NILE BASIN INITIATIVE

NILE BASIN INITIATIVE

NBI Core Agricultural Functions Study

Proposed Framework, Options and Functions for a NBI/ Nile River Basin Commission Agricultural Agenda

Final Report

SIWI RAMBOLL

A Consortium for Capacity Development

Table of Contents

Table of acronyms

ADB ..African Development Bank
ANRBC .....African Network of River Basin Organisations
AMCOW African Ministerial Council on Water
AMU Arab Maghreb Union
AU ....African Union
AUC ..African Union Commission
ASARECAAssociation for Strengthening Agricultural Research in Eastern and Central Africa
AWF .African Water Facility
CAADP .....Africa Agriculture Development Programme
CAF ...Core Agriculture Functions
CBD...Convention on Biological Diversity
CFA ...Cooperative Framework Agreement
CIDA .Canadian International Development Agency
CIWA Cooperation in International Waters in Africa
COM .Council Of Ministers
COMESA Common Market for Eastern and Southern Africa
CRA...Knowledge Based Components
DRC ..Democratic Republic of Congo
DSS ...Decision Support System
DST ..Decision Support Tool
EAC ..East African Community
EC .....European Commission
ECA ..Economic Commission for Africa
ECCAS .....Economic Community of Central African States
ECOWAS Economic Community of West African States
ENCOM Eastern Nile Council of Ministers
ENPM .....Eastern Nile Planning Model
ENSAP .....Eastern Nile Subsidiary Action Programme
ENSAPT Eastern Nile Subsidiary Action Programme Team
ENTRO .....Eastern Nile Technical Regional Office – Addis Ababa
EU ....European Union
GEF ...Global Environmental Fund
GIZ ...German Technical Cooperation Agency
GNP ..Gross National Product
IDS ...Institutional Design Study
ICPAC Climate Prediction and Application Centre - IGAD
IGAD Intergovernmental Authority on Development
ISP ....Institutional Strengthening Project
IWRM .....Integrated Water Resources Management
IWMI.International Water Management Institute
KM ...Knowledge Management
KOBWA .....Komati Basin Water Authority
KJOF..Komati Joint Operations Forum
LBO ..Lake Basin Organisation
ITPGRFA International Treaty on Plant Genetic Resources for Food and Agriculture
LVBC .Lake Victoria Basin Commission
LVEMP .....Lake Victoria Environmental Management Programme
MARD .....Vietnamese Ministry of Agriculture and Rural Development
MDB..Murray-Darling Basin
MBDA .....Murray-Darling Basin Authority
MRC .Mekong River Commission
MTR .Mid -Term Review
MONROEVietnamese Ministry of Natural Resources and Environment

NBA ..Niger Basin Authority
NRBC Nile River Basin Commission
NRBC-COM Council of Ministers of the Nile River Basin Commission
NRBC-SEC Secretariat of the Nile River Basin Commission
NRBC-TAC Technical Advisory Committee of the Nile River Basin Commission
NBCBN Nile Basin Capacity Building Network
NBA...River Niger basin Authority
NBD .Nile Basin Discourse
NBI ...Nile Basin Initiative
NBTF Nile Basin Trust Fund
NBSF Nile Basin Sustainability Framework
NEL-COMNile Equatorial Lakes Council of Ministers
NEL-TAC Nile Equatorial Lakes Technical Advisory Committee
NELSAP Nile Equatorial Lakes Subsidiary Action Programme
NELSAP-CU NELSAP Coordination Unit - Kigali
NELTAC Nile Equatorial Lakes Technical Advisory Committee
NEPAD New Partnership for Africa Development
Nile-SEC Nile-Secretariat – Entebbe, NBI Headquarters
Nile-TAC Nile Technical Advisory Committee
Nile-COM Nile Basin Council of Ministers
NIS ...Nile Information System
NTEAP Nile Trans-boundary Environmental Action Project
UNECA United Nations Economic Commission for Africa
ORASECOM Orange-Senqu River Commission
PANAFCON Pan African Implementation and Partnership Conference
PMU .Project Management Unit
RATP .Regional Agriculture and Trade Project
RBO ..River Basin Organisation
REC ..Regional Economic Communities
RRBO Red River Basin Organisation
SADC Southern African Development Community
SAP ...Subsidiary Action Programme
SSO ..Sahara and Sahel Observatory
SVP ...Shared Vision Programmes
SWOT Strengths, Weaknesses, Opportunities, Threats
TPTC..Tripartite Permanent Technical Committee
TAC ...Technical Advisory Committee
TECCONILE Technical Committee for the Promotion of the Nile Basin
ToR....Terms of Reference
UCC ..UNEP Collaborating Centre on Water and Environment - Denmark
UNCCD .....UN Convention to Combat Desertification
UNEP UN Environmental Programme
UNDP .....United Nations Development Programme
UPOV International Union for the Protection of New Varieties of Plants
WB ....World Bank
WTO..World Trade Organisation
ZAMCOM Zambezi Watercourse Commission

Executive summary/Résumé

English

The Nile Basin Initiative (NBI) Core Agricultural Functions study was launched in late 2010, and work started in earnest in January 2011. The submission of the present report, with a translated French version, concludes the assignment.

