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Document Sheet

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Abbreviations:

ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
CFA	Cooperative Framework Agreement
CSE	Conservation Strategy of Ethiopia
CWB	Central Water Board
DEA	Directorate of Environmental Affairs
DGHER	Directorate General for Water and Energy
DRM	Desktop Reserve Model
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
ECC	Environmental Compliance Certificate
EF	Environmental Flow
EFA	Environmental Flow Assessment
EFR	Environmental Flow Requirements
EIA	Environmental Impact Assessment
EIS	Environment Information System
EMA	Environmental Management Act
EPA	Environmental Protection Authority
ESM	Environment and Social Management
ESP	Environmental and Social Policy
FIU	Florida International University
GEEC	Group for Environmental Studies of Congo
GEF	Global Environment Fund
GLOWS	Global Water for Sustainability Program
GOSS	Government of South Sudan
HAD	High Aswan Dam
HCENR	Higher Council for Environment and Natural Resources
ICOLD	International Commission on Large Dams
IEA	Initial Environmental Impact Assessment
IGAD	Intergovernmental Authority on Development
IHA	International Hydropower Association
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
MAFS	Ministry of Agriculture and Food Security
MEF	Ministry of Environment and Forest
MENCT	Ministry of Environment, Nature Conservation and Tourism
MEPD	Ministry of Environment and Physical Development
MEWCT	Ministry of Environment, Wildlife Conservation, and Tourism
MHPPE	Ministry of Housing, Physical Planning, and Environment
MINIRENA	Ministry of Natural Resources
MIWR	Ministry of Irrigation and Water Resources
MoEF	Ministry of Environment and Forest
MoWIE	Ministry of Water, Irrigation and Energy

MTNRE	Ministry of Tourism, Natural Resources and Environment
MWE	Ministry of Water and Environment
MWEM	Ministry of Water, Energy and Mines
MWLD	Ministry of Water and Livestock Development
MWRI	Ministry of Water and Irrigation
NAWAPO	National Water Policy
NBI	Nile Basin Initiative
NBSAP	National Biodiversity Strategy Action Plan
NBSF	Nile Basin Sustainability Framework
NEA	National Environment Act
NEMA	National Environment Management Authority
NEMC	National Environmental Management Council
NEMP	National Environment Management Policy
NGO	Non-governmental organisation
NWP	National Water Policy
NWRC	National Water Research Centre
NWRM	National Policy on Water Resources Management
NWSD	National Water Sector Development Strategy
PAGIRE	Plan of Action for the Integrated Management of Water Resources of Burundi
REMA	Environment Management Authority
RNRA	Rwanda Natural Resources Authority
SADC	Southern African Development Community
SEU	Sectoral Environmental Units
SNEB	National Environmental Strategy
SSNEP	South Sudan National Environment Policy
TWB-MRB	Trans-boundary Water for Biodiversity and Human Health in the Mara Basin
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
WEAP	Water Evaluation and Planning Model
WRA	Water Resources Act
WRMA	Water Resources Management Authority
WRMD	National Policy on Water Resources Management and Development
WRUAs	Water Resources User Association
WSDP	Water Sector Development Program
WSSP	Wetland Sector Strategic Plan
WUA	Water User Association
WWF	World Wildlife Fund

1 Executive summary

The Nile stretches through different geographic and climatic zones, from 4° south to 32° north of the equator, traversing a wide array of different ecosystems (for more details on different types of ecosystems in the Nile Basin and their wellbeing, please refer to Background Document 2: *“Aquatic ecosystems of the Nile Basin, their wellbeing and response to flow alterations”*) from equatorial to deserts, up to coastal at the Mediterranean Sea. Since the beginning of the last century, large hydraulic structures have been built to control the flow of the Nile, and still others are under construction, or on the drawing board. Mega dams affect river functioning and the provision of ecosystem services. Therefore, an assessment and ultimately provision of environmental flows (EF) is essential to ensure functioning of downstream ecosystems, which also support food security and livelihood of the riparian people.

However, there is no standard EF assessment procedure in the Nile Basin yet. With this project the Nile Basin Initiative (NBI) is now building a foundation for the establishment of EF as a key element of Integrated Water Resources Management (IWRM) in the Nile Basin.

The following literature review under Section 3 provided an overview of information on the Nile hydrology and water resources, but revealed only very little literature on Environment Flow Assessments (EFA). However, relatively more studies on EFA have been carried out in the Equatorial Lakes region compared to the other three regions of the Nile, mainly because of the rich flora and fauna and the many national parks located in Kenya, Uganda, Tanzania, Rwanda and Burundi. For an assessment of international practices regarding EF, please refer to Background Document 1: *“Environmental Flow Assessment: A review of global practices and experiences”*.

The EFA in the Nile is confronted with a number of challenges, viz: EF is competing with other requirements mainly irrigation and hydropower which is clearly reflected by the development of large hydraulic structures in the basin (e.g., dams and irrigation projects). At transboundary level, there is no perspective for considering cross-border EF, because transboundary water resources management potential largely remains to be explored. A lack of consistent data on ecosystems in combination with limited understanding of the interrelations between water flow and ecosystem services remains a key challenge for the establishment of correct EF at different locations in the Nile.

Water and environment policies in all of the Nile Basin countries have been evolving over time and invariably have gone through a series of updates. In most cases also relevant institutions of water and environmental affairs have undergone far-reaching changes. While this trend shows the willingness of countries to update their respective policies in line with new developments and knowledge, frequent changes in institutional arrangements may also pose problems for the implementation of policies and strategies, due to discontinuities and loss of institutional knowledge.

As stated, a number of countries currently give low priority to the necessity of EF in most of their hydraulic infrastructure projects. Only few countries have explicitly articulated the issue of EF and included it in their policies. Among the Nile Basin countries, Tanzania, Kenya seem to be the only countries that have policies and strategies for EF established. Rwanda and Ethiopia have general statements and provisions in their respective water policy documents.

The country level policy and institutional assessment has shown that in most of the Nile Basin countries explicit and well-articulated policy provisions for EF do not exist. This situation calls for considering amendments to existing policy frameworks. The amendment of national policies and legislation however is not a straight forward processes and procedures differ from country to country. Generally the process would need to start with a needs assessment exercise followed by a research based proposal for policy modification, which may be preceded by an encompassing awareness raising campaign. Knowledge and experience exchange with countries that have instituted EF is good starting point for the process of establishing EF in the Nile Basin.

Whilst policies need to be based on a detailed situation and needs assessment as well as scientific studies and justifications, their introduction also needs to be followed by effective implementation mechanisms and compliance monitoring. Clear policy objectives and policy statements, which outline the intentions of countries in establishing EF need to be articulated followed by associated responsibilities of governments, civil society and the public at large to implement the policy. Countries that have established policies for EF should evaluate the effectiveness of these policy provisions for the management and implementation of EF.

National level policies are necessary instruments but not sufficient to establish and implement EF in a shared river basin. EF in the context of transboundary river basins pose complex challenges. The Nile Cooperative Framework Agreement (CFA) can serve as a basic regional policy framework for establishing EF in the basin. The CFA as a common regional policy framework with relevant provisions to support the establishment of EF in the basin may be taken as a starting point to prepare a basin wide EF guideline.

Specific guidelines would need to outline ways in which NBI countries may use the provisions of the CFA and the planned EF guidelines to construct their respective national policies and implementation mechanisms. This will offer opportunities to streamline national policies and help to address the transboundary challenges.

EF can be established when there are strong institutions with the required human resources and budget. Institutions must have clear and unambiguous mandates which are not overlapping with other similar institutions. Institutional capacity in scientific knowledge and legal aspects of EF, including capacities in creating and sustaining public awareness in issues of EF is at the heart of a successful institutional mechanism to establish EF in the context of the Nile Basin.

Laws are necessary to implement policies. Constitutions of countries have general and overarching provisions for water and environment management on the basis of which policies and laws are formulated. Effective laws are laws that have both incentive and punitive measures to ensure the implementation of underlying guidelines and that public offices as well as individuals do comply. Lessons from countries such as Australia, South Africa and Mexico may be relevant to NBI countries to draw conclusions on effective policy implementation, legislation and standardization.

2 Study overview

This Background Document should be considered in context of:

- Background Document 1 titled: “Environmental Flow Assessment: A review of global practices and experiences”, and
- Background Document 2 titled: “Aquatic ecosystems of the Nile Basin, their wellbeing and response to flow alterations”,

which are the first two of three Background Documents for the transboundary guidance assessment on Environmental Flows (EF) for the Nile Basin.

The Nile Basin Initiative (NBI) recognizes that the sustainable management of the shared Nile Basin water resources requires the establishment of relevant transboundary policy instruments (within the Nile Basin Sustainability Framework (NBSF)). The sustainable use of the socio-ecologically important water resources of the Nile Basin requires the coordinated management of the EFs on meaningful spatial scales. EFs describe the quantity, quality and timing of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems (Brisbane Declaration, 2007). The NBI does not currently have any general standards and norms for establishment of environmental flows in the basin.

In an effort to establish general standards and norms for establishment of EF in the Nile Basin, NBI has initiated a process to develop a transboundary level guidance document on EF. The objective of the guidance document on EF is to develop a structured and scientifically based NBI procedure for establishing EF requirements for the transboundary water resources planning purposes in the Nile Basin. This is achieved through the implementation of a phased process during this project, namely; stocktaking and development of an appropriate Environmental Flow Assessment (EFA) procedure/s, piloting of the procedure and synthesis of the outcomes. The scope of work includes the following:

1. Stocktaking and procedure development
 - a) Review and synthesize global practices/experiences in establishing EFs.
 - b) Identify aquatic ecosystem types and the degradation threats to these ecosystems in the Nile Basin.
 - c) Review Nile Basin practices/experiences on Environmental flows and assess relevant policies, conventions and guidelines.
 - d) Present/discuss these findings with stakeholders in a regional review/validation workshop.
 - e) Review recommended procedures for establishing environmental flow requirements (EFR) for Nile Basin aquatic ecosystems.

2. Development of EFA procedures for the Nile Basin and presentation of developed methodology in workshop.
3. Pilot EFA procedures at different spatial scales at selected locations in the Nile Basin and reviewing pilot application of developed methodology in workshop.
4. Synthesize the outcomes of the assessment and provide recommendations for future management in the form of a guidance document on EFA in the context of the Nile Basin.

This report describes the approach adopted and the findings of the task 1c, a revision of the practices and experiences, policies, conventions and guidelines towards the management of EF in the Nile River Basin as a part of the stocktaking and procedure development phase of the study.

3 Environmental flow management case studies in the Nile Basin

3.1 Introduction

The Nile, being the longest river of the world (> 6,000 km) traverses through different ecological zones, and provides rich and diversified ecosystem services. The equatorial ecology in the upper catchments is characterized by wet climate (biannual rainy season), with equatorial forests and abundant wetlands especially around Lake Victoria, Kayoga, and the Sudd. The Ethiopian Plateau - receiving high rainfall in one rainy season, is characterized by mountainous ecosystems. The Nile then travels across the Savannah plains of Sudan before it crosses the Sahara desert in the north of Sudan and into Egypt. In this region, the Nile is almost the only source of water throughout the year. The Nile outlet at the Mediterranean Sea is in a completely different climate zone, and is characterized by estuarine ecological systems. For more details on the different types of ecosystems in the Nile Basin, please refer to Background Document 2: *“Aquatic ecosystems of the Nile Basin, their wellbeing and response to flow alterations”*.

Development of the Nile is considerable with intensive development in the downstream part, with new dams emerging in the upstream catchment, e.g., the Grand Ethiopian Renaissance Dam in Ethiopia, Bogagali Dam in Uganda, and Rusomo falls in Rwanda, among many others. The developments in the downstream countries of Sudan and Egypt are largely irrigation based, while large rainfed agricultural developments exist in the upper catchment. Fisheries are considered as an important source of proteins for many people in the Nile, in particular in the Equatorial regions, Sudd, and in the Baro-Akobo-Sobat sub-basin.

The Nile region is considered amongst the poorest regions of the world, despite the wealth of natural resources in the basin. Political instability, high population growth, and extreme climate shocks are constraints to socio-economic development in the Nile region. Therefore the ongoing provision of natural ecosystem services which provides not only for food security but also developments needs is of paramount importance to ensure better livelihood for the Nile people. However, the interaction of the Nile ecosystem and the development needs is complex, and often interlinked. e.g., the conservation of biodiversity supports the ecosystem services (grazing land, fish, wild food, flood agriculture, etc.), which directly or indirectly supports the livelihoods of the people. Putting pressure on this is that the Nile is experiencing new development of land and water resources projects (e.g., large dams for irrigation and hydropower, new industry, etc.), which will change these linkages and will incur costs as well as benefits, often unintended. For example, the large dams are essential for hydropower generation, but they will reduce the flood peaks during the wet season and increase the rate of recession during the dry season, which will significantly change the functioning of downstream ecosystems. It is for this reason that a good understanding of the Environmental Flow Requirements (EFR) is essential to ensure continued functioning of downstream ecosystems.

The complete ecosystem of the Nile needs to be considered before large development changes are introduced. i.e., it is important to know the impact of development projects on the water

flow regime, and the implications for floodplains, wetlands, biodiversity, etc., and the ongoing provision of ecosystem services. However, there is as yet no standard Environmental Flow Assessment (EFA) procedure for the Nile, and due to the absence of more detailed ecological data our understanding of how flow changes interact with the ecosystem is still incomplete, thus making formulation of the EFRs along the Nile challenging.

3.2 The Hydrology and water resources of the of the Nile

The Nile Basin with a catchment area of over 3.3 million km², is the longest river in the world of about 6,700 km. Although it ranks number six in terms of catchment size, it comes at the bottom of the list among the large rivers of the world in terms of annual discharge. The Nile is a closed river basin, i.e., almost all its blue water is diverted before the outlet. The Nile River extends from 4°S to 32°N, stretching over different geographical, climatological and topographical regions. Besides the two plateaus in Ethiopia and around the Equatorial Lakes (Victoria, Albert, Kayoga, Edward), the Nile Basin can be considered as a large flat plain, in particular the White Nile sub-basin.

The Nile starts from Lake Victoria (in fact from the Akagera River), Figure 1a, and travels north, receiving water from numerous streams and lakes on both sides, Figure 2. The river spills over at the Sudd in South Sudan creating huge wetlands (38,000 km²). The White Nile travels with a very mild slope (1.9 cm/km) and large river width (4 km), before it joins the Blue Nile at Khartoum. The Sobat tributary originating from the Ethiopian Plateau joins the White Nile at Malakal in South Sudan. The Blue Nile originates from Lake Tana on the Ethiopian Plateau at 1800 m above mean sea level, Figure 1b. The only main tributary of the Nile before it ends up at the Mediterranean Sea is the Atbara River, also originating from the Ethiopian Plateau.



(a) White Nile at Source (Akagera River)



(b) Blue Nile at Source (Gilgile Abbay)

Figure 1: the source of the Blue Nile near Lake Tana, Ethiopia, and Akagera River in Rwanda

The vegetation cover in the Nile Basin closely correlates with the spatial distribution of rainfall. The annual rainfall decreases from above 2,000 mm/year in the Equatorial Mountains and tropical rainforests, to virtually zero in the Saharan Desert, Figure 2. A single season of intense precipitation occurs over the Ethiopian Plateau between June to September, responsible for the

strongly seasonal pattern of the Blue Nile discharge, while there are two rainy seasons over the Equatorial Lakes, with peaks around April and October. The spatio-temporal pattern of rainfall defines the Nile water flows, and directly impacting ecosystem services. The evapotranspiration increases sharply from south to North, see monthly rainfall and evapotranspiration pattern along the Nile in Figure 2. The daily evapotranspiration rate is almost double in northern Sudan and Egypt compared to the Upper Nile.

