Key relevant policies on groundwater include: National Water Policy, Water Act and relevant regulations that provide policy and legal basis for management of groundwater; Permits for regulation of groundwater including Groundwater abstraction permits, Borehole Drilling License and Waste Water Discharge Permits. Groundwater is of interest to a number of ministries and institutes, including: Ministry of Water and Environment, Makerere University and various NGOs, CSOs. Relevant national and regional projects include: Ministry of Water and Environment studies related to groundwater availability, potential and pollution; A groundwater mapping exercise for use in planning of groundwater development activities for about 85% of Uganda; Studies on groundwater - surface water interactions on deeply weathered surfaces of low relief in the Upper Nile Basin of Uganda; Groundwater/surface water assessment and monitoring activities in relation to catchment based water resources management; Coordinated research project on interaction of groundwater and surface water at one of the stations at L. Kyoga. Lakes Edward and George Integrated Fisheries and Water Resources Project (AfDB/GEF/NBI); Lake Victoria Environmental Management Project (Lake Victoria Basin Commission/World Bank); Water Management and Development (World Bank); Water Management Zones Project (various donors); Support to Water Resources Management project (various donors).

1.3 The proposed alternative scenario

The initial project concept was formulated together with the Nile riparian countries, NBI, IAEA, UNESCO and UNDP in Vienna, May 2016. The project concept was further developed by NBI in consultation with the Nile Basin countries through the Nile Technical Advisory Committee (Nile TAC). The project concept was presented to the Nile-TAC in the 46th meeting on 13th July 2016 and the Extra-Ordinary meeting on 23rd February 2017. The refinements focused on project components, its geographic coverage and implementation and execution arrangements. The revised PIF was communicated to the Nile-TAC in July 2017 and subsequently in August 2017 for review further comments. Clarifications were given by the NBI Secretariat on questions raised by Nile-TAC members. The project responds to the needs of the countries that share the selected aquifers covered by the project and is consistent with the expected strategies of the NBI with respect to groundwaters. The project builds on the IAEA/UNDP/GEF project '*Mainstreaming groundwater considerations into the integrated management of the Nile River Basin*', that initiated detailed understanding of the aquifers and surface/groundwater interactions through isotope and modelling studies (details of the key achievements are included in Annex 1).

The project is the first of its kind in dealing with specific shared groundwater aquifer issues in the Nile Basin. Therefore, given the complex surface water management issues in the Nile Basin, it was found more appropriate to start with a limited set of selected transboundary aquifers rather than cover the entire Nile Basin. It must be noted that all the Nile Basin countries don't share one continuous aquifer. Rather, a constellation of two or three countries share different aquifers. While general policy related matters on sustainable management of shared aquifers might apply to most of the aquifers, the specific situation of each aquifer dictates the scope and approach of the project towards addressing the issues in the aquifer. Therefore, it was found necessary at this stage to focus on few selected transboundary aquifers rather than distribute project financial resource thinly over the entire river basin. As a result, not all Nile Basin riparian countries will be involved in the project. The selected aquifers and countries that will be covered by the project are given below:

Eastern Nile sub-basins:

Priority: Gedaref – Blue Nile aquifers (shared by Ethiopia and Sudan).

Nile Equatorial Lakes sub-basins:

Priority 1: Mount Elgon aquifer (shared by Burundi, Kenya and Uganda): this catchment is part of the Kagera river system.

Priority 2: Kagera aquifer (shared by Burundi, Rwanda, Tanzania and Uganda). This catchment is part of the Kagera sub-basin.

Final selection of the aquifers will be made during the PPG phase of the project.

Relevance to GEF focal area strategies

The project is consistent with, and supportive of GEF IW Objective 1: Catalyse Sustainable Management of Transboundary Waters (Program 1 - *Foster Co-operation for Sustainable Use of Transboundary Water Systems and Economic Growth*) and GEF IW Objective 2: Catalyze investments to balance competing water-uses in the management of transboundary surface and groundwater and to enhance multi-state cooperation (Program 3 - *Advance Conjunctive Management of Surface and Groundwater through Effective Institutional, Legal, and Policy Measures*; Program 4 - *Addressing the Water/Food/Energy/Ecosystem Security Nexus*)

Project Objective: To strengthen knowledgebase, capacity and cross-border institutional mechanisms for sustainable use and management of selected transboundary aquifers in the Nile Equatorial Lakes and Eastern Nile sub-basins.

Specific Objectives: Building on previous GEF-financed actions: i) to further improve knowledge and understanding of groundwater resources of selected aquifers underlying watersheds of selected sub-basins¹⁰; ii) to strengthen the overall water resources management nationally and at sub-basin/specific aquifer level; iii) to respond to climate change impacts through effective risk-reduction adaptation measures, including conjunctive use and management of surface water and groundwater; and, iv) to ensure a healthy ecosystem and strengthened livelihoods.

The project interventions focus on selected aquifers and, in this regard, do not cover basin-wide issues.

Project outcomes, components and outputs

Background

The project aims to foster the more effective utilisation and protection of selected shared aquifers in the selected sub-basin in the Eastern Nile and the Nile Equatorial Lakes region through further improving the understanding of available groundwater resources and demonstrating ‘conjunctive management’¹¹ that optimizes the joint use of surface and groundwaters. The project will also contribute to aid the national achievements and reporting of water-related Sustainable Development Goals; and will be supportive to environmental protection whilst enhancing socio-economic development of the basin’s population.

¹⁰ Exact linkages of the aquifers with the surface water of the watersheds (if any) will be established as part of the project

¹¹ Conjunctive Water Management is intended as the efficient utilization of all freshwater resources existing in a specific basin – surface waters, groundwater shallow and deep, but also rainfall, treated wastewaters reuse and other non-conventional sources – according to an overall strategy aimed at improving water availability and reliability. It is crucial for integrated water resources management and helpful to reduce vulnerabilities of water supply systems and mitigate the water supply stress in responding to climate change.