The report, summarised in this executive summary, provides information on a number of issues. Specifically, these are:

(i) Background to the study and its objectives;

(ii) Overview of water and agriculture in the basin, a review of basin cooperation and the comparative advantages of NBI having an agriculture agenda;

(iii) what core agriculture functions entail;

(iv) Extensive background reviews of river basin organisations around the world;

(v) A review of some NBI programmes of relevance to the agriculture sector;

(vi) Presentation of "framework, options and functions", the main section of the report; and

(vii) A section called "turning good intentions into action". This last section focuses on three issues: the links between drivers for change in the region and the proposed agriculture functions, a cost estimate of two initial activities per function, and six proposed "first" activities that NBI may choose to implement. These have been selected based on their potential to attract funding, addressing apparent needs, and providing a basis for further work.

Objectives

The Terms of Reference (ToR) of this assignment state that the objective is to "*prepare framework and options for an agricultural agenda for the Nile Basin Initiative (NBI) and the future Nile River Basin Organisation*", with the motivation for the study being that "*it remains unclear what role the NBI should play, what its mandate should be in this area, and how the core agricultural functions are to be implemented".* These themes are discussed and analysed in the following report.

All the basin riparian states face serious water resource management challenges in the years to come as a consequence of rising populations, improving standards of living, and possible negative effects of climate change. Important questions to ask include how much water is currently being used for food production in the basin, consumed by the basin population, and potentially available for future enhanced food production? The answers to such questions will provide a framework for the proposed agricultural functions and their focus.

Water, agriculture and development in the Nile Basin

With a basin population of approximately 160 million, the required amount of water to sustain those people is about 190,000 m cm (based on 1200 m^3 per person/y, primarily being water used in food production). This amounts to about 10% of the total basin precipitation. A small percentage of this is linked to irrigated agriculture, with the remaining consumed in rain fed agriculture. Of the remaining 90% most water is consumed by grasslands, a bit less by woodlands, and very little (about half a percent) enters the Mediterranean Sea. Almost all the water consumed in irrigated agriculture is used in Sudan and Egypt,

whereas almost all rain fed agriculture takes place in the upstream states of the White Nile plus Ethiopia. Rain fed agriculture produces about 60-70% of the total basin food production, with irrigated agriculture supplying the balance.

In addition to these water flows, virtual water enters the Nile basin in the form of imported food. This amounts to roughly 41,000mcm/y, while the export amounts to roughly 14,000mcm/y, including both crops and livestock (ibid). The net imported is thus about 27,000mcm/y. These 'flows' are considered to contribute substantially to the water security of Sudan and Egypt in particular; Egypt imports more than half its food. As an average, the basin depends on imported food to supply around 20-25 per cent of its total needs (FAO, 2000); and this figure has increased in recent years. Based on these figures and a review of scientific reports, the following conclusions are made:

1. *The basin cannot feed its growing population* and support a rising urban middle class by focusing on irrigated agriculture only. Instead, a comprehensive basin development approach must be adopted; involving rain fed and irrigated agriculture, the importation of food, and the development of an export-oriented service and industrial sector to pay for the imported food.

2. *Rain fed agriculture produces most of the food* found in the basin today and will continue to do so in the future. In addition, the potential to increase land and water productivity in rain fed agriculture is high.

3. *Water and land related catchment functions are of vital importance*. The catchment functions provide a steady, regulated flow of clean (silt, debris and pollutant free) water and are critical to the region's future. If the runoff turns increasingly seasonal, fill dams with silt, damage turbines and contain pollutants, everybody will suffer. A focus on upstream water and land management provides a basis for downstream investments in irrigated agriculture and power infrastructure.

Nile River Basin Commission (NRBC) is one of many organisations engaged in natural resources management and development in East and North Africa. Why should it be involved in agriculture? What is the comparative advantage of NBI in that field? And if it is involved, what are the criteria for engagement?

We believe that NBI should be involved in agriculture. The reasons are twofold. First; the agreement that establishes the NRBC (the CFA) provides the institutional arrangements for a regional "water management" organisation to function. So – let's make use of all that work. Further, agriculture is by far the single largest human water-use sector in the basin (including both rain fed and irrigated agriculture) and should thus be associated with a regional water resource management organisation. NBI and the future commission also represent vital expertise in water and linked resources, either directly or through its partners. These are important arguments in favour of NBI pursuing an agricultural programme. Second: There are no alternatives to NBI for pursuing an agricultural programme in the basin. There are many organisations with some sort of link to agriculture (trade, research, education); but none with the type of comprehensive approach that NBI has on water, land and development.