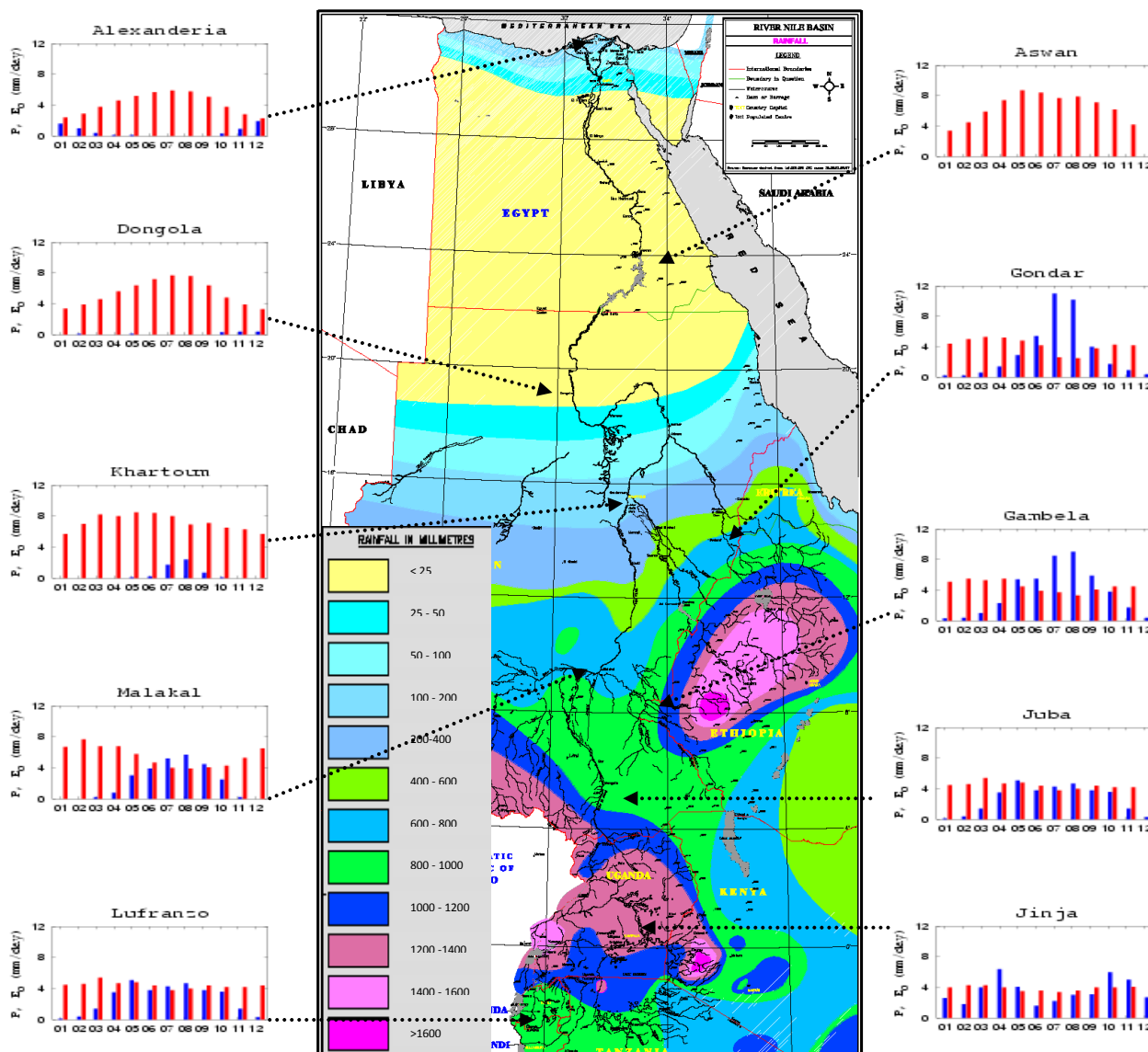


Figure 2. Mean annual rainfall in mm/yr (Source: Nile Basin Atlas, TECCONILE). Mean monthly precipitation P (— Blue colour), and potential evaporation E_0 (— Red colour) in mm/day at key stations (source: Smith, 1993), Source (Mohamed et al., 2005)

The main land use land cover types of the Nile are shown in Figure 3. Intense rainfed systems of forestry, wetlands, and rainfed agriculture exist in the upper parts of the Nile, while large irrigation developments exist in the lower parts (Nile Delta, Gezira). Livestock grazing is featured by a dynamic north-south movement and is widely practiced in the Savannah region of Sudan.

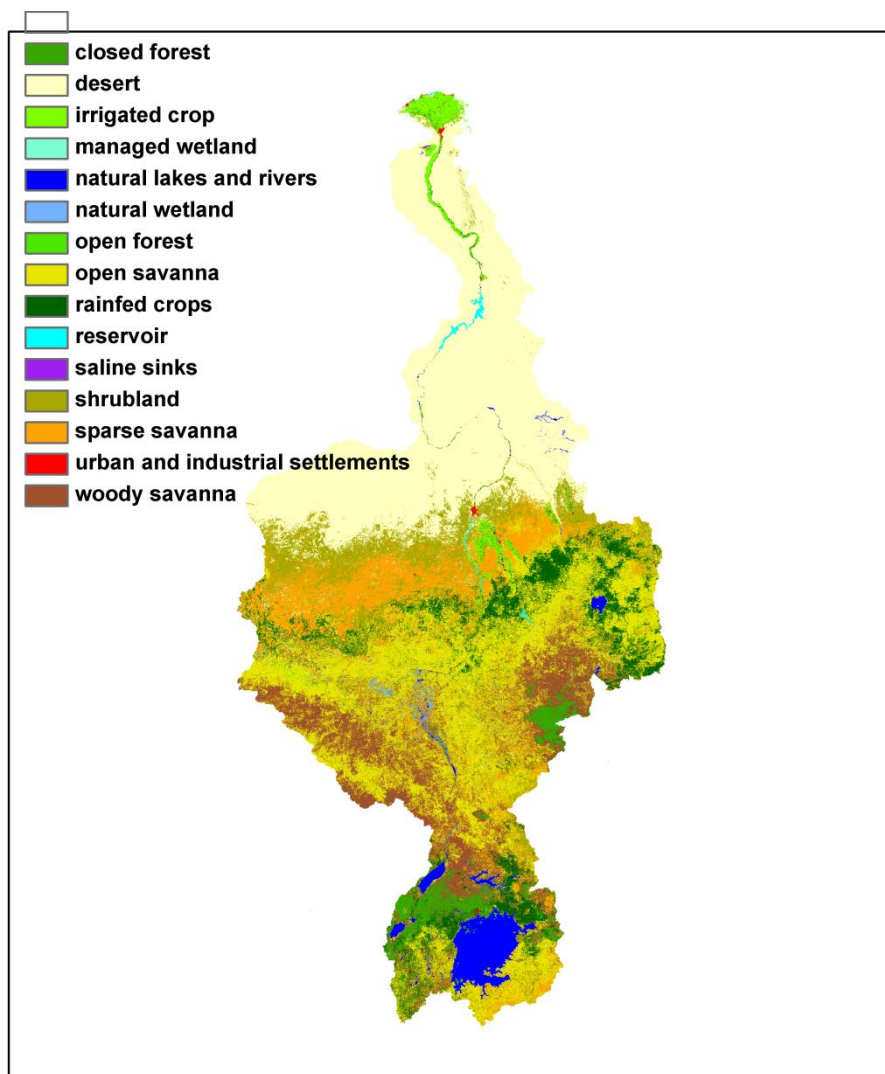


Figure 3: the Land use land cover map of the Nile (Source: Nile CPWF, 2009)

The Nile long term mean annual flow is about $84 \times 10^9 \text{ m}^3/\text{year}$, although this exhibits wide variability, from a minimum of 50 to a maximum of $120 \times 10^9 \text{ m}^3/\text{year}$. The magnitude of the waters of the main Nile originates $4/7^{\text{th}}$ from the Blue Nile, $2/7^{\text{th}}$ from the White Nile, and $1/7^{\text{th}}$ from the Atbara River. The White Nile at the outlet of Lake Victoria is $2/7^{\text{th}}$, but 50% evaporates when the river traverses through the extensive wetlands of the Sudd, resulting in $1/7^{\text{th}}$ immediately downstream of the Sudd wetlands (Mohamed et al., 2005). This flow is supplemented again at Malakal where $1/7^{\text{th}}$ of the flow is brought in by the Baro-Akoba-Sobat originating from Ethiopia and South Sudan. Thus a $2/7^{\text{th}}$ flow originates from the White Nile. About $6/7^{\text{th}}$ of the Nile flow is generated from the Ethiopian Plateau. Whereas the White Nile is a perennial river with a quasi-constant flow regime, the Sobat, Blue Nile and Atbara River have a strong seasonal behaviour, Figure 4. Downstream of the High Aswan Dam, all flows are regulated, and a constant supply is given to the water users in Egypt. Because of large irrigation abstractions and coastal wetlands, not much Nile water reaches the Mediterranean Sea (Droogers and Immerzeel, 2009; Molden, 1997).

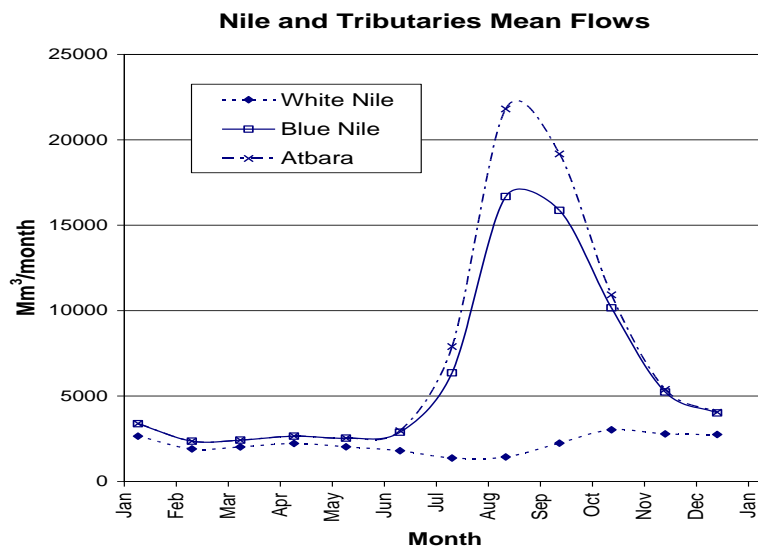


Figure 4: Mean monthly flow of the Nile tributaries.

Except for the High Aswan Dam (capacity $167 \cdot 10^9 \text{ m}^3$), the storage capacity in all other riparian countries is very small, and among the lowest in the world (ICOLD, 2003; Waterbury 2002). Other dams in the Nile are: in Sudan (Sennar $0.9 \cdot 10^9 \text{ m}^3$, Khashm el Girba $1.1 \cdot 10^9 \text{ m}^3$, Roseires $3 \cdot 10^9 \text{ m}^3$, Jebel Aulia dam $3.3 \cdot 10^9 \text{ m}^3$, Merowe $12 \cdot 10^9 \text{ m}^3$), Ethiopia (the new Tekeze dam $9 \cdot 10^9 \text{ m}^3$, Chara Chara weir, Tana-Belese diversion), in Uganda the Owen dam at the exit of Lake Victoria. The last four dams are mainly for hydropower generation. However, there are several new large dams under construction, or on the drawing table, including: Grand Ethiopian Renaissance Dam (GERD), Mendaya, Karadobi, Beko Abo, in Ethiopia, Bogagali in Uganda, Upper Atbara in Sudan, plus others

3.3 History of Environmental Flow Assessments (EFA) in the Nile

As described in Background Document 1: “*Environmental Flow Assessment: A review of global practices and experiences*”, the methods for assessing environmental flow requirements range from the simple use of hydrological records to establish minimum environmental flows, to sophisticated modelling approaches connecting changes in river flow with geomorphological and ecological response (Arthington and Zalucki 1998 and Section 3.1 in Background Document 1). The historical review of environmental flow methodologies by Tharme (1996) showed that the United States of America was the pioneer of EFA with the first *ad hoc* methods appearing in the 1940s, with more formally documented methods emerging in the 1970s. In many other parts of the world, the need for EFAs were recognized far later. Clear approaches to estimate environmental water allocations appeared in the literature in the 1980s (Arthington et al. 2004).

For the Nile Basin however there is no set of EFA methods or frameworks which are acceptable to all water users or are suitable for all circumstances. EFA assessments in the Nile generally rely on rapid approaches implemented by expert panels and are suited only for specific situations.

Although many dams have been built across the Nile, e.g., Aswan dam in Egypt (1902), Sennar dam in Sudan (1925), Jebal Awliya dam in Sudan (1937), Owen Dam in Uganda (1954), environmental flow requirements - though not recognized, were considered implicitly as part of the downstream requirements. The key point of historical arrangements of Nile water allocation was to satisfy the downstream irrigation requirements of Egypt. e.g., the 1929 agreement between Sudan and Egypt conditioned uninterrupted water flow during the recession period from January to July every year. Furthermore, ensuring a natural rating curve at Jinja station was the primary condition to operate the Owen dam. In a sense these arrangements always ensured river flow for Egypt which then had positive implications for downstream ecosystems. The High Aswan Dam (HAD) has completely changed the flow pattern of the Nile since the early 1970's. The distinct seasonal pattern of the Nile, in which 80% of the flow occurred during four months (July to October), has been completely smoothed to ensure an almost steady flow downstream of HAD. This has had significant impacts on ecosystem services downstream of the dam, e.g., especially those related to flood-plain agriculture, and on the Nile Delta at the Mediterranean Sea.

Environmental flow requirements were also not considered for other dams, e.g., Khashm al Girba dam (1964) and Roseires dam (1966) in Sudan. Despite their small size compared to river flow, these dams have significantly affected the downstream ecosystems. The recession flow along the Atbara River has been seriously reduced after construction of the Khashm el Girba Dam, affecting the downstream users of the Butana nomads who depend on the pools of water in the river bed for their livestock. However, the technical reports of the most recent dams, e.g., Merowe (2009) and Tekeze-5 (2010), showed rough estimates of minimum downstream flows, without a professional assessment of environmental flow requirements. In DRC, the EFA is not yet implemented, though plans are underway to be implemented by the Basin Management Department of Water Resources Directorate of Environmental Ministry¹.

With this project the Nile Basin Initiative (NBI) is now building a foundation for the establishment of Environmental Flows (EF) as a key element of Integrated Water Resources Management (IWRM) in the Nile Basin. This recognizes that functioning ecosystems are necessary for rural communities who depend on natural resources as well as for biodiversity conservation. But, yet there is no standard procedure or guidelines for EFA in the Nile. Section 3.4 gives a review of EFA cases in the Nile, mostly during the last one or two decades.

3.4 Literature review of Environmental Flow Assessments (EFA) within the Nile

The natural flow variability of the Nile is continuously being modified by mega dams and diversions in order to meet the increasing water and energy demands. In the past, water resources in the Nile have been managed primarily to meet irrigation demands further downstream in Sudan and Egypt, which may reach more than 90% of the Nile water volume.

¹ According to the received questionnaire as filled by Democratic Republic of Congo.

Fortunately, meeting these demands ensures sufficient water flow downstream, which is in favour of the environmental flow requirements.

However, despite the large benefits from dams, changing the natural flow pattern of the river has direct impact on the ecology, ranging from habitat destruction to reduction of biodiversity. This affects the ecosystem services provided for the downstream communities and the environmental system in general.

Although there is abundant literature on the Nile hydrology and water resources, the literature on environmental flow assessment is very limited and scattered. This section gives a detailed review of EFA case studies in four main regions of the Nile:

- Nile Equatorial Lakes,
- Ethiopian Plateau of the Nile,
- Sudan plains,
- The Egyptian Nile.

3.4.1 Equatorial lakes region of the Nile

Relatively more studies on EFA have been carried out in the Equatorial Lakes region compared to the other three regions of the Nile. This is mainly because of rich flora and fauna systems and many national parks located in Kenya, Uganda, Tanzania, Rwanda and Burundi. Furthermore, a number of research centres and universities were already active in EFA research, including University of Kinshasa, University of Dar es Salaam, Sokoine University, Tanzania Fisheries Research Institute and Tanzania Forests Research Institute, University of Burundi, Burundian Office for Environment Protection, Egerton University, Moi University, Kenyatta University and University of Nairobi².

The report entitled "Critical analysis of environmental flow assessments of selected rivers in Tanzania and Kenya" by Dickens (2011) includes critical analysis of EFA for four river basins in Tanzania and Kenya (Pangani, Wami, Great Ruaha and the Mara). The report referred to EFA done in Pangani using the DRIFT model (Brown et al 2005). Several methodologies for EFA were used in the Wami River basin, including the BBM, the DRIFT, the Ecological Limits of Hydrologic Alteration (ELOHA) and the Savannah Method (King et al. 2003; Richter et al. 2006). In the Great Ruha river basin, there has been considerable work done on the relationship between the river flow and the flooding of the wetland, but only limited work on the ecological processes of the wetland has been completed. On the other hand in the Mara River basin, the BBM method has been used to determine the environmental flows for three sites on the Mara River. These findings were published in two separate reports; the Environmental Flow Assessment (EFA), Mara River Basin: Proceedings of the Final EFA Workshop, (WWF - EARPO, 2007) and Assessing Reserve Flows for the Mara River (LVBC, 2010).

² According to the received questionnaire as filled by Burundi, Democratic Republic of Congo, Kenya and Tanzania.

As general review finding of Dickens (2011) for various methods that have been applied in Tanzania i.e. DRIFT, BBM, Desktop Model and Savannah Method is that each of these approaches is significantly different from the other with clear advantages and disadvantages. Methods such as DRIFT are relatively complex, while others e.g. the Desktop Model are probably poor for the task. The BBM method has been criticized as it does not integrate easily with possible scenarios for water flow that may be used by water resource planners, something which was introduced by the DRIFT model. On the other hand, the report noted that the BBM is easily understandable by scientists and managers as well, and if accepted into a framework for planning may become the more appropriate system for Tanzania.

Kashaigili et al. (2007) showed that the Great Ruaha River flowing through the Ruaha National Park in Tanzania suffers from drought with extended periods of zero flow during the dry season. These dry flows have resulted in social conflicts between upstream and downstream users and disturbed the natural life of the wild animals in the park. They used the desktop reserve model (DRM) to determine high and low maintenance flows in the Ruaha National Park. Further they have showed that a flow of 635.3 million m³/year is required to maintain basic ecological functioning of the river, for both high and minimum flow regimes.