The proposed project supports participating countries to address perceived gaps in knowledge and practices, including:

- Knowledge on distribution, characteristics and resource potential (recharges and safe yield, interaction with the Nile river system, etc.)
- Vulnerability of groundwater resources connected: due to climate change, over exploitation, pollution (point and non-point source), etc.
- Understanding how water dependent ecosystems (wetlands, lakes, etc.) interact with groundwater; isotope techniques can be used to quantify groundwater contributions to the sustenance of the aquatic ecosystems
- Formulation, operationalization and monitoring of technical manuals and guides
- Capacity development in use of modern techniques (such as groundwater mapping through satellite remote sensing)
- Approaches to managing surface water – groundwater conjunctive use

Addressing these gaps will help in future design of cooperative arrangements for sustainable development and management of groundwater resources in the selected aquifer systems. The anticipated benefits to the countries of the Nile River Basin include:

- Mapping of aquifers and understanding of quantity and quality of water resources available, to utilise, through conjunctive use and management, by participating countries for sustainable socio-economic development and meeting ecosystem requirements;
- Sub-basin and national climate change scenarios will be better defined through the knowledge on groundwaters, to build-in resilience strategies to adapt to potential climate change and ensure sustainable use of groundwater use towards effective risk-reduction adaptation measures.
- Improved understanding of the interactions between surface waters and ground waters, including opportunities for artificial recharge by countries when surface water is abundant or to harvest runoff for recharge in arid and semi-arid regions;
- Countries are better equipped to achieve and report progress towards SDGs (specifically SDG 6 (*Access to Water*), 2 (*Food and Nutrition Security*) and 15 (*manage forests, halt and reverse land degradation and biodiversity loss, etc.*)).

Component 1: Furthering knowledge and understanding about availability of groundwater resources in the selected aquifers underlying watersheds in the sub-basins of the Eastern Nile and the Nile Equatorial Lakes.

Purpose of component: This will build and expand on the understanding of groundwater resources through detailed mapping and assessment of selected aquifer systems. Further utilisation of isotope and modelling techniques will provide more national and regional knowledge on these important assets and ensure that future sustainable socio-economic development can be assured. The analysis will also consider the implications of impacts of potential climate change scenarios on the overall basin surface and groundwater resources in the Nile. The work will also document the current groundwater abstraction/use and anticipated groundwater abstraction trends (in irrigation, industry and drinking water) from the aquifers of basin wide significance to inform modelling, decision support systems etc.

The findings of the assessments will establish the baseline knowledgebase for the key aquifers, identify current state of knowledge and gaps, and identify priority follow – on actions for addressing the knowledge gaps. The assessments shall build on and complement previous assessments (including assessment reports based on the GEF TWAP methodology).

Outputs of Component 1 shall include the following:

Output 1.1: Shared aquifers diagnostic analysis reports for all selected shared aquifers that serves as baseline fact-based analysis of current status of the aquifers, historical trends in resource availability, existing governance mechanisms at national and cross-border levels and threats that the aquifers face. The reports will, among others, cover the following:

- Safe recharge and sustainable yield
- Status of utilisation of groundwater resources
- Governance structures (national and regional) including existing policies, legislation and institutional arrangements for management of shared aquifers;
- GW/SW conjunctive management practices and options for further improvements
- Identification of key threats to sustainability of shared groundwater aquifers (climate change scenarios, increased/unsustainable withdrawals, land use/change)
- Status on monitoring of shared aquifers and identification of key gaps in current monitoring infrastructure.
- Recommendations for sustainable conjunctive groundwater – surface water use covering technical, institutional and governance aspects. The recommendations will be used to develop action plans for cooperative management and use of the shared aquifers

Output 1.2: A regional groundwater knowledgebase for all shared aquifers that draws on data and analysis carried out as (1.1) above. The knowledgebase will comprise aquifer maps and geo-database of key aquifer attributes. The aquifer maps shall, at a minimum, include aquifer areal extents, water table elevation, key water recharge areas, key water demand centres they support (if any), and water quality status (using key parameters) with identified water quality hotspots. The geo-database will be integrated into the Nile Basin Decision Support System (NB DSS);

Output 1.3: Water balance modelling of the selected aquifers with quantified: recharge, outflows (base flow, deep percolation, etc) and withdrawals. Trends in aquifer recharge as a result of changes in precipitation or land use/cover will be quantified and documented. The water balance study shall employ isotope hydrology techniques coupled with hydrologic modelling of linked aquifer – river systems to quantify the components of the water balance of each shared aquifer. Being the first attempt for developing the water balance, the project focuses on some of the selected aquifers.

Output 1.4: Projection of groundwater availability and use under climate change for selected aquifers: Further, as part of the modelling, the water balance of selected shared aquifers will be projected into the future (time horizon to be agreed with stakeholders during the PPG phase) for selected SSPs (Shared Socio-economic Pathways), and range of climate change scenarios to identify strategic recommendations for sustainable management and utilization of the selected shared aquifers.

Component 2: Development of action plans on groundwater resources governance, management, and protection for inclusion in national, sub-basin frameworks: – also including consideration of surface water/groundwater resources conjunctive use

Purpose of component: From the map of groundwater aquifers bodies highlighted in Component 1, work will be directed at targeted aquifers to develop appropriate guidelines (technical and policy) on the exploration and use of groundwaters as a valuable resource together balancing the use of ground and with surface waters towards optimized use of both resources. The project will focus on the key aquifers within the basin with approaches being replicated and up-scaled where appropriate. The work will be central to the development and agreement of an overall basin approach to groundwater, in ensuring a harmonisation of use and management of groundwaters within and adjacent to the whole Nile River Basin.