While the objectives of NBI, "t*o develop the Nile Basin water resources in a sustainable and equitable way to ensure prosperity, security, and peace for all its peoples"* (www.nilebasin.org) are broad, our interpretation of NBI/NRBC's mandate within the agriculture-development arena is as follows:

1. All activities promoted should focus on the connection between water, agriculture and trans-boundary cooperation;

2. Two or more countries shall benefit from an activity;

3. There are clear win-win opportunities from having a shared approach;

4. Activities require the support (or approval) from basin countries, which NBI/NRBC can facilitate.

The first three are valid to all activities, the last when appropriate. In other words, it is our view that NBI/NRBC should not become a *general support organisation of agriculture in the basin*. This would imply too broad and unfocused engagement. It should focus: the connection to water should always be apparent.

Whereas agriculture issues falling outside the above criteria are better suited to be engaged by other organisations..

When the above criteria are adequately satisfied, what role should NBI/NRBC have in the area of agriculture? Essentially the role envisaged has four components outlined below::

1. *To facilitate processes that lead towards a set of intended activities*. Facilitation may include the coordination of arranging funding for a research study or the transfer of experience from one country to another. This is a management function.

2. *To implement the activities themselves*. This may consist of supporting partners in the basin with information from the DSS model. This is a development function.

3. *To support processes and activities that other organisations and initiatives are managing*. Support may consist of an expert advisor, source of information or facilitator. Examples may include providing expertise to COMESA on the potential to export meat to the Gulf region.

4. *To act as a lobbyist.* There are routine decisions taken by various institutions at national/ regional/ continental/global levels that have profound impact on agriculture in the basin. NBI should engage in such decisions making processes by for example sharing relevant information or working through media to raise awareness amongst decision-makers and the public.

What are "core agricultural functions"?

"Goggling" the term "core agriculture functions" on the internet provides few hints. It is not a common term. In our understanding, core agricultural functions are such functions that an RBO has developed specifically in order to promote agriculture in its area of jurisdiction. They are not functions that only indirectly support agriculture, like a general move towards improved water quality, based on the understanding that this is "good". On the contrary, they are functions explicitly connected to enhanced or improved agriculture in a basin and supported by an RBO. It is also important to note that functions are not activities. Activities belong to a project proposal and its subsequent implementation, while the functions are more strategic, providing a direction and a role.

Linked to the task of developing core agricultural functions for the NBI/NRBC, what is the long term goal of water, agriculture and development in the Nile basin? We propose the following:

1. *No more famines*. Famines are rarely caused only by unfavourable physical conditions, such as poor rains or soil erosion, or by too many mouths to feed. On the contrary, it is typically inappropriate human systems that limit food production, its distribution, and subsequent consumption.

2. *Food production growth outpaces population growth*. As a minimum, the level of food security should grow faster than the population in the basin. This also highlights the population factor in ensuring that all have enough to eat.

3. *Produce more food with less water.* While there is still plenty of water in the Nile basin, the situation may change in the near future. Such farming practices that produce more with less water must be developed, disseminated and applied.

4. *Increased food production promotes sustainable basin management.* To many this may seem like a contradiction but it is not. To maximise food production over long periods of time requires much knowledge and excellent soil, water and nutrient management practices. Such farms are sustainable components in the landscape and cause no danger to the basin at large.

5. *The agriculture sector should also contribute to export earnings* .There will be a need to import staple food from abroad in order to feed expanding urban populations. The agriculture sector, as well as other sectors, should contribute to the payment of such food.

Background studies

A major task of this assignment was to undertake a global review of basins and their RBO's potential agricultural functions. Eight RBOs were reviewed, as desk-studies, while three were visited for in-depth reviews. However, explicit core agricultural functions, as defined above, were rare. Some of the main lessons learned are summarised below.

1. *Value good quality land*. Local councils in California, USA, are pro-active in blocking urban encroachment onto valuable farmland. Campaigns are carried out, by-laws enacted and "correct" values promoted;
2. *Dam management*. Along the Komati River in South Africa and Swaziland a number of dams have been built. They are today all managed in a coordinated way in order to provide a reliable irrigation water supply throughout the basin.
3. *Data management*. The sharing of data is often difficult in trans-boundary RBOs. In the Mekong River Commission (MRC) this has been addressed and an easy, informal system of data sharing is in place. Some of the data is even available on-line, while some may be obtained through requests from the different countries through an easy procedure.
4. *Management of water quality*. The rivers of India are typically heavily polluted, to the extent that both river and groundwater have been made useless. There is environmental regulation in India, but the laws are not followed.
5. *Too much bureaucracy kills a local economy.* The state has for too long been heavy and overly intrusive, thus impeding the open market and competition. This has led to serious deficiencies in the agriculture sector in the Moulouya basin in Morocco.
6. *The use of subsidies in India.* The Green Revolution in India was , and still is, based on a comprehensive system of massive government subsidies to the agriculture sector. All types of inputs are heavily subsidised, having both good and bad effects, including a near food security situation in the country. But it also says something about central Government's focus: the rural farming communities are politically important.

The lack of core agricultural functions was particularly true for international, trans-boundary river basins. RBOs in such cases are primarily concerned with water allocation between sub-national states, environmental issues, and hydropower.