Global Water for Sustainability Program (GLOWS) (2007) assessed the impact of water quality in the Mara River of Kenya and Tanzania on the environmental flow. The report pointed out that population growth, agricultural expansion, deforestation, water abstractions, and untreated wastewater releases have threatened the supply of sufficient and clean water in the basin. Increasing water demands in the upper catchment in combination with contamination sources are seriously threatening the environmental flows required to sustain wildlife in Masai-Mara National Reserve, Serengeti National Park, and Mara Wetlands. The GLOWS (2012) report presented the EFA for the Mara River. It is one of a growing number of EFA studies in East Africa, and one of the first examples of a trans-boundary EFA. This has been led by the Florida International University (FIU) through the "*Trans-boundary Water for Biodiversity and Human Health in the Mara Basin (TWB-MRB) project*" under the GLOWS Program. The Mara EFA spanned nearly the entire TWB-MRB project (2005-2012) and included a series of capacity building actions, scientific studies, workshops, and information dissemination forums. It also involved many different stakeholders, experts and scientists from different countries. The study adopted a holistic approach for EFA, drawing upon existing methodologies such as the Building Block Method, developed in South Africa. Details on the EFA and all scientific studies are published in several reports (e.g., Mara River Research Database at www.globalwaters.net). For more information on the applied methodologies, please refer to Section 4 of Background Document 1. The same study has been reported in the Questionnaire of Tanzania.

Recently, McClain et al. (2014) investigated the flow regime, channel hydraulics, and biological communities to understand flow–ecology relationships in the Mara River of Kenya and Tanzania. The results identified ecologically relevant components of the Mara River flow regime and translated flow levels into dynamic aquatic habitat characteristics (velocity, depth, wetted

perimeter) along selected channel cross-sections, and document aquatic and riparian species living among these habitats. The results of the biological sampling indicate that some species are considered to be sensitive to the flow regime of the Mara River. This project is intended to produce a detailed EF for the Mara River.

3.4.2 Ethiopian Plateau region of the Nile

Few studies have been conducted on EFA for the Nile in Ethiopia (McCartney et al. 2009; Abreha 2010; Alemayehu et al. 2010). Major water resource developments in Ethiopia that may have significant environmental impacts are obliged to carry out an environmental impact assessment by proclamation. However, there is no specific requirement for environmental flows to be maintained (McCartney et al. 2009). The concept of environmental flow is at an early stage and limited studies have been conducted so far.

McCartney (2007) used a decision support system for large dam planning and operation for simulating water allocation, considering hydrological, environmental and socioeconomic factors. He reported that most of the dams were developed to maximize economic returns, with little or no intention for downstream environmental flow requirement. The report also discussed early approaches to EFA through defining minimum or average flows to support fish species or maintain in-stream habitat.

Over the last decade, flow in the Abay/Blue Nile River has been modified by the operation of the Chara Chara weir for hydropower generation which significantly reduces the flow of the Tissi Sat falls. McCartney et al. (2009) presented the findings of a hydrological study to estimate environmental flow requirements downstream of Chara Chara weir. They used the DRM) DRM to determine high and low flow requirements. The results indicated a requirement of 862 Million m^3 /year to maintain the basic ecological functioning in the given reach. The minimum allocation, even in dry years, should not be less than $3.7 m^3/s$. The study demonstrated that, in the absence of ecological information, hydrological indicators can be used to provide a preliminary estimate of environmental flow requirements. However, to ensure proper management, much greater understanding of the relationships between flow and the ecological condition of the river ecosystem is needed (McCartney et al. 2009).

Abreha (2010) studied environmental flow requirement on the Tekeze River (Ethiopia), downstream of the Tekeze dam. He used the South African DRM. The study aims at assessing the trade-off between requirements for the Humera irrigation project (proposed), hydropower generation, and Environmental Flow Requirements (EFR). The result showed that the flow requirements are: $693 \times 10^6 m^3$ for low season and $366 \times 10^6 m^3$ for the high season respectively. The study revealed that the (DRM) method can provide an initial EFR in an ecological data scarce river basin such as the Tekeze-Atbara River.

Alemayehu et al. (2010) used the Water Evaluation and Planning (WEAP) model to investigate scenarios of future water resource development in the Lake Tana catchment. The model

simulated water demand in three sectors: irrigation, hydropower and the downstream environmental flow. The results indicated that the mean annual water level of the lake will be lowered by 0.44 meters, adversely impacting the ecosystem, shipping and the livelihoods of local communities.

Reitberger and McCartney (2011) discussed the concepts of EFA and related challenges in the Blue Nile Basin, in Ethiopia. The findings of the first attempt to rigorously quantify environmental flows in the Blue Nile have been presented. Three desktop hydrological methods were used, including: the Global Environmental Flow Calculator, the Desktop Reserve Model, and the Tennant Method. With reasonable consistency they indicate that 21–28% of the mean annual flow may be sufficient to sustain basic ecological functioning in the river.

3.4.3 The Sudan plains

Teodoru et al. (2006) carried out an independent review of the environmental impact assessment of the Merowe Dam Project across the Nile in Sudan. The study concluded that the effects on aquatic biodiversity and impacts on downstream ecology have not been adequately addressed. The available list of species in the environmental impact assessment report is inadequate and incomplete.

Hassaballah et al. (2011) conducted a research for optimization of downstream impact during the filling of the proposed Mandaya reservoir in Ethiopia. The objective of the research was to set a filling rule for Mandaya with minimum impact on downstream hydropower, irrigation demand and environmental flow requirement. In the absence of specific ecological data, the in-stream minimum environmental flow was simply set to be 10% of the annual average flow during the dry season and should be increased during the wet season following the pattern of the flow hydrograph at Mandaya site.

The strategic options assessment of the Blue Nile multipurpose projects development study carried out by NBI-ENTRO reported that only little information exists on fish species and fish population along the Blue Nile (NBI-ENTRO 2012). A detailed study covering the Blue Nile and the Main Nile is required to understand the impact of the cascade of dams along the Nile on the ecological system.

The environmental release modelling section of the draft final report of the Roseires Dam Heightening Project (SMEC 2012) assumed that the environmental requirements downstream of Roseires Dam will be met by providing the minimum discharge at Khartoum. The same has been confirmed by the Lahmeyer (2013) report for minimum release downstream Sennar dam. For these purposes, the flow passing downstream of Sennar Dam during the irrigation season should normally be not less than 10 million m³ per day. It is clear that the downstream minimum flow requirements focus mainly on meeting the irrigation and hydropower demands. No detailed information regarding the downstream environmental impacts resulting from Roseires dam Heightening were provided.

Mohamed (2005) studied the impact of the Sudd wetlands on the Nile hydro-climatology. He pointed out the importance of the swamps and floodplains of the Sudd for supporting the biota, including over four hundred bird and one hundred mammal species. The birds make use of the extensive floodplains, while the mammals follow the changing water level and vegetation. The proposed Jongalei canal is planned to drain part of the Sudd swamps to transfer White Nile water directly downstream. The canal may dry up to 30% of the Sudd swamps, which requires more investigations to assess impacts on provided ecosystem services.

3.4.4 The Nile region in Egypt

In Egypt, it is clear that the construction of the High Aswan Dam has changed the hydraulic regime of the river downstream. In effect, The Nile has become a fully regulated river in Egypt, since its flows are completely controlled by a series of dams and barrages. A major environmental concern resulting from flow alteration is the potential drop in the river-bed level downstream of the dam as a result of serious erosion. Further downstream, the HAD has caused significant environmental impacts to the Egyptian delta, increasing saltwater intrusion, coastal degradation and channel scouring, as well as initially reducing the important sardine catch along the coast, all directly or indirectly caused by reduced silt load (Nicol 2003).

Table 1 below presents a summary of the EFA case studies, giving advantages and key challenges faced.

Table 1: Summary of the EFA methods applied in the Nile region

No.	Case study	Method	Merits	Remarks/challenges
1	Great Ruaha River, Tanzania	The desktop reserve model (DRM)	<ul style="list-style-type: none"> - initial estimate of EFR prepared - model results are relatively low-confidence - site specific 	<ul style="list-style-type: none"> - Required long time series hydrological data - ecological data have proven to be time consuming to collect - Better understanding of the relationships between river flow and ecosystem is still needed.
2	Chara Chara Weir, Ethiopia	The desktop reserve model (DRM)	<ul style="list-style-type: none"> - initial estimate of EFR prepared - model results are relatively low-confidence - site specific 	<ul style="list-style-type: none"> - Required long time series hydrological data - ecological data have proven to be time consuming to collect - Better understanding of the relationships between river flow and ecosystem is still needed.
3	Tekeze Dam, Ethiopia	The desktop reserve model (DRM)	<ul style="list-style-type: none"> - initial estimate of EFR prepared 	<ul style="list-style-type: none"> - Required long time series hydrological data

			-model results are relatively low-confidence -site specific	- ecological data have proven to be time consuming to collect- Better understanding of the relationships between river flow and ecosystem is still needed.
4	Mandaya Proposed site Ethiopia	Hydrological – based /look up table	- simple and easy based on fixed percentage of the natural flow - Cheap - rapid to use	- Not site-specific -hydrological indices not valid ecologically
5	Mara River ,Kenya and Tanzania	Habitat Simulation Methods	-Relatively rapid -inexpensive, - basin-wide reconnaissance method	-inadequate for comprehensive EFAs -Expensive to collect hydraulic data - Time and resource requirement is very high
6	Mara River, Kenya and Tanzania	Building Block Method	-The recommended flow is highly reliable and defensible.	- time consuming, - resource intensive - required high level of expertise - participation of stakeholders was a merit - capacity building programs were complementary

The "Key Strategic Direction 2" of the Nile Basin sustainability framework (NBI 2011) for water resources planning and management has pointed out that water resources development that is not founded on adequate and reliable water resources data cannot lead to optimal use of scarce water resources. The main focus of the proposed policy interventions under this strategy is the promotion of good practices in trans-boundary water resources management, and the development of a knowledge-based IWRM function within the NBI.

3.4.5 Main challenges for EFA in the Nile

The main challenges for EFA in the Nile can be summarized as:

- Environmental flow is not yet sufficiently reflected in development priorities.
- Larger-scale development in the Nile Basin, such as infrastructure development (hydropower, irrigation) competes with environmental flow requirements. The latter is not carefully considered.
- There is a clear lack of trans-boundary perspective in the management of environmental flow.
- No detailed data and information is available to assess the environmental flows and their ecological and social importance. There is uncertainty in river hydrology and long-term

changes in river morphology. There is also a lack of consistent information on water use and the state of aquatic ecosystems in the basin.

- There is limited understanding of the relationship between flow modification and impacts on ecosystems and ecosystem services due to lack of data and understanding.
- Rules and models are needed to determine the environmental flows requirements, which in their turn are coordinated with other types of basin-wide water and land use management practices.
- The high load of sediment concentrations in the Blue Nile during flood season, hydropower and irrigation demands are very much controlling the operations of the dams along the Nile River, with little inclusion of environmental flow considerations.
- Each dam has particular characteristics and accordingly the scale and nature of environmental flow alterations are very much site-specific and often very difficult to predict accurately (McCartney et al. 2000).
- Implementing the environmental flows concept requires dialogue amongst scientists, policy-makers, water managers and users, and local communities, about sustainable water usage that balances priorities amongst competing demands (Pahl-Wostl et al. 2013). The participation is related to the need for decentralisation of water management to the lowest appropriate level (Jaspers 2003).

3.5 Conclusions

The flow of the Nile has high seasonal and inter-annual variability. Storage reservoirs have been very important to secure water supplies for irrigated agriculture and generation of hydropower. However, those reservoirs significantly change the natural flow pattern of the Nile, and may seriously affect ecological functioning of the river, unless adequate environmental flow is allocated both in quantity and in time. Reservoirs eliminate floods during the wet season and increase low flow in the dry season. However, environmental flows generally have the opposite requirements, low flow in the dry season and high flow in wet season (i.e. a more natural flow regime). The alteration of the natural flow regime tends to replace the natural river species with some general species that cope with the new conditions and may create serious environmental and social consequences.

To determine the required environmental flows, it is important to consider the whole river basin from the headwaters to the outlet including wetlands, floodplains and associated groundwater systems. It is important to consider the environmental, socio-economic and cultural values in relation to the entire system.

However, there is limited knowledge of EFA in the Nile. Present experience in most of feasibility studies of dams do not sufficiently cover the EFA at the needed details. According to feedback received from representatives in Burundi, D.R. Congo, Kenya, Uganda, Rwanda and Tanzania no documentation on Environmental Flow reengineering for dams is available. The review given above shows some of the methods used at specific sites, e.g., Mara River, Ruaha River, Blue Nile,

amongst others. There is a growing awareness of the importance of environmental flow requirements in the Nile.

establishment of environmental flows in the Nile Basin are discussed below. For an assessment of environmental flow policies, conventions and declarations on a global scale, please refer to Section 3.2 in Background Document 1: *“Environmental Flow Assessment: A review of global practices and experiences”*.

4.2 Why policies matter

Except for Tanzania and Kenya, explicit policies on environmental flows do not exist in the Nile Basin countries. With some notable exceptions, environmental flows are only considered in an ad-hoc manner on a project by project basis. Preliminary consultations with the Ministry of Water, Irrigation and Energy of Ethiopia have confirmed this situation. The absence of policy and guidelines for environmental flows has led to the situation where in most of the Nile Basin countries it is consultants that study and design hydraulic infrastructure and propose environmental flows for specific projects. However, as noted in the preceding section of this report, there are encouraging efforts and studies related to environmental flow assessments have been done which may serve as a building block to initiate the establishment of environment flow in the Nile Basin.

Environmental flow policies and guidelines can coordinate the actions of the many actors managing water resources in the Nile Basin and hence are a prerequisite to the successful establishment of environmental flows in the Nile Basin.

On the basis of the International Water Management Institutes (IWMI) Water Policy Briefs, Issue 29 (2007) Box 1 provides an explanation why policy makers should be concerned with environmental flows:

Why should policymakers be concerned about environmental flows?

- Loss of ecosystem services—reducing river flows means potentially less of all of the ecosystem services, i.e. provisioning (water for domestic and agriculture, fish etc.), regulating (nutrient processing, water quality etc.), cultural and supporting services. To maintain these ecosystem services, water needs to be allocated to sustaining the ecology of rivers.
- The loss of ecosystem services means a risk to all of the people in the Nile Basin, with those living closest to nature (i.e. the poor) being the most vulnerable. However even the rich are directly at risk.
- Loss of biodiversity—making changes to the flow in rivers leads to changes in the diversity of aquatic communities. Species adapted to natural flow regimes will disappear.
- Invasion by exotic species—making changes to flow regimes may help spread exotic species.
- Environmentally unsustainable development of water resources—failure to implement Environmental Flows (EF) will render all water developments unsustainable in the long-term.

Box 1. The costs of ignoring environmental flows; in dependence on IWMI Water Policy Briefs, Issue 29.

4.3 Regional frameworks, declarations, strategies and relevant international policies

Environmental guidelines for use by a regional organizations such as the NBI need enabling and supporting frameworks in order to legitimize the guidelines and subsequent downstream environmental flow implementation mechanisms.

4.3.1 Agreement on the Nile River Basin Cooperative Framework (CFA) (Signing process during 14th May 2010 to 13th May 2011)

A common negotiated framework by most of the Nile Basin countries is the “Agreement on the Nile River Basin Cooperative Framework (CFA)”.

It is thus worthwhile making reference to this framework as an enabling framework for riparian countries to establish environmental flows in the Nile Basin.

The CFA does not refer directly to environmental flows, however important references are included in the various sections of the framework that signify the importance of environmental flows in the Nile Basin. E.g. the introductory section of the CFA alludes to a key statement that recognizes the importance of the Nile environment which can be related to environmental flows (Nile Basin Initiative, 2009):

*“Recognizing that the Nile River, its **natural resources and environment** are assets of immense value to all the riparian countries;” (Preamble, paragraph 3)*

Further the CFA provides clear definitions for three important terms that relate to environmental flows (Article 2):

- **“Nile River Basin”** means the geographical area determined by the watershed limits of the Nile River system of waters; this term is used where there is reference to **environmental protection, conservation or development**;
- **“Nile River system”** means the Nile River and the surface waters and ground waters which are related to the Nile River; this term is used where there is reference to **utilization of water**;
- **“Water security”** means the right of all Nile Basin States to reliable access to and use of the Nile River system for health, agriculture, livelihoods, production and **environment**.

The following principles and articles provide a framework for establishing environmental flows in the Nile Basin:

Protection and conservation

*“The principle that Nile Basin States **take all appropriate measures**, individually and, where appropriate, jointly, for the protection and conservation of the Nile River Basin and **its ecosystems**.” (Article 3, item 7)*

Water has social and economic value

*“The principle that water is a natural resource having social and economic value, whose utilization should give priority to its most economic use, taking into account the satisfaction of basic human needs and the **safeguarding of ecosystems**.” (Article 3, item 14)*

Protection and conservation of the Nile River Basin and its ecosystems (Article 6)

1. *“Nile Basin States shall take all appropriate measures, individually and, where appropriate, jointly, to protect, conserve and, where necessary, rehabilitate the Nile River Basin and its ecosystems, in particular, by:

 - Protecting and improving **water quality** within the Nile River Basin;
 - Preventing the introduction of species, alien or new, into the Nile River system which may have effects detrimental to the ecosystems of the Nile River Basin;
 - Protecting and conserving **biological diversity** within the Nile River Basin;
 - Protecting and **conserving wetlands** within the Nile River Basin; and
 - Restoring and rehabilitating the degraded natural resource base.*

2. *Nile Basin States shall, through the Nile River Basin Commission, take steps to harmonize their policies in relation to the provisions of this article.”*

4.3.2 Nile Basin Sustainability Framework (NBSF) (2011)

This framework is the Nile Basin Initiative’s approach to sustainability and among the broad objectives provided in the NBSF the following are relevant to the issue of **environmental flows** (Nile Basin Initiative, 2011):

- *“To facilitate and contribute to efficient management of the Nile water resources drawing on principles of integrated water resources management (IWRM), and good practices in transboundary water resources management”.*
- *“To facilitate and contribute to wise use of sustainable management of the environment and water-related natural resources of the Nile Basin”.*

The NBSF also stresses the necessity of assessing flow changes that might be brought about by the construction and operation of water-related developments and evaluating a range of potential flow scenarios, including the determination **of environmental flows**.