Findings from the assessments (Component 1) will be used to guide actions to address gaps in knowledge, policies and practice to improve groundwater management and governance, including. The component has two outcomes and five outputs as described below:

Outcome 2: Increased convergence of national approaches, policies and governance mechanisms for protection and sustainable use of shared aquifers.

Output 2.1: Regional Shared Aquifers Integrated Management Action Plan for strengthening cooperative management and utilization of the selected shared aquifers will be developed. The Action Program is envisaged as a collection of recommended measures that are intended to address gaps and threats identified in Component 1 and enhance sustainable use of shared aquifers. The action plan will cover the following:

2.1.1 Actions for improving groundwater monitoring using ground and remote sensing based technologies. Given the advantage of large area coverage of remote sensing data, the technologies selected will also be promoted for use for other aquifers within each country covered by the project. The measures that will be covered by the action plan will cover aspects of monitoring the status of the groundwater resource base (water levels, recharge, water quality) as well as its use (abstraction).

2.1.2 A technical manuals and guides support conjunctive use groundwater and surface water resources. These technical manuals and guides will address, among others, measures for enhancing aquifer recharge (such as through MAR) and sustainable yield, water quality protection, and conservation of groundwater dependent aquatic ecosystems linked to the selected aquifers.

2.1.3 Recommended institutional mechanisms for sustainable management and utilization of the groundwater resource. Further, the recommendations will also cover aspects for strengthening national inter-sectoral coordination to promote protection and sustainable conjunctive use of surface and groundwater resources.

2.1.4 Measures for maintenance of groundwater to sustain groundwater-dependent aquatic ecosystems (wetlands, floodplains and river reaches).

- **Strategies for conjunctive** surface and groundwater use as a key climate change adaption measure at national and regional levels.

Outcome 3: NBI's subsidiary action programs (Eastern Nile and Nile Equatorial Lakes sub-basin) will be strengthened through **integration** of groundwater aspects for selected sub-basins.

Output 3.1: Technical guide on integration of groundwater aspects in NBI's subsidiary action programs for the selected sub-basins targeting key activities: The findings under output 2.1 will be used to develop guidance manuals to integrate groundwater aspects in selected projects of the NBI Subsidiary Action Programs. Key projects that will be targeted include watershed management and sub-basin integrated water resources management plan development. While the project doesn't directly cover larger wetlands in the Nile Basin, such as the Sudd and the Baro-Akobo-Sobat wetlands, the experiences and knowledge generated on groundwater-surface water interactions will help in advancing the understanding significance of larger wetlands in sustaining the hydrology of the connected rivers and the dependent ecosystems.

Component 3: Targeted pilot projects to explore conjunctive use of surface and groundwaters, and links to biodiversity conservation and climate change adaptation

Purpose of component: Through a range of activities that will aid national and sub-regional bodies to upscale approaches will be applied to both existing and new programmes addressing water resources management (both surface and groundwaters) in the sub-basins and countries covered. Pilots will assist in further testing and demonstrating novel approaches in the selected sub-basins and their benefits to a range of stakeholders. The results and lessons will also help to inform the development of national and regional action plans (Component 2). Successful pilots from this project will be scaled up through other national and sub-regional initiatives. The project has two outcomes and two outputs (one for each outcome).

Outcome 4: Broad dissemination of the results from two pilot actions lead to scaled activities by ENSAP and NELSAP.

- **Output 4.1: Up to 5 pilots** illustrating appropriate innovative techniques for sustainable conjunctive use of groundwater and surface water resources will be implemented during the lifetime of the project. Detailed scope and geographic focus of each pilot will be determined during the PPG phase. The pilots shall include the following:
 - a. **Managed Aquifer Recharge (MAR) interventions:** the MAR will be piloted in two sub-basins of the Nile. In both cases, the MAR will be designed to complement on-going watershed management activities of the Nile Subsidiary Action Programs. The pilot shall include the detailed study, design and on-site implementation of the MAR measures integrated with appropriate instrumentation for monitoring effectiveness of the measures. At least one pilot will be integrated with improving water supply for a small – medium sized town dependent on groundwater. The MAR will be targeted, among others, to meet the growing water demands for the pilot town under selected SSPs and climate change scenarios.
 - b. **Pilot Water Funds for sustainable watershed services to improve groundwater recharge and upstream-downstream collaboration will be explored.** The Water Fund pilot could possibly be linked to one of the pilots where the MAR (linked to urban water supply) will be implemented to demonstrate clear benefits to downstream water users while at the same time enhancing the role of upstream land and water management to enable sustainable groundwater recharge.
 - c. **Use of advanced remote sensing for monitoring and management of shared groundwater aquifers.** Under this pilot, customized monitoring tools will be developed that use available remote sensing imageries for mapping and monitoring a selected groundwater aquifer that is intensively used to

supplement surface water resources. The monitoring tool will then be mainstreamed at the relevant national institution to support sustainable management of the groundwater resource.

d. Use of isotope hydrology technique for detailed modelling of interaction between ground and surface water for specific (selected) wetland ecosystems. The focus of this pilot will be to establish the causal link between the dynamics of the selected wetland and the connected groundwater system. Under this pilot, a detailed model for surface water – groundwater interaction will be developed and linked to the NB DSS. This model will further be used in the protection and/or restoration of groundwater interactions with wetlands to conserve natural sources of livelihoods for the local populations, biodiversity and integrity of ecosystem (e.g. in the Sudd area).

Further pilots will be identified during the PPG phase. The following provides potential ideas for pilots in addition to the above examples:

- Integrating surface water diversions and groundwater withdrawals to maximize efficiency and minimize impacts on other resource users and ecological processes;
- Demonstrating comprehensive conjunctive use analysis and water utilisation plans for small selected sub-basins as a pilot to identify optimal approaches for conjunctive use management at a basin scale;
- Shared and cross-border collaborative actions at identified groundwater/surface water interaction sites where impacts are noted by the GW/SW analyses (Component 1)
- Land-use and wetlands groundwater protection and/or restoring actions to conserve biodiversity and strengthen livelihoods
- Farmer/private sector specific action (irrigation, protection, etc.) that demonstrate benefits of conjunctive management within a SLM framework;
- Community specific actions that demonstrate benefits of conjunctive management

The pilots will be platforms for illustrating appropriate innovative techniques relevant to conjunctive management of surface and groundwater at the national and regional level.