Framework, options and functions

Based on the ToR for this assignment, initially a framework defining alternative core agriculture functions and options was developed. The framework is based on two institutional alternatives (one based on a request by the Client and one based on work done by the Institutional Design Study (IDS) group) and three alternative operational models on how to address agriculture in the Nile basin. These were used to generate four options for organizing the functions. Below are the proposed agricultural functions are described. (In the final section specific functions (and sub-functions) are attached to the four options)The two *institutional alternatives* are as follow:

1. *Option 1: The Nile Basin Initiative*. The current NBI structure should be maintained and strengthened based the Strategic Action Plan and turned into a permanent institution.
2. *Option 2: A Nile River Basin Commission*. A Nile River Basin Commission be established based on the Cooperative Framework Agreement. This agreement provides the basis for a commission and assigns it a mandate and a set of functions to perform.

The three *operational models* are as follows:

1. *Re-active Model*: This is focused purely on the management of water – essentially making sure there is enough water in the system to satisfy the needs and/or rights of various water users, thus avoiding or mitigating conflict.

2. *Pro-active Model*: it plays an explicit role in promoting increased agricultural production (more "crop per drop") in the basin.

3. *Development Mode*l: promotes broad-based socio-economic development across the basin, allocating water to users and sectors which provide the most "job per drop" or "welfare per drop".

The institutional alternatives are grouped together with the operational models, and four *combinations* are identified:

1. *Nile Basin Initiative-Reactive Model*. Nile SEC and NBI at large will play a limited role in the basin's agricultural sector. It will provide some coordination, a focal point for inter-state formalities and assist on a case by case basis.

2. *Nile Basin Initiative-Proactive Model*. Nile SEC and NBI at large play an active role in promoting agriculture at the national or sub-basin scale. It is an active organisation, looking for opportunities to promote water efficient agriculture, sustain the environment, and encourage individual or sub-basin based countries to cooperate and achieve benefits from such endeavours.

4096. *Nile Basin Initiative-Development Model*. Attempts by Nile SEC and NBI at large to play an active role in promoting food security in the basin are hampered by a limited mandate. In order to promote food security, the power and trust embedded in the CFA is needed, and that is not the case in this combination.

4096. *Nile River Basin Commission-Development Model***.** The NRBC plays a very active role in promoting agriculture at the national, sub-basin and full-basin scales. By having the support of the CFA and its associated principles, vision and trust and focusing on a full IWRM approach (thus having a food security focus on activities linked to agriculture), the full potential of the basin resources can be put to use for development and growth.

There are four *agricultural functions* and each is divided into several sub-functions. All the functions and sub-functions are described in detail in Chapter 6 of this report. For each function the role of NBI/NRBC is outlined; how the proposed function compares to existing NBI functions and projects, the comparative advantage of NBI/NRBC to address the function area, and relevant experience from basins and RBOs reviewed.

These four combinations are linked to a set of functions, depending on the character of the combination, different types of functions are attached. In Table 3 the combinations and associated functions are presented.

Functions and sub-functions are outlined below. The first, second and fourth functions should be regarded as valid for any type of agriculture production; rain fed, irrigated, greenhouses, livestock, aquaculture and more. The third function is linked to blue water development, that is, the building of multi-purpose dams for power generation and irrigation water, and the development of irrigation schemes.

Function 1: Policy formulation and Development. This function provides the basis for cooperation across borders – the formulation of shared, basin-wide policies *and/or guidelines*. It is not necessarily traditional policies, determined after much work, negotiation, and government decisions; rather, it is a flexible approach to get countries to agree on the many issues that bring them together under a shared basin context. It may sometimes require formal policy development, on issues such as water allocation or international trade, but in many other instances it is more like a set of shared guidelines. Whether it is a "policy" or a set of "guidelines", it provides a common framework to align and harmonise national approaches (policies, guidelines), enables shared approaches for communication and information sharing, and offers conflict resolution mechanisms. There are 6 sub-functions associated with this function.

1. **Policy on knowledge management**

4097. **Policy on water and agriculture standards**

4098. **Policy on basin agricultural planning**

4099. **Policy on foreign investments in basin agriculture production**

4100. **Policy on agricultural openness and conflict resolution**

4101. **Policy on market development**

Function 2: Knowledge management. Knowledge is data put into a context and analysed, linked to a particular need (use), benefitting from research and experience gained over time. The function focuses on the *knowledge content* of the many activities that NBI/NRBC performs, today and in the future. It has two main components:

(i) Knowledge development and

(ii) Knowledge dissemination. The function is engaged in the collecting of raw data, converting it into information, adding experience and spatial studies, and thus generating *knowledge*. From that it focuses on sharing and dissemination of information and knowledge through diverse means, formats and stakeholder platforms. There are 5 sub-functions associated with this function.