With regards to policy development and other interventions the NBSF envisages the following possible future interventions

- NBI policy for transboundary water resources planning and management
- NBI strategy for sub-basin management
- NBI strategy for flood management
- NBI strategy for integrated watershed management
- NBI guidelines for information sharing and exchange

- NBI guidelines for data management
- NBI guidelines for water resources assessments
- NBI water quality guidelines
- Operation of resource monitoring networks

4.3.3 NBI Environmental and Social Policy (ESP) (2013)

The ESP is a key reference point for basin wide multi-purpose water resources development projects.

It was devised with the following four objectives in mind, which are based on NBI's recognized mandate (Nile Basin Initiative, 2013):

- **“Objective 1:** *To provide a set of principles and fields of action for the integration of environmental and social concerns in NBI programs.”*
- **“Objective 2:** *To provide guidance for managing transboundary environmental and social impacts of national activities.”*
- **“Objective 3:** *To provide support to Nile Basin countries for the **protection and conservation of critical Nile Basin environmental resources.**”*
- **“Objective 4:** *To demonstrate commitment of the NBI and Nile countries to international best practices with regard to environmental and social management of development activities.”*

Key Policy areas that have direct relevance to environmental flows include the following provisions (Nile Basin Initiative, 2013):

- **“3.2 Water quality:** The NBI shall strive to protect the Nile Basin water resources from pollution in accordance with international best standards in a manner that sustains the ecosystem services from the Nile Basin water resources.”
- **“3.4 Biodiversity:** Critical ecosystems of regional and global importance due to their significant biodiversity characterize the Nile Basin. NBI projects shall aim to avoid significant loss or degradation of these ecosystems. An evaluation of biodiversity as part of the environmental assessment shall be undertaken for WRD projects. Plans to deal with risks to natural habitats shall be included in the project cycle.”
- **“3.5 Wetland degradation:** The wetlands of the Nile Basin perform crucial basin-wide functions, including improving water quality, providing resilience against drought and flooding, and sustaining biodiversity. Wetland degradation is already a concern in many areas of the basin and threatens the critical ecological functions of these ecosystems. NBI shall aim to avoid further harm to Nile Basin wetlands, evaluate any possible risk to them as part of the environmental and social assessment and include plans to deal with these risks.”

The establishment of environmental flows will go a long way in the implementation of the ESP of the NBI. At the same time the ESP provides overall policy guidance and highlights important

issues for the establishment of environmental flows in the Nile Basin. Basin wide policies can only be implemented through strategies and guidelines such as environmental flow guidelines.

4.3.4 NBI Wetland Management Strategy (2013)

The NBI Wetland Management Strategy quotes (Nile Basin Initiative, 2013):

“The strategy aims to reverse wetlands degradation and institute cooperative management and wise use practices for these important transboundary ecosystems. [...] the overarching goal of this Wetland Management Strategy is to foster the sustainable management and utilization of the Nile Basin’s wetlands.”

Strategic objectives

The strategy has the following five strategic objectives (Nile Basin Initiative, 2013):

- *“**Objective 1:** Strengthen the knowledge base on wetlands of transboundary importance in the Nile Basin to support basin-wide conservation, management, planning and restoration efforts.”*
- *“**Objective 2:** Raise awareness and undertake advocacy efforts to build consciousness around the important role of wetlands and their ecosystem functions for the basin’s development.”*
- *“**Objective 3:** Develop and promote a basin-wide approach for the sustainable and cooperative management of wetlands taking into account the full variety of wetland uses.”*
- ***Objective 4:** Strengthen national policies and institutional capacities for the effective management of wetlands with basin-wide importance.”*
- *“**Objective 5:** Strengthen basin-wide access to finance for wetland management and the capacity for development of feasible projects in the Nile Basin.”*

The wetlands strategy goal expects to result in four outcomes in the areas of knowledge based decision making, informed management and planning activities and improved management of shared wetlands through improved capacities and policies on transboundary wetland management (Nile Basin Initiative, 2013).

The establishment of environmental flows has positive impacts on the wellbeing of Nile wetlands. Wetlands depict aquatic ecosystems of great importance in the Nile Basin. The establishment of EF that meet their specific flow requirements assures to sustain wetlands across the basin. For developing a basin wide approach for sustainable management of wetlands, an important element is the establishment of environmental flow through appropriate policies, legal framework, standards and guidelines that the future basin commission and member countries may adopt and cooperatively put in to use.

4.3.5 Khartoum Declaration on Nile Basin Environment Management Cooperation (2008)

In 2008 the NBI environment project organized the biannual Nile Basin Development Forum at which all institutions responsible for environment affairs of all NBI countries participated at ministerial level as well as heads of institutions (Box 2).

Since the event was prior to the approval of the CFA (Section 4.3.1), the agreement of the declaration was considered a breakthrough in getting both upstream and downstream countries to reach a consensus on issues related to environmental management of the Nile Basin.

All of the Nile Basin countries have committed to “managing the Nile Basin environment by giving due attention to its water and land resources, wetlands and biodiversity and addressing the impacts of climate change.” This commitment is indeed an excellent starting point to call upon all riparian countries, jointly and individually, to take all appropriate measures to establish respective environmental flow policies to be considered in the development and operation of hydraulic infrastructure and in transboundary water management in the Nile river system.

We the Ministers of Environment of the riparian countries of the Nile Basin, namely, the Republic of Burundi, the Democratic Republic of Congo, the United Arab Republic of Egypt, Democratic Republic of Ethiopia, Republic of Kenya, Republic of Rwanda, Republic of Sudan, United Republic of Tanzania, and Republic of Uganda, having participated at the second Nile Basin Development Forum, in Khartoum, Sudan during November 17-19, 2008

Aware of the environmental challenges facing the Nile Basin and its inhabitants and recognizing that environmental assets and ecosystem functions of the Nile Basin need to be preserved for the benefit of the basin and its population,
Desirous of the necessity of building on what has been achieved so far in the areas of environment management of the Nile Basin,

Do hereby reaffirm our commitment to cooperate among our respective countries and with the Nile Basin Initiative and the future permanent Nile River Basin Organization in preserving and **managing the Nile Basin environment by giving due attention to its water and land resources, wetlands and biodiversity and addressing the impacts of climate change,**

Do hereby support the definition of clear environment functions of the future permanent Nile River Basin Organization that include:

- Harmonization of policies of NBI countries with respect to **Nile environment management**
- Development of procedures for data and information exchange
- Development of criteria and procedures for conducting **environmental impact assessment and audits**
- Development of guidelines for prevention and mitigation of harmful conditions
- Environmental assessment and **monitoring environmental changes,**
- Promotion of Integrated river basin and sub basin approach,
- Identification of **environmental “hot spots”,**
- Capacity building
- Policy, institutional and legal analysis
- Coordination of action on agreed priorities
- Ensure the **conduct of environmental audits and EIA** for projects with transboundary impacts and promoting compliance among the NBI countries.
- Coordinating role in climate change issues with regards to both adaptation and response measures at a basin wide level.

Box 2: Khartoum Declaration agreed by Ministers of Environment of the Nile Basin countries

4.3.6 International Hydropower Association (IHA), Sustainability Guidelines (2004)

The IHA stipulated the following clear guidelines regarding downstream hydrology and environmental flows (International Hydropower Association, 2004):

*“Changes to downstream hydrology impact on river hydraulics, instream and streamside habitat, and can **affect local biodiversity**. Operating rules should not only consider the requirements for power supply, but also be formulated, where necessary and practicable, to reduce downstream impacts **on aquatic species and human activities**.”*

*“Operating schedules should, where necessary and practicable, incorporate environmental water release patterns (including **environmental flows**) within the operational framework for the supply of power. Downstream regulating ponds and other engineering solutions may provide cost-effective alternatives to environmental flow releases directly from power stations. It is important that the environmental objectives of any flow release are identified in a clear and transparent manner. These releases need to be developed within the context of environmental sustainability and also take into account local and regional socio-economic factors. It is desirable that the **environmental flow objectives** be agreed with local communities.”*

Policy support and enforcement should ensure that water is released and abstraction is limited to maintain the recommended environmental flows. The international Hydropower Association encourages countries to develop hydropower infrastructure in a sustainable manner and one of the measures of sustainability is the maintenance of environmental flows.

The added value of international organizations such as the IHA is the technical and scientific knowledge and skills embodied in these institutions which the Nile Basin countries may make use of in their efforts to establish environmental flow in the region.

4.3.7 Intergovernmental Authority on Development (IGAD) Regional Water Resources Policy (2015)

The IGAD regional water policy was approved in 2015 and is based on Southern African Development Community (SADC) regional policy. The provisions that relate to environmental flows are as follows (IGAD, 2014):

- *“The management of a river (or lake) basin, or of an aquifer (or aquifer system), shall follow an **ecosystem approach**. [...]*
- *Member States shall take all appropriate measures to protect and conserve water resources and their ecosystems following a precautionary approach, according to their capabilities. [...]*
- *Before authorizing activities that are likely to exert an adverse impact on transboundary/shared water resources, or to have transboundary implications, Member States shall ensure that **environmental impact assessments** are undertaken.[...]*
- *Member States shall also undertake strategic social and environmental assessments, where feasible. [...]*
- *Member States shall encourage the participation of stakeholders in social and environmental assessments. [...]*

- *Member States shall endeavour to reserve a **basic minimum flow** for the **environment** in all river basin and aquifer management plans. [...]*
- *Member States shall promote payment for ecosystem services as part of the protection and preservation of their transboundary/shared water resources.”*

Since six members of IGAD are within the Nile Basin, the IGAD policy is supportive for the establishment of environmental flow in the basin countries by providing a coordinating mechanism and supporting the efforts at the basin level.

4.3.8 International Commission on Large Dams (ICOLD) Committee on Environment (2012)

ICOLD issued in 2012 a supplementary paper to the “Position Paper on Dams and the Environment”, which states the following with regards to impacts of dams on the environment and legislative requirements for environmental flows (ICOLD, 2012):

- *“Although it is important to carefully consider the negative effects of each dam on the environment an additional use and benefit resulting from construction of a reservoir is the creation of new habitat in which fish and other flora and fauna, including migratory birds, may thrive.”*
- *“Some dams are also now required by legislation to regulate flows for **environmental needs**. Flows are controlled to carefully manage habitat and ecosystems especially for endangered species recovery programs.”*

Most of the Nile Basin countries are members of the ICOLD. The guidance of ICOLD with regards to environmental flows can assist the Nile Basin to influence member countries to comply with the advice of ICOLD.

4.4 Policies, laws, regulations and relevant institutions of Nile Basin countries relevant to Environmental Flows

The following sections provide an overview on relevant policies, laws, regulations and institutions in the Nile Basin countries.

4.4.1 Burundi:

In Burundi, “[a] number of institutions are involved in the management of water resources, resulting in overlapping responsibilities in some areas: The Ministry of Water, Energy and Mines (MWEM) leads policy formulation through the Directorate General for Water and Energy (DGHER). The DGHER oversees and coordinates access to drinking water in rural areas, with some authority passed to communal water authorities. Water User Associations (WUA) are responsible for maintaining local water points.” (USAID, 2010).

According to the Government of Burundi (2008) “The Ministry of Land Management, Tourism and Environment’s Sectoral Policy evaluates Burundi’s environmental problems and defines recommended interventions to achieve its objectives. These include: promotion of coordinated

environmental management; rational management of land, water, forest, and air; preservation of ecological balance; conservation of biodiversity; and promotion of the tourist sector.”

The Burundian Office for the Protection of the Environment (OBPE) under the Ministry is designated as an IUCN focal office⁴.

National Water Policy (2009)

MWEM’s Water Sector Policy (2005–2007) expresses the government’s commitment to ensuring the quality and quantity of water needed to meet the demands of the different users. The policy goals are to (USAID, 2010):

- *“improve knowledge of water sources for efficient, equitable, and sustainable management of water resources;*
- *increase the water and sanitation coverage; and*
- *achieve better coordination among sector players.”*

National Environmental Strategy (SNEB) (2005)

The Ministry of Land Management, Tourism, and Environment of the Government of the Republic of Burundi (2005) states that *“The National Environment Strategy (SNEB) enumerates available natural resources; analyses the challenges to which they are subjected; identifies root causes on an institutional, organizational, and technical level; and clearly explains the ways and means for resolving these problems. The main identified environmental challenge is the degradation of land, forestry, and biodiversity resulting from high demographic pressure.”*

Code of Environment (2000)

According to the Government of Burundi (2008) *“The Environment Code establishes basic regulations that facilitate management of the environment and the protection of the same against degradation. It is designed to safeguard and value the rational use of natural resources, to combat various kinds of pollution, and to improve human living conditions, while respecting the balance of the ecosystem.”*

A number of policies and acts are in place that relate to environmental flows and ecosystem protection which include the following:

- Master Plan of Swamps Management (1999)
- National Strategy and Action Plan on Biological Diversity (NSAP-BD) (2000)
- Environment Code of the Republic of Burundi, Law No.1/10 of 30/06/2000
- Plan of Action for the Integrated Management of Water Resources of Burundi (PAGIRE) (2009)
- Presidential decree on Environment Management (2010)

⁴ According to the received questionnaire on EF from Burundi.

- Water Act / Bill (2011)
- National Water Strategy 2011-2020 (2011)
- Decree Law No. 1/033 of 30 June 1993 on plant protection;

Burundi: Summary of findings:

As indicated above relevant policies that contain provisions related to environment flow have been reviewed. A number of national policies related to water and environment do exist and are constantly being updated. There are also plans and codes directly related to wetland management and environmental flows. However specific policy with regards to environmental flows is not clearly articulated in any of the policies or acts reviewed.

Policies have been screened and reviewed for their relevance. It is evident that in terms of improving policies to better articulate environmental flows, the entry point would be

- Water Act / Bill (2011), and
- Decree Law No. 1/033 of 30 June 1993 on plant protection;
- Presidential decree on Environment Management (2010)
- Environment Code of the Republic of Burundi, Law No.1/10 of 30/06/2000

These four policy and legal documents are the appropriate entry points to accommodate environment flow policy provisions. These provisions may be introduced as amendments to the documents. The assessment of policy and legal documents and stakeholder feedback show that explicit policy provisions on environmental flow do not exist in Burundi. In general respective environmental flow policies are articulated in the government's water and environment sectors' policies and legislation. It is thus advisable to update corresponding policies and legal provisions including well-articulated environment flow policies followed by legal provisions in order to support the establishment of environmental flow in Burundi. Since the process of national policies updating varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow policies and contents of such policies.

In terms of relevant institution for managing environmental flows in Burundi the Ministry of Water, Environment, Land Use and Urban Management, the Ministry of Livestock and Agriculture and the Ministry of Mining and Energy have the required mandates. According to stakeholder feedback the Water Court and Land Court and a steering team for wetland management are important institutions to consider, which will also play a role for the management of environmental flows in Burundi.

It should however be noted that no assessment of the capacity and capability of the ministry to handle issues of environmental flows is available. It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is

therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

4.4.2 Democratic Republic Congo:

The SADC Environmental Legislation Handbook (Walmsley, B & Patel, S, 2011) mentions that the constitution was adopted on 18 February 2006 and that Article 53 states that:

- *“Every person has a right to a healthy environment, which is favourable to his/her full development.*
- *The environment must be protected.*
- *The state must look after the protection of the environment and the health of the people.”*

Further *“[e]nvironmental management is dealt with between several ministries and at different levels of government”*.

According to Walmsley, B & Patel, S (2011) *“the **Parliamentary Commission** for the Environment and Natural Resources has between 50 and 60 members, who are organized into four committees:*

- *general environment,*
- *mining environment,*
- *flora and fauna, and*
- *environmental control.”*

Ministry of Environment, Nature Conservation and Tourism (MENCT)

Walmsley, B & Patel, S (2011) states that *“The Ministry responsible for the environment in the DRC has undergone several changes in name and associated responsibilities: Directorates of nature conservation, land affairs, tourism, water and forests have all been included and excluded at various times since the Ministry was created under Ordinance No. 75-231 of 22 July 1975. This legislation gave the Ministry responsibility for Environmental Impact Studies”*.

The Basin Management Department of the Water Resources Directorate of the Ministry of Environment will be responsible for the future implementation of Environmental Flows⁵.

Group for Environmental Studies of Congo

Walmsley, B & Patel, S (2011) further state that *“In Ministerial Order No. 044/CAB/MIN/ECN-EF/2006 of 8 December 2006, the MENCT created an agency for Environmental Impact Assessment (EIA) administration and approval – the Group for Environmental Studies of Congo (GEEC). A further Ministerial Order, No. 008/CAB/MIN-EF/2007 of 3 April 2007, amended and completed the institution of the GEEC.”*

⁵ According to the received questionnaire on EF from the Democratic Republic of Congo.

Inter-ministerial Committee on Environment, Nature Conservation and Tourism

According to United Nations Environment Programme (UNEP) this Committee was originally established by Law No. 75/232 of 22 July 1975. It is chaired by the Minister of Environment, and members include ministers whose portfolios address environmental issues in some way, the private sector, civil society, research centres and universities, and local authorities.