Outcome 5: Pilots lead to overall enhanced conservation and efficient use of water resources and promote water-efficient land use activities, strengthening livelihoods status;

- **Output 5.1: Scaling up strategy:** based on the above pilots, a strategy and guideline will be developed for mainstreaming the most successful pilots into operational IWRM activities at national and regional

Component 4: Further strengthening capacity to address groundwater issues at the national and regional levels

Purpose of component: Recognising the underutilisation and general lack of awareness issues associated with groundwater, the project will build upon the previous technical training provided by UNESCO/IAEA and to strengthen the ability to manage groundwaters (and conjunctive use aspects) at both the national and regional levels. This would address all levels of society (decision makers, technicians, academics, local authorities and communities) and assist with sector-specific training for policy makers, researchers, and private sector (including farmers). This component will cut across the whole project and will aid the post-project sustainability of the work to support the use and protection of groundwaters. The specific outcomes and outputs of this component are described below:

Outcome 6: Technicians, academics, and senior planners at national, sub-regional and regional levels capacitated on key requisite techniques on groundwater monitoring and sustainable management;

Output 6.1: Relevant national agencies, academics and NBI/LVBC representatives receive training on:

- Ground water assessment using ground based and remote sensing data sources
- Hydrogeology and ground water recharge estimation
- Ground water modelling
- Aquifer mapping
- Planning and implementing Managed Aquifer Recharge

Potential beneficiaries of the training include: Technicians, academics, and senior planners at national, sub-regional and regional levels.

Outcome 7: Regional and national decision makers have increased their understanding on importance of groundwater and capacitated to develop and adopt recommendations emerging from the analyses related to groundwater governance and conjunctive management facilitating policies.

Output 7.1: Targeted knowledge exchange programs and processes, including South-South cooperation, visits, exchanges, etc. The beneficiaries of this knowledge exchange programs will include universities and research institutions relevant to the specific sub-basins covered by the project.

Output 7.2: Targeted training at various administrative levels in groundwater governance and management, applying the recommendations contained in the Framework for Action on Groundwater Governance (GEF/FAO/UNESCO/WB/IAH). Potential topics of the training include:

Groundwater governance

Conjunctive surface

Groundwater management and protection

water and gender for the promotion of gender equality and women empowerment, and on the collection of gender disaggregated data using the UNESCO WWAP Toolkit

Component 5: Communications and awareness raising

Purpose of component: This component is an important aid to the overall implementation of national action plans relating to groundwaters and to guide the sub-regional policy development on conjunctive management on surface and groundwaters. This will support both the work of the NBI and national authorities to understand and explain to their stakeholders the importance, values and benefits from conjunctive use of surface and groundwaters to protect the environment and support livelihood development within the selected sub-basins.

Outcome 8: Groundwater issues and conjunctive use management included in NBI communications and awareness raising activities;

Output 8.1: Up to 5 communication and awareness raising products generated and disseminated to national stakeholders through NBI communication platforms (website, Facebook). The communication products will be used to raise awareness and understanding on role of groundwater management and conjunctive use of surface – groundwater resources. Further, role of groundwater in sustaining ecosystems will be covered by the communication products complementing other activities of NBI with respect to watershed management and transboundary wetlands.

Output 8.2: A video documentary prepared by NBI to raise awareness on role of groundwater – surface water conjunctive use in integrated water resources management in selected sub-basins.

Outcome 9: Lessons and experiences on conjunctive use management and the inclusion of groundwater considerations disseminated to IW (and other) projects globally.

Output 9.1: Information leaflets and guidance on groundwater issues prepared for different groups of stakeholders

- Website, use of virtual media (twitter, Facebook, etc.) to raise awareness
- 1% of overall GEF budget used to support project participation in GEF IW: LEARN activities
- Lessons and experiences documented and disseminated
- Groundwater /water network, IW: LEARN, CoP
- Active presence at Development Partners meetings and fora
- Scientific conference
- National engagements

Addressing topics including:

- Sustainable use of ground water resource use
- Surface water quality and ground water link
- Forest hydrology and groundwater recharge
- Outreach material on successful groundwater – surface water conjunctive use
- Groundwater- surface water interactions
- Policy briefs based on project outputs on significance of groundwater in sustaining wetlands of regional significance (such as the Sudd)

Project execution and management arrangements

The Nile Basin Initiative (NBI) is expected to be the main executing agency of the project, subject to UNDP approval following a micro-HACT assessment of execution capacity. All countries that will be involved in the project are active members of the NBI. The Nile TAC will be the Project Steering Committee representing all selected countries covered by the project. A Regional Groundwater Experts Group representing the countries covered by the project will be formed. The experts group will be responsible for closely working with NBI in all technical aspects. It shall be responsible for reviewing and clearing technical reports and advising the Nile TAC in matters related to the execution of the project. Members of the experts group will be nominated by the countries covered by the project. Activities of the project will be directly implemented by NBI centers. Government agencies will participate in consultation meetings at country and sub-regional levels; review and clear deliverables of the project and advise NBI on issues related to the project execution. All funds for project activities executed by NBI will be disbursed directly by NBI through payments to consultants, workshops or on-site contractors for pilot demonstrations.