1. **Develop and implement applied KM strategies**
2. **Data collection, storage and sharing**
3. **Develop, regulate and monitor standards and agreements**
4. **Agricultural research and knowledge development**
5. **Applied training, including the dissemination of knowledge**

Function 3: Basin development. Basin development links resources with their sustainable and efficient use and thus generates more output per volume of water (and other resources) used. Compared to more centrally-located management functions, this function focuses on actions, investments and the generation of beneficial outputs. This can be done either directly or indirectly (through sustainable watershed management practices), and is as such located as close to the users as possible. This then implies a sub-basin focus which will over time benefit both people and the environment in the basin. The function includes four types of sub-functions:

1. **Plan basin development;**
2. **Agricultural watershed management;**
3. **Facilitate project preparation; and**
4. **Support project implementation and management.**

Function 4: Market development. In the coming years, considering that strong processes like urbanization, industrialisation, increasingly liberalized economies, and cross-border trade are at work and will affect the region; it is likely that an increasing share of the food produced will be sold on national, regional, or international markets. This will make farming an increasingly commercial activity, where the cost of inputs like seeds, fertilizers, energy, and water, together with the market price for products on sale, will become progressively more important. These changes have to be balanced by paying more attention to marketing, trade and the access to information by the agriculture sector. The function has two sub-functions.

1. **Marketing and the promotion of agriculture trade**
2. **Make market information easily available**

Turning good intentions into action

In the final chapter the question "What will shape food, water and development in the Nile basin in years to come?" is posed, and linked to the proposed agricultural functions. A number of drivers for change are identified and three conclusions made;

1. *Export earnings in foreign hard currencies must have a priority right* to available green and (primarily) blue water resources given that they are water-use efficiently produced. These earnings, together with other capital transfers, are today paying for about 20 per cent of all food consumed in the basin, and this rate will most likely increase in the near future. Therefore future export earnings must be secured.

2. *Maintain critical upstream catchment functions*. Probably 30-40 per cent of the basin population lives in true "upstream positions", that is, they live in areas supplying some 100 million people downstream with water. These people depend on the amount, distribution and quality of water from upstream. Thus, upstream catchment functions must be maintained. Upstream rain fed agriculture development (increased production and efficiency) and sustainable land management should be given priority over further expansion of irrigated agriculture.

3. *Promote dedicated, focused and state-of-the-art knowledge*. Both of the above issues depend heavily on knowledge. There has to be capacity in the region to develop context-specific knowledge, and in the case of land, water and agriculture, need to have a listening organisation able to handle Terms of References, contracts and facilitated funding, and deliver appropriate knowledge products to the users.

Linked to the issue of moving from intentions to action, is the costing of functions to be implemented. We have chosen the following approach: For each sub-function the cost at two levels of implementation is given. The first level is "to get the function going", something small but still noticeable. The second level will give functions "direction and substance", albeit still modest in size and early in the process of making a difference in the basin. Further activities will depend on prevailing conditions, priorities, and funding opportunities. We have not attempted to calculate some theoretical "total" cost per function. It depends on too many unknown factors and would only send wrong messages. In most cases the cost is between USD 25,000 and 80,000 per sub-function. The list is provided in Table 4.

In the final section, six goals are linked to four sub-functions identified as potential first activities in an implementation programme for NBI/NRBC agricultural functions (Table 8). All except one are preparatory activities. The exception is a project to make better use of already existing knowledge within the NBI system. Each sub-function is presented by the activities required to implement it, expected outcomes, and necessary arrangements. The cost is stated in Table 7. The four sub-functions can get started with a total of USD 170,000 (preparatory work) plus the project costing USD 210,000.

French

L'étude sur les Fonctions Agricoles de Base de l'IBN a été lancée fin 2010, avec le démarrage effectif du travail en Janvier 2011. La transmission du présent rapport, avec la version traduite en français met fin à la mission.

Le rapport dont le présent résumé exécutif fait la synthèse donne des informations sur un certain nombre de questions. Ce sont plus précisément (i) le contexte de l'étude et ses objectifs; (ii)un aperçu sur l'eau et l'agriculture dans le bassin, de même que la revue de la coopération dans le bassin et les avantages comparatifs pour l'IBN d'avoir un agenda agricole ; (iii) Ce qui soutiens les fonctions agricoles de base ; (iv) une revue exhaustive des Organisations de bassins à travers le monde (v), la revue de quelques programmes pertinents de l'IBN ; (vi) la présentation des « cadre, options et fonctions, la partie principale du rapport ; (vii) une section dénommée « transformation des bonnes intentions en actions ». Cette dernière partie est axée sur trois questions : les liens entre les facteurs/forces de changement dans la région et les fonctions agricoles proposées, une estimation des coûts de deux activités initiales par fonction, et six « premières » activités proposées, que l'IBN pourrait choisir de mettre en œuvre. Celles-ci ont été sélectionnées se basant sur les potentialités qu'elles ont à attirer des fonds, satisfaire à des besoins tangibles et établir une base pour des travaux futurs.

Objectifs

Les termes de référence (TdR) de la mission stipulent que l'objectif général de la mission est «*de préparer un cadre et des options pour un agenda agricole de l'Initiative du Bassin du Nil et la future organisation de bassin du Nil* » l'étude se définissant alors *« qu'il n'était toujours pas clarifié le rôle que l'IBN devrait jouer, ce que devrait être son mandat dans ce domaine, et la manière dont les fonctions agricoles de base seront mises en œuvre* ». Ces questions là et de nombreuses autres sont traitées dans le présent rapport.