Environmental Protection Act, No. 11/009 (2011)

“After many years in draft form, a framework law on the environment has been promulgated: the Environmental Protection Act (EPA), No. 11/009 of 9 July 2011. The new law sets out the fundamental and universal principles for sustainable development and sound environmental management.” (Walmsley, B & Patel, S, 2011).

Water Act (2010)

The Water Act provides an overarching legislative framework for the rational and sustainable management of water resources. A fundamental principle defining the water law is IWRM, which aims to create a structured process for reconciling the divergent needs of multiple stakeholders, including ensuring the sustainability of aquatic ecosystems.

Related additional laws and codes include:

- Water Law (Decree of 1952)
- Environment Code (2011)
- Ministerial order on environmental and social impact assessment(2006)

D.R. Congo: Summary of Findings

A number of national policies related to water and environment are available and are constantly being updated. However specific policy or guidelines with regards to environmental flows is not clearly articulated in any of the policies or acts reviewed, which has also been confirmed through the received feedback of stakeholders⁶.

Policies have been screened and reviewed for their relevance. It is evident that in terms of improving policies to better articulate environmental flows, the entry point would be

- Water Act (2010) and
- Ministerial Order on Environmental and Social Impact Assessment (2006).

These two documents contain relevant provisions, if articulated and expanded, may provide better articulated environmental flow policies. These provisions may be introduced as amendments to the Water Act and the Ministerial order. Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environmental flows. It would however be helpful to consider and make use of the experiences of countries such as

⁶ According to the received questionnaire on EF from the Democratic Republic of Congo.

South Africa and Australia in formulating environmental flow policies and contents of such policies.

In terms of relevant institution for managing environmental flows in DR Congo the Basin Management Department of the Water Resources Directorate of the Ministry of Environment has the required mandate. As indicated above the ministry has undergone numerous reorganization phases and it is difficult to ascertain its current mandates. It should also be noted that no assessment of the capacity and capability of the ministry to handle issues of environmental flows is currently available. It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

4.4.3 Egypt:

According to Ghodeif (2013) *“The Ministry of Water and Irrigation (MWRI) formulated the national water policy to face the problem of water scarcity and water quality deterioration. The overall policy’s objective is to utilize the available conventional and non-conventional water resources to meet the socio-economic and environmental needs of the country. Under law No. 12 of 1984, MWRI retains the overall responsibility for the management of all water resources, including available surface water resources of the Nile system, irrigation water, drainage water and groundwater. The National Water Research Centre (NWRC) supports the MWRI in its management.”*

Further *“The MWRI is the central institution for water quality management.”* Under law 12 of 1984, the MWRI has the overall responsibility for appropriating and distributing water and for managing drainage, groundwater and the Mediterranean coastline. In addition, under law 48 of 1992, the Ministry has the responsibility for controlling the inflow of pollutants into waterways. Specifically for the environment, Law 4 of 1994 and its Executive Regulations (amended by Law 9 of 2009) is the framework environmental legislation in Egypt. It provides the legal requirement for EIA. The national EIA Guidelines were issued and revised in 2009, and various sectoral guidelines have since been developed.

Egyptian Environmental Affairs Agency (EEAA)

Ghodeif (2013) mentions that *“The central organization for environmental protection is the EEAA. This agency has an advisory task to the Prime Minister and has prepared the National Environmental Action Plan of Egypt 2002/17 (2002). According to Law 4, it has the enforcing authority with respect to environmental pollution except for fresh water resources. Through Law 48, the MWRI remains the enforcing authority for inland waterways.”*

Ministry of Agriculture and Land Reclamation (MALR)

Further he mentions that the *“MALR develops policies related to cropping patterns and farm production. Moreover they are in charge of water distribution at field level and reclamation of*

new agricultural land. With respect to water quality management issues, their policies on the use and subsidy reduction of fertilizers and pesticides is important. In addition, MALR is responsible for fisheries and fish farms (aquaculture)."

Finally *"The Soil, Water and Environment Research Institute is part of the MALR and is responsible for research on many subjects such as water and soil quality studies on pollution, bioconversion of agricultural wastes, reuse of sewage wastewater for irrigation, saline and saline-alkaline soils, fertilizer and pesticide use and effects."*

Water Policy (1975)

The MWRI has prepared a National Water Policy till the year 2017 including three main themes:

- Optimal use of available water resources;
 - Development of water resources; and
 - Protection of water quality and pollution abatement.
-
- Egypt has put in place a number of policies and laws related to water and environment that include:
 - Water Master Plan (1982)
 - Law 48: Concerning the Protection of the River Nile and Waterways from Pollution (1982)
 - Water Policy and our Relations with the Nile Basin (1986)
 - Law No. 4/1994 for the Protection of the Environment, amended by Law No. 9/2009 (Environment Law)
 - Water Policy (1999)
 - National Environmental Action Plan (2001)
 - National Environmental Action Plan (2002-2017)
 - National Water Resources Plan (NWRP) (2002)
 - Guidelines of Principles and Procedures for Environmental Impact Assessment (2009)
 - Water Sector Policy (Draft) (2010)

Egypt: Summary of Findings

A number national policies and legislation related to water and environment are available and are constantly being updated. However specific policy with regards to environmental flows is not clearly articulated in any of the policies or acts reviewed.

Policies have been screened and reviewed for their relevance. It is evident that in terms of improving policies to better articulate environmental flows, the entry point would be

- Water Sector Policy (Draft) (2010) and
- National Environmental Action Plan (2002-2017).

The policy and the action plan, if amended in order to include environment flow provisions, can support the establishment of environment flow in the Nile Basin. Environmental flow policy provisions may be introduced as amendments to the Water Sector Policy and the National Environmental Act. Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow policies and contents of such policies.

In terms of relevant institution for managing environmental flows in Egypt the MWRI has the required mandate. It should be noted that no assessment of the capacity and capability of the ministry to handle issues of environmental flows is available. However Egypt has extensive research infrastructure, water related institutions with adequate human resources that can easily accommodate the management of environmental flows. It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

4.4.4 Ethiopia:

Recently, Ethiopia has undergone a decentralization of its environment management function by delegating line agencies to conduct necessary studies and meet all requirements before issuing a project clearance. Hence, the role of the Environmental Protection Authority is supervisory. According to the Environmental Protection Authority of the Federal Democratic Republic of Ethiopia (2004) “[The] *Environmental Organs Establishment Proclamation, Proclamation No. 295/2002, was enacted in 2002. This proclamation repealed Proclamation for the Establishment of the [Environmental Protection Authority] EPA, Proclamation No. 9/95.*” The proclamation re-establishes the Environmental Protection Authority as an autonomous public institution being accountable to the Prime Minister. On the 29th of July, 2013, the Environment Protection Authority was transformed in to the Ministry of Environment and Forest (MoEF) through Proclamation Number 803/2013.

Each Federal and Regional organization of the government that deals with environmental matters is required by Proclamation No. 295/2002 to set up its own Sectoral Environmental Units (SEU) with the responsibilities to coordinate and follow-up in order to ensure that its activities are in harmony with national efforts to protect the environment.

According to the former Environmental Protection Authority of the Federal Democratic Republic of Ethiopia (2004): “*Proclamation No.299/2002, enacted in 2002 empowered the EPA (now MoEF) to prepare procedure, regulations, guidelines and standards to effectively implement and enforce EIA proclamation.*” The EIA guideline was developed in 2000.

Further *“The Environmental Pollution Control Proclamation (Proclamation 3003/2002) prohibits the release of pollutant into the environment by any person engaged in any field of activity. Any person who causes any pollution shall be required to clean up or pay the cost of cleaning up the polluted environment.”*

The Ministry of Water, Irrigation and Energy

The Federal Negarit Gazeta of the Federal Democratic Republic of Ethiopia (2010) lists the following mandates and responsibilities for the Ministry of Water, Irrigation and Energy of Ethiopia:

- *“Promote the development of water resources and energy;*
- *Undertake basin studies and determine the country’s ground and surface water resource potential in terms of volume and quality, and facilitate the utilization of same;*
- *Determine conditions and methods required for the optimum and equitable allocation and utilization of water bodies that flow across or lie between more than one regional states among various uses and the regional states;*
- *Undertake studies and negotiation of treaties pertaining to the utilization of boundary and trans-boundary water bodies, and follow up the implementation of same.”*

Environmental Policy (1997)

The Environmental Policy of Ethiopia issued by the Government of Ethiopia (1997) is the output of the Conservation Strategy of Ethiopia (CSE). The specific policy objectives include:

- ensuring sustainable use of natural resources and developing currently underutilized resources,
- improving the social, economic and cultural environment of human settlements,
- adopting preventive measures of land, air, and water pollution,
- conserving, developing, and managing the rich and diverse cultural heritage, ensuring people’s participation in environmental management, and
- raising public awareness about the environment.

Water Resources Management Policy (1999)

The Ministry of Water Resources (1999) states in the section on Aquatic Resources Policy states the following:

The Policies are to:

- *“Establish and adopt water quality standards and proper assessment procedures that enhance preservation and enrichment of aquatic resources.”*
- *“Incorporate aquatic resources development in large scale water resources undertakings.”*

The section on Water Allocation and Appointment further states that the policies are to:

- *“1. Recognize that the basic minimum requirement, as the reserve (basic human and livestock needs, as well as **environment reserve**) has the highest priority in any water allocation plan.”*
- *“2. Ensure that water allocation gives highest priority to water supply and sanitation while apportioning the rest for uses and users that result in highest socio-economic benefits.”*
- *“3. Enhance and encourage water allocation that is based on efficient use of water resources that harmonizes greater economic and social benefits.”*
- *“4. Ensure that water allocation shall be based on the basin, sub-basin and other hydrological boundaries and take into consideration the needs of drought prone areas.”*
- *“5. Adopt the principle that water allocation shall not be made on permanent basis, but rather on an agreed time horizon that fits best with the socioeconomic development plans, especially pertinent to water resources, subjected to appraisals and revisions in light of new developments.”*

The Environment section has the following provisions:

- *“Incorporate environment conservation and protection requirements as integral parts of water resources management.”*
- *“Encourage that Environment Impact Assessment and protection requirements serve as part of the major criteria in all water resources projects.”*

The Government of the Federal Republic of Ethiopia (2002) in its Water Sector Development Program (WSDP) of October 2002 states the following with relevance to environmental flows, indicating the level of appreciation of issues related to environmental flows and aquatic ecosystems.

“... from the environmental perspective, it is recognized that the WSDP interventions could possibly have four types of impacts on water resources, namely

- (a) impacts on the water cycle,*
- (b) impacts on the water availability,*
- (c) impacts on water quality, and*
- (d) impacts on the aquatic ecosystems.*

For example *“major changes in water quantity or quality, or water regulation, may affect the flora and fauna living or dependent on aquatic ecosystems and create disturbance in the natural environment that threaten the existence of indigenous species. [...] Water development programs can also impact on human health --both positively and negatively.”*

The following policies and proclamations are directly relevant to environmental flows:

- Water Resources Management Proclamation (2000)

- EIA Guidelines (2000)
- Water Sector Policy (2001)
- Water Sector Strategy (2001)
- Water Resources Management Regulations (2005)

All contain provisions related to environment flow.

Ethiopia: Summary of Findings

A number national policies and legislation related to water and environment are available and are constantly being updated. However specific policy broaching the subject of environmental flows is not clearly articulated in any of the policies or acts reviewed.

Policies have been screened and reviewed for their relevance. It is evident that in terms of improving policies to better articulate environmental flows, the entry point would be:

- Water Resources Management Proclamation (2000),
- EIA Guidelines (2000),
- Water Sector Policy (2001),
- Water Sector Strategy (2001),
- Water Resources Management Regulations (2005).

Environmental flow policy provisions may be introduced as amendments to the above mentioned policies and strategies. Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow policies and contents of such policies.

In terms of relevant institution for managing environmental flows in Ethiopia the Ministry of Water, Irrigation and Energy (MoWIE) and the Ministry of Environment and Forest (MEF) have the required mandates. The MoWIE through its implementing agencies and projects currently implements and monitors environment flow issues. The ministry of Environment and Forest mandates cover wetlands management and aquatic resources conservation which have direct relationship with environment flow.

It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

It should be noted that no assessment of the capacity and capability of the ministries to handle issues of environmental flows is available.

There are some studies and specific research activities related to environment flow. These include environment flow studies of Chara Chara weir (Matthew P. McCartney, et al, 2009), Tekeze River, Lake Tana and Mandaya dam site (please also refer to Section 3.4.2). General studies such as “concepts of environment flow assessment and challenges in the Blue Nile Basin of Ethiopia” (Reitberger, B., McCartney, M., 2011) are also helpful in enhancing awareness about environment flow.

4.4.5 Kenya:

The Water Act 2002 followed the national water policy, 1999 and provides the establishment of the Water Resources Management Authority (WRMA) with the mandate for the creation of a legal framework for new institutions to implement the policy and separates water resources management from water services.

Water Resources Management Authority (WRMA)

The WRMA has set up the institutions responsible for running the water affairs. WRMA shall control and manage water resources through Catchment Area Advisory Committees that provide services on Water resource management plans, Water use and Water permits. Other important bodies include Water resources user association (WRUAs), Water Services Boards and Catchment Area Advisory Committees responsible for all the regions in the country.

The policies which were revised after 2000 are mostly in line with the Environment Management and Coordination Act (1999). This is the framework law for the management of the environment and natural resources in Kenya. It owes its existence and borrows heavily from the Agenda 21 principles and sustainable development. These policies include the National Policy on Water Resources Management and Development (WRMD) 1999, and the Forest Policy (2005).

According to GLOWS – FIU (2012) *“Kenya [...] has passed legislation aimed towards ensuring access to safe water resources for all people, as well as sustaining the valuable ecosystems upon which these people depend. The principle of **environmental flows** is evident in the wording of these laws.”*

Kenya Water Resources Management Act (2002)

Further GLOWS – FIU (2012) defines the *“**reserve**, in relation to a water source, as that quantity and quality of water required (a) to satisfy basic human needs for all people who are or may be supplied from the water resource; and (b) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the water resource.”* The Water Act further states that *“the Minister, the Authority and all public bodies shall, when exercising any statutory power or performing any statutory function in relation to the water resource concerned, take into account and give effect to the requirements of the reserve [...]*

*Draft versions of the new Kenya Water Resources Management Act include very similar wording in regards to determination and protection of **the reserve**.*

Kenya Water Resources Management Rules (2007)

Calls for the Authority to establish the reserve based on a) Water resource records and reserve water demand, or b) 1) ecological vulnerability, 2) human vulnerability, 3) local observations of historic drought flows, 4) maintenance of perennial flows, and 5) consultations with [Water Users Associations] WUAs.”

According to the NBI Wetlands Management Strategy (2013) Kenya has put in place numerous water and environment related policies, strategies and regulations:

- The National Water Master Plan (1992); updated in 1998
- Environmental (Management and Coordination) Act (1999)
- National Policy on Water Resources Management and Development (1999)
- Environment (Impact Assessment and Audit) Regulations 2003
- Environmental Management and Co-Ordination (Water Quality) Regulations (2006)
- National Water Resources Management Strategy (2007 – 2009) (2007)
- National Water Services Strategy (2005 – 2017) (2007)
- The Environmental Management And Co-Ordination (Wetlands, River Banks, Lake Shores And Sea
- Shore Management) Regulations (2009)
- Transboundary Water Policy (Draft) (2010)
- National Transboundary Water Policy Implementation Strategy (Draft) (2010)
- National Environment Policy (2012)
- National Adaptation Plan (2012)
- National Water Policy (2012)

Kenya: Summary of Findings

A number of national policies and legislation related to water and environment are available and are constantly being updated. This articulation on environment flow/reserve is evident in both the Kenya Water Resources Management Act (2002) and Kenya Water Resources Management Rules (2007). However there is no standalone policy document or legislation on environmental flow. This has also been confirmed by feedback from stakeholders⁷.

Policies have been screened and reviewed for their relevance. It is evident that the Kenya Water Resources Management Act (2002) and Water Resources Management Rules (2007), clearly outlines the specific measures to be taken in order to establish the reserve (environmental flows). Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow

⁷ According to the received questionnaire on EF from Kenya.

policies and contents of such policies. Kenya's experience in environment policy articulation is also valuable for other Nile Basin states.

In terms of relevant institution for managing environmental flows in Kenya the WRMA and the National Environment Management Authority (NEMA) have the required mandates. It should be noted that no assessment of the capacity and capability of the authority to handle issues of environmental flows is available. However Kenya has already taken steps in the right direction with regards to the establishment of environmental flows that need to be strengthened, in terms of developing practical guidelines, implementation and monitoring. It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

For studies on environmental flows in Kenya, please refer to Section 3.4.1.

4.4.6 Rwanda:

The Ministry of Natural Resources (MINIRENA) is responsible for formulation of water resources management policy, strategic planning, coordination, quality assurance, monitoring, evaluation and capacity building including water resources management and allocation. The ministry also puts in place legal and regulatory frameworks. Rwanda Natural Resources Authority (RNRA), the designated implementing agency for Natural Resources in particular the Integrated Water Resources Department, is responsible for technical coordination and implementation with other agencies and all relevant stakeholders.

Rwanda Environment Management Authority (REMA) develops regulations and ensures protection and conservation of the environment and natural resources across the country.