The NBI currently executes various programs through its three centers, the NBI Secretariat, the Eastern Nile Technical Regional Office (ENTRO) and the Nile Equatorial Lakes Subsidiary Action Program Coordination Unit (NELSAP-CU). NBI has well established its own structure that for carrying out the project activities, including the studies, consultations, and pilot interventions. Current NBI programs are funded through GIZ, the World Bank, the African Development Bank, KFW, SIDA, AFD and the European Union. A 10 M EU project has recently been approved by the European Development Fund (EDF) for NBI whose implementation is expected to start early in 2018.

NBI will enter into special arrangements with UNESCO-IHP and IAEA for execution of selected activities of the project. The precise execution arrangements will be confirmed in the PPG phase and will be dependent on the comparative advantages of NBI, UNESCO-IHP and IAEA.

1.4 Incremental cost reasoning and contributions from the baseline

Through the development of a regional assessment of groundwater resources in selected transboundary aquifers supported by this GEF project and co-financing contributions from national and international partners, the region will be strengthened through the inclusion of groundwater considerations into:

- National water and land resources planning and regulation;
- Regional and bilateral co-operation;
- Sub-basin level inclusion of groundwater considerations into the ENSAP and NELSAP.

The GEF project will support the strengthening of the capacities of selected countries and NBI to develop and implement new policies and procedures (including monitoring / modelling of aquifer and ecosystem assessments – resulting in new skills), testing of shared and common approaches to management and the piloting of novel approaches within the region to reduce pressures on the aquifer. Through the GEF resources (and expected national and partner co-financing) the countries covered by the project through the NBI will implement pilot demonstration activities that will further enhance the knowledge and capacity of all involved stakeholders to utilize selected aquifer resources for multiple purposes including protecting the water dependent ecosystems.

The national governments are committed to supporting the project through in-kind co-financing contributions to enhance the management of national aquifers and to co-operate regionally through the NBI's structure. The in-kind resources will include staff time, office accommodation and related equipment, data, etc.

The outputs and outcomes of this project will be sustained through their inclusion in national strategies to manage water resources (surface and groundwaters) in an integrated process and through the strengthening of NBI's sub-basin programs (ENSAP and NELSAP) directed at long term investments

1.5 Global environmental benefits

By strengthening the understanding and management of groundwaters in the selected sub-basins, the countries and the NBI will be better placed to utilize and protect effectively the water resources in the selected sub-basins. Groundwater is a primary source of water for the population and dependent indigenous ecosystems. Groundwater also plays an important role in providing resilience to the management of water resources systems under extreme hydrologic variability conditions. Ecosystems conditions are shaped by hydrogeological and hydro-chemical features of related aquifer systems. However, groundwater in the Nile Basin is at the risk of being over-exploited and/or contaminated due to mismanagement. Such over-exploitation could lead to quantitative and qualitative deterioration of aquifer systems. Thus, sustainable use of groundwater is one of the most important aspects in order to achieve sound water resources management in the basin and ensure sustainable livelihoods for millions of inhabitants of the selected countries. The strengthening of groundwater management and effective conjunctive use of both surface and groundwaters will help the selected countries with the provision of water for people, agriculture and economic development whilst meeting the SDGs. The interaction between groundwater and wetlands in the region, for example in the Sudd area, is important for sustainability of regional groundwater sources, ecosystems and biodiversity as is much of the river.

1.6 Innovation, sustainability and potential for scaling-up

Innovative approaches to groundwater management in the Nile River Basin have been initiated through the UNDP/IAEA/GEF project (*Mainstreaming groundwater considerations into the integrated management of the Nile River Basin*) on the use of isotopes to characterize the groundwaters and their interlinkages with surface water. It is expected that the continuing use of isotope techniques and extension to additional sites (e.g. Sudd wetlands and extending the analysis of major interactions between groundwater and the Nile River and Lake Victoria utilising isotope data building on the previous projects) and linking these results to hydrogeological models will continue to build the experience and lessons within the Nile Basin but also provide innovative examples of approaches that can be applied globally.

The selected countries and NBI have identified the significant innovation, sustainability, lessons and opportunities to include:

- Further enhancing the understanding of the availability of groundwater resources through isotope studies, mapping, models and monitoring;
- Demonstrating the benefits of ‘conjunctive use management’ of surface and groundwaters to conserve resources whilst enabling sustainable development in the region;
- Improving the understanding of linkages between aquifers, surface waters and ecosystems (rivers, wetlands, ecosystems, etc.)
- Understanding the ecosystem sustainable limits to groundwater exploitation;
- Need and benefits on regulatory approaches to managing groundwater resources (licencing abstraction, tariffs, enforcement, etc.);
- Socio-economic benefits from sustainable exploitation of groundwaters for agriculture;
- Benefits of sustainable land management to reduce over exploitation and protect aquifers from pollution;
- Use and benefits of appropriate artificial groundwater recharge;
- Importance of groundwater management to rural communities;
- Development of key messages (benefits, importance, opportunities, etc.) for government officials to promote effective management;
- Mainstreaming groundwater considerations into national management strategies;

Supplementing information available at the regional level (NBI) on water resources in the selected sub-basins and inclusion of investment strategies to protect and promote socio-economic benefits of groundwaters into ENSAP and ELSAP.

2. Stakeholders. Will project design include the participation of relevant stakeholders from civil society organizations (yes /no) and indigenous peoples (yes /no)? If yes, identify key stakeholders and briefly describe how they will be engaged in project preparation.