Tous les pays riverains font face à de sérieux défis en matière de ressources en eau qui se présenteront les années à venir, sous forme de conséquence de la croissante démographique, l'amélioration du niveau de vie, et les effets négatifs probables des changements climatiques. Les questions importantes à se poser sont alors quelle est la quantité d'eau actuellement utilisée pour la production alimentaire dans le bassin, celle consommé par la population du bassin, et le potentiel disponibles pour une production alimentaire améliorée dans le futur? Les réponses à ces questions fourniront un cadre pour les fonctions agricoles proposées et leurs axes d'intervention.

L'eau, l'agriculture et le développement dans le bassin du Nil

Avec une population du bassin d'environ 160 millions d'habitants, la quantité d'eau nécessaire pour subvenir aux besoins de ces personnes est d'environ 190 000 millions de mètres cubes (basé sur les 1200 m3 par personne/an, constitués principalement de l'eau utilisée pour la production alimentaire). Cette quantité équivaut à environ 10% de la précipitation totale du bassin. Un faible pourcentage de cette quantité est lié à l'agriculture irriguée, le reste étant utilisé dans l'agriculture pluviale. Des 90% restants les prairies prennent la plus grande quantité, un peu moins les zones boisées, et très peu, environ un demi-pourcent, se déverse dans la mer Méditerranée. Presque toute l'eau utilisée dans l'agriculture irriguée est utilisée au Soudan et en Egypte, alors que presque toute l'agriculture pluviale a lieu dans les États en amont du Nil blanc, et l'Ethiopie. L'agriculture pluviale produit environ 60-70% de la production alimentaire totale du bassin, le reste provenant de l'agriculture irriguées.

En plus de ces flux d'eau, l'eau virtuelle entre dans le bassin du Nil sous la forme d'aliments importés. Cela équivaut à environ 41 000 millions de mètres cubes/an, tandis que les exportations correspondent à environ 14 000 millions de mètres cubes / an, y compris les cultures et le bétail (ibid.). Le volume net importé est donc environ 27.000 millions de mètres cubes / an. Ces «flux» sont considérés comme contribuant à la sécurité de l'eau du Soudan et de l'Egypte, en particulier. L'Egypte importe plus de la moitié de sa nourriture. En moyenne, le bassin dépend de la nourriture importée à environ 25% (FAO,

2000) et ce chiffre a augmenté ces dernières années. Sur la base de ces chiffres et un examen des rapports scientifiques, les conclusions suivantes sont faites:

1. *Le bassin ne peut nourrir sa population croissante*, et satisfaire aux besoins d'une classe moyenne croissante en milieu urbain en se contentant de l'agriculture irriguée seulement. Une approche globale du développement du bassin doit être choisie, impliquant l'agriculture pluviale et irriguée, l'importation de denrées alimentaires, et le développement d'un service orienté vers l'exportation et le secteur industriel permettant de payer pour les aliments importés.

2. *L'agriculture pluviale produit la plupart de la nourriture dans le bassin aujourd'hui* - et il en sera ainsi dans l'avenir. En outre, le potentiel d'augmenter la productivité des terres et de l'eau dans l'agriculture pluviale est très bonne.

3. *Les fonctions régulatrices liées à l'eau et aux sols des bassins versants sont d'une importance vitale.* Ces fonctions permettent de fournir un débit régulier d'eau de bonne qualité (sans trop de limons, de débris ou de polluants) et sont critiques pour le futur de la region. Si le ruissellement devient essentiellement saisonnier et contribue à remplir les barrages de dépots, endommage les turbines et transporte des polluants, tout le monde souffrira. Il est essentiel de mettre l'accent sur la gestion de l'eau et des sols à l'amont des bassins pour envisager des investissements en irrigation et en hydroélectricité à l'aval dans de bonne conditions.

L'IBN (et la future NRBC, la Commission du Bassin du Fleuve Nil) est seulement un des nombreux organismes engagés dans les ressources naturelles et le développement en Afrique de l'Est et du Nord. Pourquoi devrait-elle être impliquée dans l'agriculture après tout? Quelles pourraient être les avantages comparatifs de l'IBN dans ce domaine? Et si elle est impliquée, quels sont les critères pour cet engagement?

Nous croyons que l'IBN devrait être impliquée dans l'agriculture. Les raisons pour ceci sont de deux ordres. Premièrement: l'Accord Cadre de Coopération (CFA) qui établira une Organisation de Bassin du Nil fournit les arrangements institutionnels pour une organisation régionale de «l'eau» qui fonctionne - faisons usage de tout ce travail. Par ailleurs, l'agriculture est de loin l'activité humaine la plus grande consommatrice de l'eau dans le bassin (y compris l'agriculture pluviale et irriguée) et devrait donc être associée à une organisation régionale de l'eau. L'IBN et sa future commission représentent également beaucoup d'expertise dans l'eau et des ressources associées, que ce soit de manière directe ou à travers ses partenaires. Ceci est un argument important en faveur d'un programme agricole pour l'IBN. Deuxièmement: Il n'existe pas d'alternatives à l'IBN pour la conduite d'un programme agricole dans le bassin. Il ya beaucoup d'organisations ayant une certaine forme de lien avec l'agriculture (commerce, recherche, éducation), mais aucune n'a le type d'approche globale que l'IBN a sur l'eau, la terre et le développement.