National Policy on Water Resources Management (NWRM) (2011)

The policy in its introductory part states (The Republic of Rwanda, 2011):

*“Equally important is the need to take account of the environmental and ecological services provided by water resources and **reserve such amounts as are required for proper functioning of ecosystems**”.*

The policies segment on water allocation states that *“the available water resources of Rwanda will be allocated on the basis of comprehensive and integrated plans and optimum allocation principles that incorporate efficiency of use, equity of access and **sustainability of the resource**.”*

The policy further elaborates on what the Government of Rwanda is expected to do:

“For this purpose the Government shall:

- a. Develop a national water resources master plan to promote water resources conservation, ensure that abstraction conforms to the sustainable yield and to institute measures to facilitate the conjunctive use of groundwater and surface water;*
- b. Formulate principles and guidelines for the allocation of water resources;*
- c. Institute measures to develop and allocate “reserve water” to meet ecological functions and **other environmental services;**”*

Rwanda has also a law called “Organic Law”, determining the Modalities of Protection, Conservation and Promotion of Environment in Rwanda (2005”).

Article: 19 of the Organic Law states (Official Gazette of the Republic Of Rwanda, 2005):

“Swamps with permanent water shall be given special protection. Such protection shall consider their role and importance in the preservation of the biodiversity.”

The Law has both incentive and punitive legal provisions with regards to environment and water resources management.

Rwanda has put in place a number of policies and legislation with regards to water and environment that include the following:

- Sectorial Policy on Water and Sanitation (2004)
- Ministerial Order No. 003/2008 of 15/08/2008 (EIA Procedures) (2008)
- Ministerial Order N°007/2008 of 15/08/2008 Establishing the List of Protected Animal and Plant Species (2008)
- National Policy and Strategy for Water Supply and Sanitation Services (NWSS) with Strategic Action Plan (part 2) (2010)
- Environment Sub-Sector Strategic Plan 2010-2015 (2010)
- Rwanda Biodiversity Policy (2011)
- Law of Establishing RNRA (2011)
- Water Resources Management Sub-Sector Strategic Plan (2011-2017) (Draft) (2011)

Rwanda: Summary of Findings

A number of national policies and legislation related to water and environment are available and are constantly being updated in Rwanda. Although there is no a standalone environmental flow policy⁸, Rwanda relates to the “amounts [of water] required for proper functioning of ecosystems” as part of their National Policy on Water Resources Management (The Republic of Rwanda, 2011).

Policies have been screened and reviewed for their relevance. It is evident that the NWRM outlines the specific measures to be taken in order to establish the ‘reserve’ (environmental flows). However there is room to enhance and harmonize the available environment flow provisions. Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow policies and contents of such policies.

In terms of relevant institution for managing environmental flows in Rwanda the Ministry of Natural Resources and the REMA has the required mandates. It should be noted that no assessment of the capacities and capabilities of the ministry and the authority to handle issues of environmental flows is available. However Rwanda has already taken steps in the right direction with regards to establishment of environmental flows that needs to be strengthened, in terms of support for researched studies on environmental flows, implementation mechanism and monitoring. It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

⁸ According to the received questionnaire on EF from Rwanda.

Along with Tanzania and Kenya, Rwanda has recognized the importance of environmental flows and has provided environmental flows provisions in its policies.

4.4.7 South Sudan:

The Ministry of Environment, Wildlife Conservation, and Tourism (MEWCT) is in charge of conservation and environmental protection. It is made up of four directorates. The directorate with relevance to environmental flows is the directorate of Environmental Affairs. Recently the Ministry of Environment and the Ministry of Interior and Wildlife have been established as separate ministries.

The **Directorate of Environmental Affairs** establishes environment policy and impact monitoring procedures for the Government of South Sudan (GOSS). The Directorate's responsibilities include promoting EIA capabilities among GOSS ministries; developing sector level screening processes to identify activities where environmental assessment is likely to be required; developing tools for monitoring environmental impacts; and overseeing waste management.

The Ministry of Environment and the Ministry of Interior and Wildlife are responsible for environmental protection and management, planning, development of action plans for policy implementation, monitoring and evaluation of policy implementation programs. The previous Ministry of Housing, Physical Planning and Environment has prepared the draft South Sudan National Environment Policy (SSNEP).

The goals of the draft SSNEP are to ensure protection and conservation of South Sudan's environment and ensure sustainable management of its natural resources to meet the needs of its present and future generations. The draft SSNEP provides policy guidance to each sector of development activity including forestry, water and sanitation, human settlements and health, energy and mining, agriculture, livestock, fisheries, wildlife and tourism, transport and roads, as well as industry. The issues highlighted in the SSNEP include the water and sanitation and wetland sectors as well as the policy guidance on EIAs.

The Water, Sanitation & Hygiene (WASH) Sector Strategic Framework (2011)

The Water, Sanitation & Hygiene (WASH) Sector Strategic Framework of August 2011 states that the Ministry of Water Resources and Irrigation (MWRI) is mandated to address all water related functions in collaboration with the states and counties.

Among the measures and steps to be undertaken in the medium to long term periods, in order to ensure equitable access to all uses the framework refers to the following which is related to environment flow, *"Gradually and incrementally allocate water to other users based on stakeholder negotiated economic, social and **environmental values**"* and has assigned a "medium priority".

The core of the sector governance is the Water Council, that acts as the principal multi stakeholder advisory body of the WASH sector and advises the cabinet on approval of new or amendment of legislation, policies and strategies;

Under the framework a Water Resources Management Authority is established as an independent body under the supervision of MWRI. The authority will develop and enforce regulations for the management, use and consumption of water resources.

The Republic of South Sudan Draft Water Bill (August 2014)

The draft bill identifies the following key organizations, the Minister of Water Resources and Irrigation, the Water Resource Management Authority, a Basin Water Board, a Catchment Committee, a Sub-Catchment Committee, the Safe Water Supply and Sanitation Services Regulator.

Section 32 of the Draft Bill states the following with regards to environment flow/ the reserve:

“32. Determination of reserve

- a. The Water Resource Management Authority shall determine **the reserve** for the whole or part of each water resource which has been classified.*
- b. A determination of the reserve shall ensure that adequate allowance is made for each aspect of **the reserve**.*
- c. All RSS and State Government institutions shall, when exercising any statutory power or performing any statutory function in relation to the water resource concerned, take into account and give due regard to the requirements of **the reserve**.”*

Water Policy (2007)

The water policy for South Sudan was approved by the cabinet of ministers and the legislature in November 2007. *“The overall goal of the policy is to support social development and economic growth by promoting efficient, equitable, and sustainable development and use of available water resources and effective delivery of water and sanitation services in South Sudan”* (Government of Southern Sudan, 2007). It outlines the government’s vision of the water sector and establishes the basic principles that would guide water sector development not only during recovery but also through to the development phase.

The general principles established in the overarching water policy include (Government of Southern Sudan, 2007): *“Water is both an economic and social good. Optimal allocation of available resources shall be determined on the basis of social equity, economic efficiency, system reliability and **environmental sustainability**.”*

The present water policy recognizes the other water subsectors, including water for irrigated agriculture, energy, livestock, fisheries, navigation, and **environmental services** in adequate detail.

National Environmental Policy (2012)

The policy is based on the following principles: good governance, sustainable development, prevention, subsidiarity, the precautionary principle, scientific knowledge, skills and expertise, and ‘The Polluter Pays’. The policy gives guidance to all relevant sectors: agriculture, biodiversity, energy, fisheries, forestry, health, human settlements, industry, livestock, mining, oil, roads,

tourism, transportation, water and sanitation. It emphasizes the importance of carrying out EIAs in relation to any activity that may affect the environment.

Environmental Protection Bill (2010)

According to the Government of Southern Sudan (2012) the Environmental Protection Bill covers the following:

- *“The establishment of the South Sudan National Environmental Authority (Article 8);*
- *The arrangements for the integration and mainstreaming of the environmental policy in line ministries and lower level governments through Environmental Liaison Units and State Environmental Committees and Local Environmental Committees (Articles 23-27);*
- *The elaboration and implementation of the 5-yearly Environmental Action Plan (Article 28);*
- *The implementation of EIA, [Environment Information System] EIS, environmental audits and monitoring (Articles 29-33);*
- *Land use planning (Article 42);*
- *The protection of wetlands, lakes, rivers, hilly and mountainous areas, biodiversity, forests, rangelands, natural heritage and the ozone layer (Articles 43-55).”*

South Sudan: Summary of Findings

A number national policies related to water and environment are available and are constantly being updated. However specific policy with regards to environmental flows is not clearly articulated in any of the policies or acts reviewed.

Policies have been screened and reviewed for their relevance. It is evident that in terms of improving policies to better articulate environmental flows, the entry point would be

- National Environmental Policy (2012) and
- Water Policy (2007).
- WASH Sector Strategic Framework (2011).

Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow policies and contents of such policies.

In terms of relevant institution for managing environmental flows in South Sudan the Ministry of Environment the Ministry of Water Resources and Irrigation have the required mandates.

It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution

for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

It should be noted that no assessment of the capacity and capability of the ministries to handle issues of environmental flows is available. At the present state South Sudan may not be in a position to accord priority to environmental flows. However with the existence of very large and complex wetlands such as the Sudd wetlands in the country the issue of environmental flows is of great importance taking into consideration the regional significance of the Ramsar recognized Sudd wetlands.

A face to face discussion with representatives of the Ministry of Electricity, Dams, Irrigation and Water and the Ministry of Environment confirmed that studies on EF have not been conducted and due to the absence of hydraulic infrastructure on most of the rivers there has not been much concern over environmental flows. Capacity building of relevant organizations, training of professionals in the field of environment flow assessment and management are priority issues for South Sudan.

4.4.8 Sudan:

According to Yagoub Abdalla (2012) the key environment related structures are “*the Ministry of Environment and Physical Development (MEPD) and the Higher Council for Environment and Natural Resources (HCENR)*”. In 2001, the HCENR initiated the development of environmental regulations called the Environment Protection Act which was issued through a presidential decree. It established guidelines and requirements for environmental impact assessments and environmental conservation frameworks.

The Environmental Protection Policy (2001) requires that any new projects, that are deemed to have an impact on the environment, have to conduct an EIA in order to ultimately obtain an Environmental Compliance Certificate (ECC) from the HCENR through the receipt of an Initial Environmental Impact Assessment (IEA) report containing a Mitigation Plan or a description of the mitigation measures to be implemented to reduce the environmental impacts of the proposed project.

Other key institutions at the national level include:

- Ministry of Tourism and Wildlife, Forests
- National Corporation of the Ministry of Environment and Physical Development,
- Range and Pastures Administration of the Ministry of Animal Resources and Fisheries,
- Natural Resources Administration of the Ministry of Agriculture,
- Desertification Control and Coordination Unit of the Ministry of Agriculture,
- Ministry of Irrigation and Water Resources,
- Dams Implementation Unit of Ministry of Water Resources, Irrigation and Electricity (MWRIE) and Ministry of Industry

The Water Resources Act (1995) is the main piece of legislation concerning freshwater. It states that water is a government property and entrusts primary responsibility for its management to the Ministry of Water Resources and Irrigation at federal level and to local administration and the Ministries of Engineering Affairs at state level.

The Environment Protection Act (2001) replaces the Higher Council for Environment and Natural Resources Act of 1991, and focuses on the role of various authorities at federal and state levels in terms of environmental protection, entrusting overall responsibility in this realm to the Higher Council for Environment and Natural Resources. In reality, responsibilities for environmental protection are often taken up by various agencies involved in resource use rather than by the Higher Council.

National Water Policy (2007)

The Water Policy of 2007 has been developed *“based on the Transitional Constitution of Sudan, water policies of 1977, 1992 and 2000, macroeconomic and social policies and development strategies.”* The Goal of Water Resources Policy is *“To lay the foundation for a rational and efficient framework to sustain the water needs of national economic development, poverty alleviation, peace, **environmental protection** and social well-being of the people through sustainable water resources management.”*

Among the objectives of the policy the following relate to environment flow:

- *“[...] to promote demand management, conservation and protection of water resources and the overall aquatic environment in a sustainable basis in conjunction with essential infrastructure development.*
- *To promote environmentally sustainable water resources development and management.”*

The Council of Ministers Resolution no. 34 on September 2005, defines the powers of the national focal point for water resources, the Ministry of Irrigation and Water Resources (MIWR). In Sudan water institutions have been evolving over time and the National Council for Water Resources (NCWR) was established with the objective of formulating common water resources policies and coordinating the activities of all water sector agencies and stakeholders. The NCWR has the Technical Water Resources Organ (TWRO) as its executing arm.

According to the Ministry of Environment, Forestry and Physical Development (2013) *“[a] draft National Water Policy was prepared in 1999. The policy document assessed the water situation in the country, existing legislation and policies and outlined the main policy principles and statements. Policy principles were illustrated under the sub-headings: water resources, water utilization, water and environment, international issues, socioeconomic issues, disaster management and institutions and capacity building. It also recommended the development of strategic plan for the water sector.”* All water affairs are now under the umbrella of the Ministry

of Irrigation and Water Resources (MIWR). The council of Ministers Resolution no. 34 on September 2005, defines the powers of the national focal ministry.

The general Water Resources Policy Objectives and principles, relevant to environmental flows include the following:

- Promote demand management, conservation and protection of water resources and the overall aquatic environment in a sustainable basis in conjunction with essential infrastructure development.
- Promote environmentally sustainable water resources development and management.
- The development of water resources should be friendly to the environment and the ecology in order to ensure sustainable utilization of water resources for present and future generations

The Republic of Sudan has put in place a number of policies and acts that include:

- Water Resources Act (1995)
- Environmental Health Act (1997)
- National Water Policy (2000)
- Sudan National Biodiversity Strategy and Action Plan (2000)
- Fishery Traps Act in Fresh Waters, 1954.
- Irrigation and Drainage Act, 1990.
- The Water-Hyacinth Control Act of 1960 to control and prevent spreading of water hyacinth in rivers and waterways in Sudan.
- Environmental Protection Act (2001)
- National Plan for Environmental Management (2007)
- Integrated Water Resources Management Policy and Strategy (2007)

Sudan: Summary of Findings

A number of national policies related to water and environment are available and are constantly being updated. However specific policy with regards to environmental flows is not clearly articulated in any of the policies or acts reviewed. This was also confirmed through personal communication with an official of the Dams Implementation Unit of Sudan.

Policies have been screened and reviewed for their relevance. It is evident that in terms of improving policies to better articulate environmental flows, the entry points would be:

- Environmental Protection Policy (2001)
- The Water Policy of 2007
- The Water Resources Act (WRA)
- Integrated Water Resources Management Policy and Strategy (2007)

Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow policies and contents of such policies.

A response to the questionnaire prepared by this study indicates the following: *“EF releases from Roseires, Sennar and Jabal al-Awlyia dams implemented by the General directorate of dams, Ministry of Water Resources and Electricity. For instance the EF releases from Sennar, is to supplement the natural flow of the river by maintaining a minimum flow in the river downstream of Guneid, of 5 million m³ per day when possible.”* In terms of relevant institution for managing environmental flows in Sudan the *Ministry of Water Resources and Electricity* has the required mandate. The MEPD and the HCENR are also institutions to be involved in the management of environmental flows. It should be noted that no assessment of capacities and capabilities of the ministries to handle issues of environmental flows is available. It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

As indicated in Section 3 of this report, it is became clear that environmental flows are only released in ad-hoc manner at some of the dams and no specific scientific studies are done to determine the quantity and timing of the environmental flows and no specific legal requirement for environmental flows is currently available.

4.4.9 Tanzania:

The Water Resources Management Act No.11/2009 and the Water Supply and Sanitation Act No.12/2009 were enacted recently. The WRMA No.11/09 was passed by the National Assembly of the United Republic of Tanzania on 28th April 2009 and assented by the President on 12th May 2009.

The Act No 11/2009 under Part IV Article 13/3 states that *“The Minister shall be assisted in the discharge of his duties under this WRM Act by the Director of Water Resources.”*

The Act also has established the Basin Water Board (replacing the Central Water Board) in respect of each water basin and Catchment and Sub-catchment Water Committees. The National Water Board which shall be an advisory board to the Minister on matters related to multi-sectoral coordination in integrated water resources planning and management as well as resolution of national and international water conflicts.

Tanzania Water Resources Management Act (WRMA) (2009)

The WRMA of 2009 in Article 3 under interpretations defines the reserve as follows: *““reserve” means the quantity and quality of water required for*

(a) satisfying basic human needs by securing a basic water supply for people who are now or who shall in the reasonably for near future, be

(i) relying upon

(ii) taking water from; or

(iii) being supplied from the relevant water resources; and

(b) protecting to protect aquatic ecosystem in order to secure ecologically sustainable development and use of the relevant water resources.

[...] the Minister, the National Water Board, Basin Water Boards and all public bodies shall, when exercising any statutory power or performing any statutory duty, take into account and give effect to the requirements of the reserve”

The Act further states:

“(2) Subject to subsection (1), the preference for water allocation shall be for

(a) domestic purposes;

(b) environmental reserve; and

(c) socio economic activities depending on the availability of water resources.”

Specific provisions of the Act on environmental flow/reserve are stated in Part VI Article 33.

“(1): The Minister shall, by notice in the Gazette, determine the reserve for the whole or part of each water resource which has been classified under this part.

(2) A determination of the reserve shall ensure that adequate allowance is made for each aspect of the reserve.

(3) The Minister, Basin Water Boards and all public bodies shall, when exercising any statutory power or performing any statutory duty, take into account and give effect to the requirements of the reserve.”