Stakeholder Group	Role in Project Development
National Governments Ministries, including: <ul style="list-style-type: none"> • Environment • Water • Agriculture • Health • Development • Energy • Industry • Mining 	<ul style="list-style-type: none"> • Agreeing priorities • Identifying issues • Participating in national workshops to discuss detailed component activities • Approving pilots, demos and other interventions • Confirming co-financing contributions
Local Authorities <ul style="list-style-type: none"> • Water boards • River Basin Authorities • Housing authorities • County/State authorities 	<ul style="list-style-type: none"> • Specifying local requirements /conditions for pilot demonstration activities • Assisting with future predictions on population in specific areas and local demands for water • Agreeing monitoring frameworks • Information dissemination needs
Academics <ul style="list-style-type: none"> • Universities • Research institutes 	<ul style="list-style-type: none"> • Assisting with model needs, specifications and operation • Training needs for students on groundwater/surface water issues
Privates Sector <ul style="list-style-type: none"> • Farmers and farmers’ 	<ul style="list-style-type: none"> • Ensuring close involvement of key private sector partners (farmers and other companies)

<ul style="list-style-type: none"> • association • Industry • Power companies • Drilling companies • Consulting firms 	<ul style="list-style-type: none"> • Estimating water demand in future • Requirements of industry on water quality
<p>Civil Society</p> <ul style="list-style-type: none"> • NGOs, CSO, women's associations, etc. • Village representatives 	<ul style="list-style-type: none"> • Ensuring that needs of communities are incorporated in the Project through holding locally-target meetings in the formulation of pilot demonstration activities; • Local communities (urban dwellers associations, small scale farmers that depend on groundwater and other groundwater users), CSOs, NGOs will be consulted during the preparation of the detailed project scope as relevant to their locality. This will apply especially for aquifers that are major sources of water for local communities, livestock and wildlife, such as the Blue-Nile – Gedaref.

3. *Gender Equality and Women's Empowerment.* Are issues on [gender equality](#) and women's empowerment taken into account? (yes /no). If yes, briefly describe how it will be mainstreamed into project preparation (e.g. gender analysis), taking into account the differences, needs, roles and priorities of women and men.

A gender consultant will be recruited in the PPG phase to ensure that all aspects of the project consider the needs of women and men. Specifically, with regards to the pilot demonstration activities the gender expert will work with the communities and relevant women's groups to ensure that the pilots maximize benefits of groundwater for women and ensure that the needs of women are included in discussions on surface – groundwater use and management to identify how better groundwater management could assist women in communities

4 *Risks.* Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

Risk	Rating	Mitigation measures
Failure to up-scale successful results from the project.	Low	The project is planned to be implemented through NBI's structure with NBI as main executing agency. This will help in mainstreaming project results into NBI's activities thereby enhancing the likelihood of scaling up the project results through the various NBI programs.
Failure to agree aquifer wide groundwater management approaches	Low	NBI will form working groups that will comprise experts in groundwater issues and senior officials to represent their respective countries and continuously engage in project execution.
Political instability (peace and stability)	High	As with the previous UNDP/IAEA GEF project the risks of instability in parts of the basin remain high. The project will monitor the situation and collect data/execute activities when UNDSS advise

Lack of groundwater and aquifer data	Medium	The project will work with all partners (countries, NBI, agencies, etc.) to ensure adequate data is generated and the project will highlight where additional information is needed.
Climate change and extreme conditions more significant than expected	Medium	The project will endeavour to ensure all actions undertaken or proposed are based on 'no regrets' principles.
Lack of awareness in groundwater issues and opportunities in all levels of stakeholders	Low	The project will work with all stakeholders' groups across the basin to ensure adequate information is made available on the importance of groundwater issues
Lack of policy enforcement leads to continuing decline in quality/quantity of groundwater resources.	Medium	The project will work with countries and local authorities to strengthen policies and encourage enforcement to prevent further deterioration of groundwater resources

5. *Coordination.* Outline the coordination with other relevant GEF-financed and other initiatives.

The planned project will co-ordinate with current and planned GEF and non-GEF projects in the region, including:

- [Enabling Implementation of the Regional SAP for the Rational and Equitable Management of the Nubian Sandstone Aquifer System \(NSAS\)](#). UNDP/GEF (Egypt, Sudan)
- Kenya: Interaction of the GW-SW of the Kilimanjaro aquifer; Groundwater mapping of the Northern Kenya region; National Groundwater Mapping Programme
- Lakes Edward and Albert fisheries and water resources management Project (LEAF II). AfDB/GEF (DRC, Uganda)
- Other donors including multi-lateral (e.g. EU) and bilateral (e.g. JICA, CIDA, DfID, SDC, etc.)
- Results from within the NBI and from the previous Lake Victoria and Nile GEF projects;
- Co-ordination with Nubian Aquifer Joint Authority
- Co-ordination with Regional Groundwater Initiative for IGAD region through the World Bank;
- Biodiversity conservation and sustainable management of transboundary wetlands and wetlands of transboundary significance. This project is currently being executed by the NBI with funding from the Government of Germany through GIZ. The project has components on understanding the water balance of key wetlands that will also include establishing the water balance components.

Through the NBI programmatic approach, the proposed project will be integrated into and contribute towards the development objectives of the three NBI programs. Specific examples are given below:

The Nile-Sec completed its first phase of strategic water resources analysis whereby first estimates of projected future (2050) water demand in the basin and likely water shortfall were prepared. The results showed considerable likely shortfall in water due to the planned substantial increase in irrigated agriculture. To address these likely shortfalls, a number of options were identified by the riparian states (later endorsed by Nile-COM). Nile-Sec is at the beginning of the second phase of the analysis wherein the options are going to be explored, specific measures identified, quantified and prioritized. One of the options identified is surface water – groundwater conjunctive use. In this regard, the proposed project (component 1 - *Further improving the knowledge and understanding of groundwater resources available in the Nile River Basin and its adjacent areas*) is expected to contribute towards filling the knowledge gap in groundwater availability in the Nile Basin. The project is also expected to complement the on-going activity for the development of the second State of the Nile River Basin Report (2016 – 2018). This will then lead to more informed dialogue among the riparian countries (project component 2- Development of action

plans on groundwater resources governance, management, and protection for inclusion in national and sub-basin and frameworks: – also including consideration of surface water/groundwater resources plans for conjunctive use) on the cooperative management and development of transboundary aquifers in the Nile Basin. Further, this component will contribute towards the water resources development program under the Eastern Nile and the Nile Equatorial Lakes (NEL) sub-basins.