Bien que les objectifs de l'IBN, «*de développer les ressources en eau du bassin du Nil d'une manière durable et équitable pour assurer la prospérité, la sécurité et la paix pour tous ses peuples*» (www.nilebasin.org) sont larges, notre interprétation du mandat de l'IBN / NRBC dans la sphère agriculture-développement est la suivante:

1. Toutes les activités promues devrait fortement mettre l'accent sur le lien entre l'eau, l'agriculture et la coopération transfrontalière;

2. Deux ou plusieurs pays bénéficient d'une activité;

3. Il y a une opportunité gagnant-gagnant évidente d'avoir une approche commune;

4. Les activités nécessitent le soutien (ou l'approbation) des pays du bassin, que l'IBN / NRBC peut faciliter.

Les trois premiers sont valables pour toutes les activités, pour la dernière c'est au cas échéant. En d'autres termes, il est de notre avis que l'IBN / NRBC ne doit pas devenir *une organisation de soutien général de l'agriculture dans le bassin*. Cela implique un engagement trop large et vague. Elle devrait se concentrer - la connexion à l'eau doit toujours être apparentes. Pour les questions agricoles ne relevant pas de ces critères, d'autres organisations sont mieux indiquées pour s'engager.

Lorsque les critères ci-dessus sont suffisamment satisfaits, quel rôle devrait alors avoir l'IBN / NRBC dans le domaine de l'agriculture? Essentiellement, l'un des quatre suivants:

1. *Afin de faciliter les processus qui mènent vers un ensemble d'activités souhaitées*. La facilitation peut impliquer la coordination de l'organisation du financement pour une étude de recherche ou le transfert d'expérience d'un pays à l'autre. Ceci est une fonction de gestion.

2. *Pour mettre en œuvre les activités elles-mêmes.* Il peut s'agir d'appuyer les partenaires dans le bassin par la mise à disposition de l'information à partir d'un modèle d'Outil d'Aide à la Décision. Ceci est une fonction de développement.

3. *Pour soutenir les processus et les activités dont d'autres organisations et initiatives ont la charge de la gestion*. L'appui peut consister à être un expert conseiller, une source d'information ou un facilitateur. Les exemples peuvent inclure la fourniture d'une expertise à la COMESA sur le potentiel d'exportation de la viande vers la région du Golfe.

4. *Agir en tant que lobbyiste*. Il ya des décisions prises tout le temps par diverses institutions aux niveaux national / régional / continental / mondial qui ont de profondes répercussions sur l'agriculture dans le bassin. L'IBN devrait s'impliquer dans la prise de ces décisions, par exemple à travers le partage d'informations pertinentes, ou en travaillant à travers les médias pour promouvoir l'intérêt que revêtent ces décisions.

Quels sont les «fonctions agricoles de base»?

Rechercher sur Google le terme «fonctions agricole de base» sur internet fournit peu de résultats. Ce n'est pas un terme commun. Dans notre entendement, les fonctions agricoles de base sont des fonctions qu'une Organisation de Basin a développées de manière spécifique afin de promouvoir l'agriculture dans son domaine de compétence. Il ne s'agit pas des fonctions qui appuient indirectement l'agriculture, comme un mouvement général vers une qualité d'eau améliorée, basée sur la compréhension que cela est «bon». Non, il y a des fonctions qui sont explicitement liées à l'agriculture renforcée ou améliorée dans un bassin et soutenues par une Organisation de bassin. Il est également important de noter que les fonctions ne sont pas des activités. Les activités font partie d'une proposition de projet et sa mise en œuvre, tandis que les fonctions sont plus stratégiques, fournissant une orientation et un rôle.

En rapport avec la tâche de développement des fonctions agricoles de base pour l'IBN / NRBC, quel est l'objectif ultime à long terme de l'eau, l'agriculture et le développement pour le bassin du Nil? Nous proposons ce qui suit:

1. *Plus de famines*. Les famines sont rarement causées par des conditions physiques défavorables, telles que des pluies insuffisantes ou l'érosion des sols, ou trop de bouches à nourrir. Au contraire, c'est en général des systèmes humains inappropriés qui limitent la production alimentaire, la distribution et la consommation par la suite.

2. *Le développement de la production alimentaire est plus rapide que la croissance de la population*. Au minimum, le niveau de sécurité alimentaire devrait croître plus vite que la population dans le bassin. Cela met en exergue aussi le facteur population pour s'assurer que tous aient suffisamment à manger.

3. *Produire plus de nourriture avec moins d'eau*. Bien qu'il reste encore beaucoup d'eau dans le bassin du Nil, la situation peut changer dans un proche avenir. Ces pratiques agricoles qui produisent plus avec moins doivent être élaborées, diffusées et utilisées.