Tanzania National Water Policy (2002)

The Tanzanian National Water Policy is among the very few policies in the Nile Basin countries that explicitly articulate policy provisions related to environmental flows. It is the existence of such policy provisions that encouraged studies such as the Pangani River Basin environmental flows study supported by International Union for Conservation of Nature (IUCN), the United Nations Development Programme (UNDP), the Global Environment Fund (GEF) and the European Union.

The policy recognizes the importance of environmental flows and prioritizes water use such that *“[...] water for basic human needs in adequate quantity and acceptable quality will receive highest priority. Water for the environment to protect the eco-systems that underpin our water resources,*

now and in the future will attain second priority and will be reserved." Former⁹ Ministry of Water and Livestock Development of the United Republic of Tanzania (2002).

According to Chris Dickens (2011) the National Water Policy (NAWAPO) was passed in 2002 and places emphasis on environmental water management, including provisions for environmental flows, maintenance of water quality and protection of surface and groundwater resources. The environmental flow provisions are based on economic, livelihood and biodiversity values.

The policy's section on environment states that:

"In-stream flows or environmental flows and levels are necessary for riparian biodiversity, wetland systems, freshwater-seawater balance in deltas and estuaries. Reduction of water volume affects aquatic life by reducing dissolved oxygen and supply of nutrients. For example, terrestrial and aquatic animal species in the Great Ruaha National Park (Rufiji Basin) suffer from depleted dry season flows caused mainly by dry season irrigation in the Usangu plains" Former Ministry of Water and Livestock Development of the United Republic of Tanzania (2002).

The following guiding principles are provided in the environment section of the National Water Policy (2002):

- *"Water related activities should aim to enhance or to cause least detrimental effect on the natural environment,*
- *The allocation and consumption of water for environmental purposes shall be recognized and given appropriate considerations,*
- *Water for the environment shall be determined on the best scientific information available considering both the temporal and spatial water requirements,"*

The Water and the Environment section of the policy provides clear objective and explanation including actions to be taken with regards to environmental flows. The objective states: *"[...] To have in place water management system which protects the environment, ecological system and biodiversity."* and proceeds to explain that water is critical to ecological systems and to the maintenance of the environment, Former Ministry of Water and Livestock Development of the United Republic of Tanzania (2002).

According to the former Ministry of Water and Livestock Development of the United Republic of Tanzania's National Water Policy (2002) *"The ecological systems include wetlands, floodplains, estuaries and coastal zones. Such systems serve important hydrological and ecological functions such as biophysical filters, safeguard biological diversity, and maintain sea and freshwater balance. [...] In order to protect ecological systems and biodiversity which, together, are [an] important part of sustainable water resources system the following will be undertaken.*

⁹ Please refer to below "Summary of Findings" for Tanzania.

- (i) *Water for the environment, in terms of quantity and quality, and levels, and for both surface and groundwater resource shall be determined on the best scientific information available considering both the temporal and spatial water requirements to maintain the health and viability of riverine and estuary ecosystems, and associated flora and fauna.”*

Tanzania has other relevant policies and strategies that include:

- Environmental Management Act (EMA) (2004)¹⁰
- The Environmental Impact Assessment and Audit Regulations (2005)
- Water Sector Development Programme 2006-2025 (WSDP) (2006)
- National Water Sector Development Strategy 2006-2015 (NWS) (2008)
- The Wetlands and Wildlife Policy (2010)
- Water Supply and Sanitation Act No 10/2009
- National Water Policy (NAWAPO) (2002)

Tanzania: Summary of Findings

A number national policies and legislation related to water and environment are available and are constantly being updated.

The Water Resources Management Act No.11/2009 and the Water Supply and Sanitation Act No.12/2009 were enacted recently to repeal and replace Water Utilization Act (WUA) Cap 331 and WWA Cap 272 respectively. This new development has resulted in dissolving the Ministry of Water and Livestock Development of the United Republic of Tanzania (2002) and established the Ministry of Water Resources, the Basin Water Board and Catchment and Sub-catchment Water Committees.

Although there is no a standalone environmental flow policy, Tanzania is one of the few countries in the Nile Basin that indirectly refers to environmental flows and ecosystem water requirements as part of their National Water Policy (2002): *“Water for the environment to protect the ecosystems that underpin our water resources, now and in the future will attain second priority and will be reserved.” Former Ministry of Water and Livestock Development of the United Republic of Tanzania (2002).*

Policies have been screened and reviewed for their relevance. It is evident that the NAWAPO of Tanzania, demonstrates that there is clear appreciation of environmental flows at policy level in stating:

¹⁰ The Environmental Management Act, 2004 No. 20 of 2004 (EMA) is a comprehensive legislation dealing with protection of environment degradation.

“In-stream flows or environmental flows and levels are necessary for riparian biodiversity, wetland systems, freshwater-seawater balance in deltas and estuaries. Reduction of water volume affects aquatic life by reducing dissolved oxygen and supply of nutrients”.

The guiding principles provided in the environment section of the National Water Policy clearly outlines the specific measures to be taken in order to establish the reserve (environmental flows).

According to GLOWS – FIU (2012) *“The reserve is generally defined as the minimum water levels that must be left in the system in order to sustain, as a first priority, basic human needs and aquatic ecosystems.”*

In terms of relevant institution for managing environmental flows in Tanzania the Water Division within the Ministry of Water Resources has the required mandates. It should be noted that no assessment of the capacity and capability of the authority to handle issues of environmental flows is available.

However Tanzania has already taken steps in the right direction with regards to establishment of environmental flows that needs to be strengthened. In fact taking into consideration the relatively advanced stage of development with regards to environmental flows in Tanzania, relevant lessons may be learnt to support establishment of environmental flows in the Nile Basin. The establishment of environmental flows in the Nile Basin may benefit from similar studies such as “the Pangani River Basin environmental flows study” and also from Tanzania’s experience in policy formulation specific to environmental flows.

Along with Kenya and Rwanda, Tanzania, is the only country that has researched study on environmental flows. Please refer to Section 3.4.1.

4.4.10 Uganda:

According to the Ministry of Water and Environment of the Government of Uganda (2010) *“The Policy Committee on the Environment was established by the National Environment Act as a sub-committee of the cabinet. It is chaired by the Prime Minister and consists of ten ministers responsible for natural resources, [namely]:*

- *Agriculture and Fisheries;*
- *Finance and Economic Planning;*
- *Education;*
- *Health;*
- *Lands, Housing and Urban Development;*
- *Local Government;*
- *Gender and Community Development;*
- *Wildlife and Trade and Industry.*

The Policy Committee on Environment provides policy guidance and oversight to the National Environment Management Authority (NEMA). It also harmonizes the sectoral roles and responsibilities over the range of environmental issues across its jurisdiction. The Committee plays a critical role in integrating environmental considerations into the policies, plans and programmes of the respective sectors and subsectors under its jurisdiction.

The Ministry of Water and Environment (MWE) has the responsibility for setting national policies and standards, managing and regulating water resources and determining priorities for water development and management. It also monitors and evaluates sector development programmes to keep track of their performance, efficiency and effectiveness in service delivery. MWE has three directorates:

- *Directorate of Water Resources Management (DWRM),*
- *Directorate of Water Development (DWD) and the*
- *Directorate of Environmental Affairs (DEA)."*

In accordance with the feedback from stakeholders, the DWRM is responsible for administration of environmental flow through a permit system under the Water Act (1995).

National Environment Management Policy (1995)

According to the Republic of Uganda (1995) the key policy objectives of the National Environment Management Policy (NEMP) are to:

- *"Enhance the health and quality of life of all people in Uganda and promote long-term, sustainable socio-economic development through sound environmental and natural resource management and use;*
- *Integrate environmental concerns in all development policies, planning and activities at national, district and local levels, with full participation of the people;*
- *Conserve, preserve and restore ecosystems and maintain ecological processes and life support systems; especially conservation of national biological diversity;*
- *Optimise resource use and achieve a sustainable level of resource consumption;*
- *Raise public awareness to understand and appreciate linkages between environment and development; and*
- *Ensure individual and community participation in environmental improvement activities."*

National Water Policy (1999)

"The National Water Policy (NWP) promotes a new integrated approach to manage the water resources in ways that are sustainable and most beneficial to the people of Uganda. This new approach is based on the continuing recognition of the social value of water, while at the same time giving much more attention to its economic value." This policy sets the framework for the

water resources management and development and guides development efforts” Gitonga (2011).

The Water Act (1995)

The Water Act’s goal is to *“provide for the use, protection and management of water resources and supply; to provide for the constitution of water and sewerage authorities; and to facilitate the devolution of water supply and sewerage undertakings.”*

The objectives of the act relevant to environmental flows are:

- *“(c) to allow for the orderly development and use of water resources for purposes other than domestic use, such as the watering of stock, irrigation and agriculture, industrial, commercial and mining uses, the generation of hydroelectric or geothermal energy, navigation, fishing, **preservation of flora and fauna** and recreation in ways which minimize harmful effects to the environment;”*
- *“(d) to control pollution and to promote the safe storage, treatment, discharge and disposal of waste which may pollute water or otherwise harm the environment and human health.”* (Government of the Republic of Uganda, 1995)

National Environment Regulations (1999)

These regulations were made to curb discharge of harmful wastes into the streams and lakes of Uganda. This is also in direct response to the transboundary nature of all the river basins Uganda shares with its neighbours.

It puts into place the general obligations for an industry or establishment to *“install at its premises, anti-pollution equipment for the treatment of effluent chemical discharge emanating from the industry or establishment”* Government of Uganda (1995).

The National Environment Act (1995)

The National Environment Act creates the National Environment Management Authority and assigns it key functions related to policy development, coordination of government ministries, and ensure the integration of environmental concerns in overall national planning.

Uganda has a number of policies related to water and the environment that include:

- National Environment Regulations Wetlands, Riverbanks and Lakeshores Management (2000)
- National Environment (Hilly and Mountainous Areas Management) Regulations (2000)
- Water Act Cap 152 (1995)
- Water Resources Regulations (1998)
- Environmental Impact Assessment Regulations (1998)

Uganda: Summary of Findings

A number national policies related to water and environment are available and are constantly being updated. Although there seems to be general appreciation of environmental flows issues in Uganda, specific policy with regards to environmental flows is not clearly articulated in any of the policies or acts reviewed, which has been confirmed by the received stakeholder feedback. Policies have been screened and reviewed for their relevance. It is evident that in terms of improving policies to better articulate environmental flows, the entry points would be

- National Water Policy
- The Water Act 1995
- The National Environment Act (1995)
- National Environment Regulations Wetlands, Riverbanks and Lakeshores Management (1999)

For the future implementation of environmental flows it is important to consider the Water Release and Abstraction Policy for Lake Victoria.

Since the process of introducing amendment to national policies varies from one country to another, it is not possible to recommend the specific nature of the needed amendments in relation to environment flow. It would however be helpful to consider and make use of the experiences of countries such as South Africa and Australia in formulating environmental flow policies and contents of such policies.

In terms of relevant institution for managing environmental flows in Uganda the Policy Committee on the Environment, the NEMA and the MWE have the required mandates.

It should be noted that no assessment of capacities and capabilities of the ministries to handle issues of environmental flows is available.

It has to be stated that assigning institutional responsibilities can only be done at a national level and following national laws. The purpose of indicating the possible candidate national institution for managing environmental flow is therefore not to pre-empt national processes but to indicate the conclusion of this preliminary policy and institutional review.

4.5 Key findings and messages from the policy review relevant to establishing environmental flows in the Nile Basin.

Regional frameworks such as the Nile Cooperative Framework Agreement (CFA), the Nile Basin Sustainability Framework (NBSF); NBI initiated policies and strategies such as the NBI Environmental and Social Policy (ESP) (2013), NBI Wetland Management Strategy, Khartoum Declaration on Nile Basin Environment Management Cooperation, and regional and international organizations policies and guidelines such as International Hydropower Association (IHA) Sustainability Guidelines (2004) IGAD Regional Water Resources Policy, International Commission on Large Dams Committee on Environment all incorporate provisions relevant to environmental flows. The Nile Basin Initiative can build up on these provisions as part of the effort to establish environmental flows in the Nile Basin. A summary of these provisions are stated below:

- The CFA has a provision that can serve as a basis for establishing environmental flows in the Nile Basin: *“The principle that Nile Basin States take all appropriate measures, individually and, where appropriate, jointly, for the protection and conservation of the Nile River Basin and its ecosystems.”*
- The NBSF also stresses the necessity of *“assessing flow changes that might be brought about by the construction and operation of water-related developments and evaluating a range of potential flow scenarios, including the determination of environmental flows.”*
- The NBI ESP provides an objective that states *“to provide support to Nile Basin countries for the protection and conservation of critical Nile Basin environmental resources.”*
- In the Khartoum Declaration all of the Nile Basin countries have committed to *“managing the Nile Basin environment by giving due attention to its water and land resources, wetlands and biodiversity and addressing the impacts of climate change.”*
- The IHA Sustainability Guidelines (2004), advises that *“operating schedules should, where necessary and practicable, incorporate environmental water release patterns (including environmental flows) within the operational framework for the supply of power.”*
- IGAD Regional Water Resources Policy states *“member States shall endeavour to reserve a basic minimum flow for the environment in all river basin and aquifer management plans.”*

The assessment of the principal regional frameworks, policies, international conventions, and declarations has clearly shown the importance of environmental flows for the sustainable development of the Nile resources. The Nile Basin Initiative policy and strategy instruments that are already in place set the scene for future work in the areas of environmental flows at basin and national levels. Beyond the guidance document on environmental flows the necessity of policies and legal frameworks at national level are also evident from the above assessment of policies and frameworks, which can be summarized as follows:

- In most of the Nile Basin countries explicit policies on environmental flows are non-existent. However from the national policy and institutional review above, one can notice that provisions for environmental flows are contained in a number of national policies and programs, albeit being scanty and lacking comprehensiveness. Environmental flows are considered in an ad hoc manner on project by project basis. Preliminary consultations with the Ministry of Water, Irrigation and Energy of Ethiopia confirms this situation. In Tanzania there are policy provisions referring to environmental flows and encouraging research based efforts in establishing environmental flows are evident in Kenya and Tanzania.
- The absence of policy and guidelines for environmental flows has led to the situation where in most of the Nile Basin countries it is consultants that study and design hydraulic infrastructure that propose environmental flows for specific projects.
- Environmental flow policies and guidelines that can coordinate the actions of the many actors managing water resources in the Nile Basin is a prerequisite to establish environmental flows in the Nile Basin.

The following principles for the provision of “water for ecosystems” (see Box 3) are useful to refer to during the formulation process of environmental flow policies and provisions.

“Principle 1. River regulation and/or consumptive use should be recognized as potentially impacting on ecological values.

Principle 2. Provision of water for ecosystems should be on the basis of the best scientific information available on the water regimes necessary to sustain the ecological values of water-dependent ecosystems.

Principle 3. Environmental water provisions should be legally recognized.

Principle 4. In systems where there are existing users, provision of water for ecosystems should go as far as possible to meet the water regime necessary to sustain the ecological values of aquatic ecosystems while recognizing the existing rights of other water users.

Principle 5. Where environmental water requirements cannot be met due to existing uses, action (including reallocation) should be taken to meet environmental needs.

Principle 6. Further allocation of water for any use should only be on the basis that natural ecological processes and biodiversity are sustained (that is, ecological values are sustained).

Principle 7. Accountabilities in all aspects of management of environmental water should be transparent and clearly defined.

Principle 8. Environmental water provisions should be responsive to monitoring and improvements in understanding of environmental water requirements.

Principle 9. All water uses should be managed in a manner that recognizes ecological values.

Principle 10. Appropriate demand management and water pricing strategies should be used to assist in sustaining ecological values of water resources.

Principle 11. Strategic and applied research to improve understanding of environmental water requirements is essential.

Principle 12. All relevant environmental, social, and economic stakeholders will be involved in water allocation planning and decision making on environmental water provision.”

Box 3: ARMCANZ/ANZECC National Principles for the Provision of Water for Ecosystems (Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) and Australian and New Zealand Environment and Conservation Council (ANZECC), 1996)

4.6 Relevant international experiences in Environmental Flows policies and institutions

In the following section an overview on relevant international experiences with the establishment of Environmental Flows and corresponding policies and practices is provided.

South African Water Policy (1998)

The South African National Water Act (1998) makes provision for the creation of a **reserve** of water in each river basin to meet basic human needs and protect river ecosystem health. **The Reserve** is an allocation of water for the basic human needs (i.e. there is a policy of 25 litres of water per person per day) and the river ecosystem (i.e. the Ecological Reserve). In simple terms these are the water requirements that must be met before other users (i.e. industry and agriculture) are permitted to abstract water. **South Africa was the first country in the world to legislate for the concept of the Ecological Reserve (EF) and provide this Reserve as a right of law.** South Africa has also undertaken in excess of 1000 Environmental Flow Assessments (EFAs), but has been able to implement only a portion of these in any detail. However the EF requirement of every catchment and sub-catchment has been determined at a low-confidence level and has been used in all levels of planning and development.