In the Eastern Nile, ENTRO expects funding from World Bank (CIWA) for a study on Groundwater Availability and Conjunctive Use assessment. The objectives are: *to make preliminary assessment of Ground Waters resource (mapping, recharge and safe yield); to make preliminary assessment of the potential use of ground for irrigation and domestic use.* The proposed project for GEF funding will complement the study that will be undertaken by ENTRO.

Other on-going and planned projects related to and can benefit from this proposal include:

- EN Cascade Reservoir Operation (ongoing)
- Baro-Akobo-Sobat Multipurpose Integrated Development Study Project (on-going)

EN Multi-Sector Investment Opportunity Analysis (EN MSIOA)

6. *Consistency with National Priorities.* Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes /no). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

Preliminary meeting of the countries and the NBI ensure that the project objectives, outcomes and outputs are in line with national priorities. At the regional level, the project is consistent with NBI's objective (expressed by Chair of NBI in Vienna, May 2016) of including groundwater issues into their next 5-year plan to manage the waters of the Nile Basin. NBI has been involved in the preparation and the review of the project activities and will be fully engaged during execution. The project is consistent with, and will contribute to, the NBI's ENTRO and NELSAP investment programmes.

At the national level, all selected counties have actively contributed to the formulation of the outputs/outcomes and have actively contributed to the preparation of this PIF, thereby ensuring countries' needs are expressed adequately. Specific priorities identified by the countries include:

- In Ethiopia groundwater is included in the next five-year development strategic plan (GTP II) with the expansion of groundwater irrigation and the improvement (through 2.4. billion USD investments) to improve drinking water supplies largely dependent on groundwater sources.
- In Kenya, the project is supportive of the flagship Vision 2030 and the 2002 Water Act, EMCA 1999 (recently updated). The project will also support economic development through the identification and sustainable use of water resources.
- In Tanzania, the Water Resources Management Act 2009 requires the classification of water resources considering both surface and groundwater sources.
- In Sudan, the project is supportive of the Sudan Water Policy and Agriculture and Food Security Plan
- In Uganda, the Water Policy, Water Act and Water Resources Regulations have clear provisions for the management of surface and groundwaters.

7. *Knowledge Management.* Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

The project will work closely with the knowledge management structures of the NBI and LVBC to supplement current information on groundwater resources and knowledge on groundwater /surface water interactions. The project will be developing extensive information resources that will contribute to the countries and NBI/LVBC knowledge base and be available globally through the GEF IW: LEARN project.

The project will also be developing specific stakeholder group targeted information to assist with the protection and sustainable exploitation of groundwater resources that will address the needs/concerns of government officials, private sector (including farmers) and community groups

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT¹² OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the [Operational Focal Point endorsement letter](#)(s) with this template. For SGP, use this [SGP OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Ms. Antoinette Macumi	NA	MINISTRY OF WATER, ENVIRONMENT, LANDS MANAGEMENT AND URBAN PLANNING, BURUNDI	05-OCT-2017
H.E. Mr. Kare Chawicha Debessa	NA	MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE, ETHIOPIA	19-SEP-2017
Mr. Charles Talengo SUNKULI	NA	MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES, KENYA	18-SEP-2017
Eng. Coletha U. RUHAMYA	NA	RWANDA ENVIRONMENT MANAGEMENT AUTHORITY (REMA), RWANDA	31-AUG-2017
Dr. Hana HAMADALLA	NA	MINISTRY OF ENVIRONMENT NATURAL RESOURCES AND PHYSICAL DEVELOPMENT, SUDAN	29-AUG-2017
Mr. Patrick Ocailap	NA	MINISTRY OF FINANCE, PLANNING AND	15-SEP-2017

¹² For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

		ECONOMIC DEVELOPMENT, UGANDA	
Mr. Richard MUYUNGI	NA	VICE PRESIDENT'S OFFICE, TANZANIA	28-SEP-2017

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies¹³ and procedures and meets the GEF criteria for project identification and preparation under GEF-6.					
Agency Coordinator, Agency name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email
Adriana Dinu UNDP-GEF Executive Coordinator		1 September 2017	Mr. Vladimir Mamaev Regional Technical Advisor	NA	vladimir.mamaev@undp.org

Annex 1

Achievements, Conclusions and Recommendations from UNDP/IAEA GEF Project 'Mainstreaming Groundwater Considerations into the Integrated Management of the Nile River Basin'

Key Achievements

Several segments of the Nile course, along which surface water-groundwater interaction is or is not taking place, have been identified. The area of influence of the Nile on adjacent aquifers is estimated in selected segments. Amounts of Nile water flowing to adjacent aquifers have been estimated by modelling approach and this has been confirmed by isotope hydrology application.

Results of this study indicate that swamps in the Equatorial Lakes region may in fact be fed by groundwater. However, due to several challenges related to security issues, the Sudd swamps studies could not be accomplished and therefore Sudd hydrology could not be ascertained despite of the great socioeconomic, environmental and hydrological importance of the Sudd wetland.

Isotope hydrology data gathered under this project have been utilized in the modelling work to validate the model results in two sub-basins where this work was done. The model is intended to be integrated into the Nile Decision Support System hosted at the Nile Basin Initiative.

Active involvement of counterparts from all the countries in all the aspects of the project including capacity building, and involvement of the Nile Basin Initiative, have been key in ensuring a common understanding of groundwater issues and analysis among the riparian countries as well as facilitating the inclusion of groundwater considerations into integrated Nile Basin water resources planning and management activities.

¹³ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT

1. In terms of groundwater–surface water interactions, the hydraulic head of the Nile is generally lower than the regional water table in the case of the upper riparian countries, but mostly above the regional water table in the downstream countries, meaning it could change from a gaining to a losing river between its upper and lower reaches. It is therefore important to add groundwater considerations in the sustainable management of the Nile Basin water resources.
2. Groundwater–surface water interactions along the Nile Basin have been assessed and reasonably well understood in locations where collection of isotopic and chemical data was feasible (e.g. Medani, Umm Aggaga, Aswan, and White Nile). The hydro-geochemical assessment and understanding is also well constrained from piezo-metric head data. The results show that appreciable amount of river water leaks into the aquifers in these particular locations. The effect of the Nile on adjacent aquifers is detected over a distance of 5–30 km, in some cases river water seeps into narrow elongated depressions adjacent to the river course and is subsequently lost by evapotranspiration. This further indicates that groundwater and surface water management needs to be integrated for sustainable development of Nile Basin water resources.
3. Surface water isotope fingerprints are traceable along the flow from the headwaters to lower reaches with isotopic fractionation effects being well identified, analyzed and understood. Evaporation losses from lakes Tana and Victoria were computed on the basis of variations in water isotopic composition. Such computation was not possible for flowing rivers such as the Atbara, although significant isotopic enrichment was observed along the river course.
4. A reasonable isotopic database has been generated for Lakes Tana and Victoria, which enabled a preliminary modelling of water balance. There is a necessity to extend this effort to other parts of the Nile Basin to more comprehensively address the water balance. However, the currently generated isotopic data in these regions may not be adequate to successfully run the water balance models. It is therefore strongly recommended to extend data collection plans to lay the groundwork for successful modeling and integration into the Nile DSS. This will enhance groundwater/surface water resources management and integration in all the countries.
5. Wetland areas are an important component of the local/regional atmospheric water cycle. Results of this study indicate that swamps in the Nile Basin may in some cases be fed by groundwater. Thus, information about the role of groundwater, in particular its contribution to water balances in lakes, rivers, and wetlands, and general sustainable socioeconomic development is crucial for determining equitable and appropriate water allocation and water resource management strategies.

Recommendations:

Based on the major findings, and the challenges faced during the completion of this report along with consideration of proper resources management and priorities, the following are the main recommendations:

1. In areas where surface water clearly recharges groundwater, the exploitation of groundwater resources in these areas should be encouraged. This will indirectly utilize the Nile water in an efficient manner.
2. Groundwater–surface water interactions in different Nile segments have been assessed, identified and graphically represented. This will encourage conjunctive use of surface and groundwater resources in losing areas. However, in areas where base flow is taking place or seasonal fluctuations are observed, groundwater should be protected and managed to preserve the environment and resources.
3. Although evaporation losses from lakes have been estimated via isotopes, there is an urgent need to estimate these losses along flowing rivers such as Atbara. It has been observed that significant isotopic enrichment occurs along the course of the Atbara. Apart from evaporation, other sources of such enrichment remain unknown. It is recommended to investigate the sources of isotopic enrichment in such Nile tributaries in order to estimate evaporation losses and to rule out other sources.
4. The role of wetlands, especially the Sudd swamps, in the Nile water cycle is extremely important. However due to security issues, the Sudd swamps studies could not be accomplished and therefore Sudd hydrology could not be ascertained in detail despite the great socioeconomic, environmental and hydrological importance of the wetland. Lack of infrastructure (e.g. piezometers, rainfall stations, gauges) and capacity make the task more difficult. Therefore, an urgent need remains to assess the Sudd wetland and its role in the water cycle in the Nile Basin. This is only possible if adequate infrastructure and capacity building become available. The Sudd affects the Nile hydrology in terms of surface and groundwater flow as well as a source for precipitation in the surrounding areas. Likewise, the sub-basins of Bahr El-Ghazal and Sobat contribute to the wetland areas and their hydrology is also not well understood. The Sudd wetland stands out as a vital regional project to which the Nile Basin countries may contribute and benefit from.
5. The isotopic signature of the Bahr El-Ghazal sub-basin has shown an interestingly different signature when compared to the rest of the sub-basins, which demonstrates a need for isotopic measurement of the precipitation in the Jabel Marra area. This will improve our understanding to the water cycle of the Nile. Such assessment can be conducted under the umbrella of the Sudd wetland regional project.
6. In some areas, isotopic mixing of heavier and younger Nile water with lighter and older groundwater has been demonstrated. Groundwater dating however was conducted using C-14. Taking into consideration the limitations of C-14, a second method of groundwater age determination that has fewer limitations and improved precision is recommended (e.g. tritium-helium) to understand groundwater flux from the Nile at higher resolution.
7. Appropriate distribution of monitoring points (e.g. piezometers, rainfall stations, gauging stations etc.) is fundamental to obtain good and reliable data that well represent each sub-basin. The current project has revealed data gaps in some locations. It is strongly recommended that monitoring networks in the Nile Basin countries should be updated and measurements and sample collection plans continue (spatially and temporally) to update

decision makers with water resources trend/s and to send early warning messages to enable preventive measures to be implemented. There is therefore a need for construction of monitoring boreholes close to the various lakes and rivers to better assess interaction between groundwater and surface water and also wetlands, to validate the findings of this study.

8. Isotope balance modeling: The isotope modeling work undertaken under this project could be integrated into the wealth of existing hydrological modeling tools of the Nile Basin Initiative. The NBI has a framework to integrate analytical or water resources modeling systems. Regardless of the potential to integrate the isotope modeling tool in the Nile DSS, there remains a significant amount of validation work to be carried out in the areas where the isotope modeling has not yet been conducted, and on a longer time scale basis. The validation work could be conducted by institutions in the member state countries. For this the isotope sampling needs to continue using the monitoring networks put in place under the current project. Efforts and mechanisms should be in put in place to continue the collaboration among the isotope modeling and Nile DSS developers facilitated by the IAEA and NBI and capacity building/training around the isotope balance modeling tool.