The National Biodiversity Strategy Action Plan (NBSAP) (2005)

In accordance with (Cadman, M., et al., 2010) , the National Biodiversity Strategy Action Plan (NBSAP) demonstrates the resolve of South Africa to address issues of biodiversity with the following lessons that can be summarized as follows:

- Political commitment to national policies and seriousness in adopting and implementing international conventions;
- Policies and strategies should be holistic and should recognize the interconnectedness of environment, socio-economy and culture of the people;
- SA has strong and knowledge based institutions that have capabilities to *“bridge the science-policy-implementation divide”*

The SADC Regional Water Policy (2005)

The Southern African Development Community Regional Water Policy of August 2005, highlights two policy statements on environment flow:

a) “The environment is recognised as a resource base and a legitimate user of water in the SADC region and Member States shall adopt all necessary strategies and actions to ensure that the environment is sustained.”

b) “Member States should, in their mechanisms for allocating water resources among many users, allocate sufficient water to maintain ecosystem integrity and biodiversity including marine and estuarine life.”

The policy further explains the importance of allocating sufficient water to maintain ecosystem integrity and biodiversity and releasing flows below dams to maintain minimum stream flows to sustain wetland habitats.

Relevant to the Nile basin is the provision which states *“for shared watercourses, all the Watercourse States should agree on the quantity of water for sustaining the environment. Such quantities will vary with the specific nature of the environment, seasons, and prevailing flows. SADC will need to develop common methodologies for determining environmental flow”* (SADC 2005).

The establishment of environmental flows in the Nile Basin may draw conclusions on lessons learnt from the approach South Africa follows in policy formulation and implementation.

Lessons learnt from South Africa

Rafik Hirji and Richard Davis (2009) state that the following lessons can be learnt

- *“A progressive policy and legislation, a strong scientific knowledge base and capacity, and a wide commitment and energy for change, [...] [as well as] widespread social support for [environmental flows establishment] [are important]”;*
- *“It is difficult to introduce an ecological reserve in catchments where the water resource was already fully allocated under the old riparian doctrine.”*
- *“Introducing the ecological reserve has proven to be difficult because there is little acceptance that the reserve is intended to provide the goods and services on which poorer segments of society depend.”*
- *“extensive consultation [is required] in the policy and legislation [formulation but has] proven to be time consuming to implement and [...] slowed down the production of catchment strategies and the determination of the ecological reserve.”*
- *“The policy and the legislation do not require that best available scientific knowledge is included in the determination of environmental water requirements. [But] it may prove to be a limitation [...] when] difficult decisions have to be made between water for the environment and water for consumption.”*

Australian Capital Territory Water Resources Act 2006 and Water Resources Environmental Flow Guidelines (2013)

According to the Environment and Planning Directorate of the Australian Capital Territory Government (2006): *“The Environmental Flow Guidelines are a[n] [...] instrument under the Water Resources Act 1998 that set out the **environmental flow** requirements needed to maintain aquatic ecosystems. [...] Environmental flows are the flows of water in our streams, rivers and impoundments that are necessary to maintain aquatic ecosystems. We rely on our waterways for a range of functions including biodiversity and conservation, irrigation and domestic water supply. Waterways need to be healthy to provide these functions. The Environmental Flow Guidelines need to identify those components of flow from this variable flow regime necessary to maintain stream health. One way to do this is to specify environmental flows that mimic the flows that would occur naturally.”*

The Water Resources Act 2007 of Australia that has become effective on 22/08/13 states the following objectives (Australian Capital Territory, 2007):

- *“to ensure that management and use of the water resources of the Territory sustain the physical, economic and social wellbeing of the people of the ACT while protecting the ecosystems that depend on those resources; and*
- *to protect aquatic ecosystems and aquifers from damage and, where practicable, to reverse damage that has already happened; and*
- *to ensure that the water resources are able to meet the reasonably foreseeable needs of future generations.”*

The Act provides detailed provisions on how to formulate and approve environmental flows guidelines, defines and details out water access entitlement, licensing, administration, and detailed enforcement mechanisms including incentives and punitive measures. It also provided definition and concepts of terms included in the Act.

Lessons learnt from Australia

Australia’s experience in the establishment and management of environmental flows provides exemplary lessons that may benefit the establishment of environmental flows in the Nile Basin. Lessons may be learnt in terms of the process followed in the formulation of environmental flows policies and legal frameworks, preparation of guidelines, institutional arrangement and implementation and monitoring of environmental flows guidelines.

Exchange visits of Nile Basin stakeholders and their Australian counterparts and use of expertise from Australia during the early stages of environmental flow establishment in the Nile Basin can facilitate the process and will assist in charting an NBI action plan for establishing environmental flow in the basin.

Mexico Regulatory frame work and private public participation (1992)

The National Water Commission of Mexico, created in 1989, is an administrative, normative, technical, consultative and decentralized agency of the Mexican government, whose mission is to “[...] *manage and preserve national waters and their inherent goods in order to achieve sustainable use, with joint responsibility of the three tiers of government (federal, state, and municipal) and society as a whole.*” (National Water Commission, 2015, July 01).

Mexico’s National Water Law, passed in 1992, provides the legal framework for water management in Mexico. It states that the use of the nation’s water or the right to discharge wastewater will be carried out by concessions from the Federal Executive Branch, through the National Water Commission of Mexico.

Article 41 of the Law states *“The Federal Executive can issue a decree to reserve completely or partially the national waters to guarantee the **minimum flows for ecologic protection including the conservation of essential ecosystems.**”*

Article 86 states, *“Sets the commission responsibilities to promote the **national water reserves or the ecologic reserve** according to the law to preserve the wetlands.”*

The Mexican Standard for environmental flows sets the procedures and technical specifications to determine the environmental flows regime for rivers and water bodies in basins.

Mexico has also a “National Water Reserves Program” for environment which is a private –public initiative of the National Water Commission that involves the World Wildlife Fund (WWF) and Intra-Mexican Development Bank. The program’s goal is to establish water reserves for environmental purposes in 189 basins before 2018.

In the programme a water reserve is defined as an annual volume with environmental significance that flows to protect biodiversity and give environmental services (water supply, agricultural production, fisheries, and flood control).

Lessons from Mexico

A well-articulated policy, institutional arrangements with clear mandates and responsibilities, provision of environment guidelines and standards and innovative programs such as public – private partnership are commendable characteristics for a successful establishment and functioning of environmental flows.

The unique experience of Mexico is the national Water Reserves Program which aims to establish environmental flows in 189 basins before 2018 with the participation of private banks and non-governmental institutions (NGOs). An in-depth assessment of Mexico’s experience in establishing environmental flows will be useful to inform the NBI environmental flows guidelines.

International Water Management Institute (IWMI)

IWMI (2007) states that *“**policy support and enforcement** should ensure that water is released and abstraction is limited to maintain the recommended environmental flows. An understanding of the impacts of flow alteration through the construction of hydraulic infrastructure in river basins is crucial in shaping basin wide and national policies on hydropower development and water diversion structures.*

IWMI’s (2007) key findings regarding the establishment of environmental flow include the following:

- *“The ecological status of rivers needs to be assessed before making any decisions to develop water resources.*

- *Simple tools are already available for rough-and-ready—though quite reliable—assessments of rivers’ ecological status and the environmental flows needed to maintain or improve this status.*
- *These tools can encourage greater investment in building national capacities—to develop detailed methods tailored to specific contexts and to engage ecologists and hydrologists who know their local rivers.*
- *River flow data is essential, so should be made more accessible. Other priorities are to inventory the ecologically relevant information that already exists in-country and to quantify how hydrology affects river ecology.*
- *Policy support and enforcement should ensure that water is released and abstraction is limited to maintain the recommended environmental flows.”*

A key finding that can be added to this list, is that a loss of ecosystem services as a result of a failure to provide the EF, would result in a loss of services on which society depends.

For a detailed assessment of environmental flow policies, conventions and declarations on a global scale, please refer to Section 3.2 in Background Document 1: “Environmental Flow Assessment: A review of global practices and experiences”.

4.7 Challenges of the NBI Region in establishing Environmental Flows with respect to policies and institutions

Water and environment policies in all of the Nile Basin countries have been evolving over time and invariably have gone through a series of updates. In most cases relevant institutions of water and environmental affairs have also undergone various changes.

While this trend shows the willingness of countries to update their respective policies in line with new developments and knowledge, frequent changes in institutional arrangements may also pose problems for implementation of policies and strategies, due to discontinuities and loss of institutional knowledge.

As shown above, countries of the Nile are presently giving low priority to the necessity of environmental flows in most of their hydraulic infrastructure projects. Only few countries have explicitly articulated the issue of environmental flows and included it in their policies.

Most of environment-related activities taking place are funded by external donors and NGOs. This reflects the very low priority and lack of real political commitment to establishing EF by most countries. Among the Nile Basin countries, Tanzania and Kenya seem to be the only countries that have policies and strategies for environmental flows. Rwanda and Ethiopia have general statements and provisions in their respective water policy documents.

Based on the findings of Kamal Ghodeif (2013), the following challenges are given for the context of the Nile Basin:

- There is a general lack of public awareness in almost all of the Nile Basin countries regarding the magnitude of the environmental problems and their negative effects;
- The regulatory approach is not effective because standards generally do not allow the flexibility necessary for the polluter and the regulatory agency to negotiate quick agreement on a compliance schedule;
- There is no sufficient coordination and cooperation among the ministries and governmental institutions regarding the issue of environmental protection. There is also a lack of adequate authorities with necessary resources to carry out inspection and enforcement;
- Environmental and hydrological data need consistency and continuity over time, however in most of the Nile Basin countries, data sets have begun as part of a development project supported by donor funds and are not consistent.
- Also applicable in the context of the Nile Basin is the finding of Rafik Hirji and Richard Davis (2009) *“Introducing environmental flows management into cross-border and transboundary rivers and groundwater systems is particularly difficult because of the inherent complexity of dealing with multijurisdictional issues. There needs to be agreement between the countries of the basin on the allocation of water for environmental purposes before environmental water allocations can be made.”*

4.8 Conclusion

4.8.1 Establishment of Environmental flows in the context existing policy frameworks

The country level policy and institutional assessment has shown that in most of the Nile Basin countries explicit and well-articulated policy provisions for environmental flows do not exist. This situation calls for considering amendments to existing policy frameworks.

Policy reforms or amendment to national policies and legislation is not a straight forward process and procedures differ from country to country. Generally the process may need to start with a needs assessment followed by a research based proposal for policy modification. This may be preceded by an awareness raising campaign at all levels.

Knowledge and experience exchange with countries that have instituted environmental flows may be a good point to start the process of establishing environmental flows in the Nile Basin. Appropriate countries would be South African and Australia.

The text in the following Box 4 outlines some of the steps to be taken as listed by Megan Dyson, Ger Bergkamp and John Scanlon (2003):

“It is important to be well prepared when getting into environmental flows. Five critical steps need to be kept in mind:

- **Step 1.** *Know what environmental flows is about. Use appropriate sources of information, to be as well informed as possible on the issue;*
- **Step 2.** *Know the river basin and the resources it contains, both natural and manmade. [...]*
- **Step 3.** *Know about the river benefits to local people who rely on the river. [...]*
- **Step 4.** *Know what local groups have been established that have an interest in the basin. [...]*
- **Step 5.** *Know the local laws and what they have to say about managing water resources and the other natural resources of the basin.”*

Box 4, Five steps for establishing EF

Policy and institutional requirements and actions necessary to establish EF on the ground in the context of the Nile Basin are discussed below based on previous sections of this report.

Except for Tanzania and Kenya, the Nile Basin countries do not have explicit, clear and comprehensive policy provisions with regards to environmental flows. Policies need to be based on detailed situation assessments, scientific studies and justifications. Policies need to be followed with implementation mechanisms and compliance monitoring.

Clear policy objectives and policy statements that outline the intentions of countries in establishing environmental flows need to be articulated followed by associated responsibilities of governments, civil society and the public at large in implementing the policy.

Those countries that have policies for environmental flows should evaluate the effectiveness of these policy provisions in the management and implementation of environmental flows. Policies are necessary instruments but are not sufficient to establish and implement environmental flows. Environmental flows in the context of transboundary river basins pose complex challenges.

The CFA can serve as a basic regional policy framework for establishing environmental flows in the Nile Basin. As a common regional policy framework supplemented with relevant provisions to support the establishment of environmental flows in the basin, it may serve as a starting point to prepare encompassing basin wide and transboundary environmental flows guidelines.

The NBI guidelines need to outline ways in which NBI countries may use the provisions of the CFA and the planned environmental flows guidelines to construct their respective national policies and implementation mechanisms. This will offer opportunities to streamline national policies and help address the transboundary challenges.

Laws are necessary to implement policies. Constitutions of countries have general and overarching provisions for water and environment management on the basis of which policies and laws are formulated.

Effective laws are laws that have both incentive and punitive measures to ensure the implementation of environmental flows guidelines and for public offices and individuals to comply with policies and laws. Lessons from countries such as Australia, South Africa and Mexico may be relevant to NBI countries to draw conclusions on effective policy implementation, legislation and standardization.

Environmental flows can be established if there are strong institutions with the required human resources and budget. Institutions must have clear and unambiguous mandates which are not overlapping with other similar institutions. Institutional capacity in scientific knowledge and legal aspects of environmental flows, including capacities in creating and sustaining public awareness in issues of environmental flows is at the heart of a successful institutional mechanism to establish Environmental Flows in the context of the Nile Basin.

The NBI guidelines should explore ways in which institutional arrangements at the NBI level and national level institutions can work in a coordinated manner.

4.8.2 Priority actions for water managers to successfully establish environmental flows.

IWMI (2007) lists the following priorities for action which are relevant for the establishment of environmental flows in the Nile Basin:

- *“Assess the environmental requirements for water and check the health of rivers before deciding on any development.*
- *Make simple preliminary assessments of environmental flows as a first step towards more comprehensive assessments.*
- *Make use of the information that already exists on the ecology of rivers and the relationships between ecology and hydrology.*
- *Make aquatic ecology, where possible and feasible, a priority in water allocation—at least in basins or parts of basins which are under-developed at present.*
- *Take action to keep environmental flows at the level required to maintain rivers in their desired condition*

4.8.3 Operations and compliance monitoring

Compliance monitoring ensures that environmental flows policies, legal requirements and guidelines are enforced. Setting standards is a prerequisite for compliance monitoring.

Two types of monitoring are appropriate for environmental flows:

- Compliance monitoring to determine if the environmental flow rules were followed (i.e. were the environmental flows delivered to the river as specified?)

- Routine monitoring to test the hypothesis that environmental flows will lead to improved river health (i.e. did river health improve as expected in response to the implementation of environmental flows?)

This monitoring and assessment framework is based on the following key steps in accordance with Cottingham P. et. al (2005):

- *“Define the scope of the program and its objectives*
- *Define the conceptual understanding of flow–ecology relationships and the questions (hypotheses) to be tested*
- *Select variables to be monitored*
- *Determine the study design, accounting for the specific activities and location*
- *Optimize the study design and identify how data are to be analysed*
- *Implement the study design*
- *Assess whether the environmental flow have met the specific objectives and review the conceptual understanding and hypotheses.”*

In the context of the Nile Basin, a basin wide policy and institution represented by the CFA and NBI Secretariat/NB Commission (when the CFA is ratified) exist. However the following points reflect necessary conditions for setting up a compliance monitoring system at a basin level:

- basin wide environmental flows guidelines,
- agreed standards and variables to be monitored,
- appropriate technical unit under the NBI with scientific and technical capacity,
- setting of target to establish environmental flows in selected segments of the Nile river system,
- agreement among NB countries on environmental flows water allocation

Similarly Nile Basin countries need to amend their respective policies and legal framework to adequately accommodate the requirements of environmental flows establishment, setting up of appropriate institutions with scientific and technical capacity and should demonstrate political commitment and willingness to establish and implement environmental flows in their respective territories.

Compliance monitoring systems at basin and national level may require some kind of agreement or protocol to be endorsed by participating countries in order for the system to function properly.

The current institutional arrangement and NBI governance have the necessary capacity and mandate to develop environmental flow guidelines and support the policy reform process at the national level, including instituting a compliance monitoring system.

The sub-regional technical offices, the Eastern Nile Technical Regional Office and the Equatorial Lakes Subsidiary Action Program, may play crucial roles in supporting the initiation of policy reforms to accommodate environmental flow provisions.

The main drivers for initiation and implementation of environmental flow in the Nile basin are enabling policies and institutions that are manifested by clearly articulated national policies, legislation, guidelines and capacitated institutions with clear mandate, scientific and technical capacities. It is essential that at the Nile basin level and the two subsidiary action programs level there exist equivalent enabling policy and institutional arrangement that have ability to provide coordination and technical backstopping to member countries.

In conclusion and recalling some of the salient discussions at the Kigali workshop, the following need to be noted with regards to NBI's roles & capacity:

- To formulate (follow up) and (implement in the long term) environmental flow guidelines;
- To support the policy reform process at the national level;
- To institute a compliance monitoring system;
- To provide coordination and technical backstopping to member countries;
- To handle transboundary aspects of environment flow;
- To institute environment flow assessment in projects of NBI Subsidiary Action Programs
- To recruit and train environmental flow champions (youth, women, farmers, etc.)

At national level the following need to be noted:

- The main drivers for initiation and implementation of environmental flow in the Nile basin are enabling policies and institutions.
- Understanding the process and procedures of putting in place clearly articulated national policies, legislation and guidelines for environmental flow are important and any plan should take note of and appreciate the time it takes to formulate appropriate environment flow policy.
- The plan to establish environmental flow in the Nile basin countries should take into consideration and appreciate the time it takes to have capacitated institutions with clear mandate, scientific and technical capacities.

It is important to engage in lobbying for political buy-in and public support for establishing environmental flow.

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