4. *La production alimentaire accrue favorise la gestion durable du bassin*. Pour beaucoup cela peut paraître comme une contradiction, mais elle ne l'est pas. Maximiser la production alimentaire sur de longues périodes nécessite beaucoup de connaissances et d'excellentes pratiques dans la gestion du sol, de l'eau et des éléments nutritifs. De tels éléments sont des composantes durables dans la nature et ne causent aucun danger pour le bassin au sens large.

5. *Le secteur agricole devrait également contribuer aux recettes d'exportation*. Il y aura un besoin d'importer des denrées alimentaires de base provenant de l'étranger afin de nourrir les populations urbaines en

expansion. Le secteur de l'agriculture - ainsi que d'autres secteurs - doivent contribuer au paiement de ces aliments.

Etudes de base

Une tâche majeure de cette mission était de procéder à une revue générale des bassins et les fonctions agricoles des éventuelles Organisations de Bassins (OB) qui s'y trouvent. Huit OB ont été examinées, sur la base d'une étude documentaire au bureau, tandis que trois autres ont été visitées pour des investigations plus approfondies. Cependant, il faut noter que, ce que l'on désigne par fonctions agricoles de base, telles que définies ci-dessus, ont été très rares. Quelques-uns des principaux enseignements tirés sont résumés ci-dessous.

1. *La valorisation des terres de bonne qualité*. Les conseils locaux en Californie, Etats-Unis, sont très proactifs dans le blocage de l'empiètement urbain sur les terres agricoles précieuses. Les campagnes sont régies, par des lois adaptées et les valeurs «correcte» promues;
2. *La gestion de barrage*. Le long du fleuve Komati en Afrique du Sud et au Swaziland, un certain nombre de barrages ont été construits. Ils sont aujourd'hui tous gérés de manière coordonnée afin d'assurer un approvisionnement fiable en eau d'irrigation dans le bassin.
3. *La gestion des données*. Le partage des données est souvent difficile dans les OB transfrontières. Au niveau de la Commission du Fleuve Mékong (MRC) ceci a été réussi, et un système informel facile de partage des données est en place. Certaines des données sont même disponibles en ligne, tandis que d'autres doivent être demandées par les différents pays à travers une procédure simple.
4. *Gérer la qualité de l'eau*. Les fleuves de l'Inde sont généralement beaucoup plus pollués, au point où aussi bien les fleuves que les eaux souterraines ont été rendus inutilisables. Il existe une réglementation environnementale en Inde, mais les lois ne sont pas suivies.
5. *Trop de bureaucratie tue l'économie locale*. L'Etat a trop longtemps été lourd et trop intrusif, entravant ainsi le libre marché et la concurrence. Ceci a conduit à de graves lacunes dans le secteur agricole dans le bassin de la Moulouya au Maroc.
6. *L'utilisation des subventions en Inde*. La Révolution verte en Inde a été - et est toujours - basée sur un système complet de subventions massives du gouvernement au secteur agricole. Tous les types d'intrants sont fortement subventionnés, avec des effets à la fois bons et mauvais, y compris une situation de sécurité alimentaire dans le pays. Mais cela révèle aussi la priorité du gouvernement central : les communautés agricoles dans les zones rurales. Celles-ci ont été importantes sur le plan politique.

Le manque de fonctions agricoles de base a été particulièrement vrai pour les bassins fluviaux transfrontaliers internationaux. De telles OB sont principalement concernés par l'allocation de l'eau entre les Etats, les questions environnementales, et l'hydroélectricité,

Cadre, options et fonctions

Sur la base des termes de référence de la mission, au départ il a été développé un cadre de définition de fonctions agricoles de base et des options alternatives. Le cadre se fonde sur deux alternatives institutionnelles (l'une basée sur une demande formulée par le client et l'autre sur le travail effectué par le groupe sur l'étude de conception institutionnelle (IDS)),puis trois modèles opérationnels possibles sur la façon d'aborder l'agriculture dans le bassin du Nil. Cela génère ainsi quatre options pour l'organisation des fonctions. A la suite de cela les fonctions agricoles proposées ont été décrites. Dans une dernière section se trouvent consignées des fonctions (et sous-fonctions) spécifiques liées aux quatre options alternatives.

Le cadre est tel que décrit ci-dessus. Les deux *alternatives institutionnelles* sont les suivantes.

1. *Option 1: L'Initiative du Bassin du Nil. La structure actuelle de l'IBN est maintenue. Elle est renforcée se fondant sur le Plan d'Action Stratégique et transformée en une institution permanente.*

2. *Option 2: Une Commission du Bassin du Nil. Une Commission du Bassin du Nil est crée, fondée sur l'Accord Cadre de Coopération. Cet accord fournit une base pour une commission et lui attribue un mandat et un ensemble de fonctions à remplir.*

Les trois modèles opérationnels sont les suivants:

1. *Modèle réactif:*se concentre uniquement sur la gestion de l'eau - essentiellement s'assurer qu'il ya assez d'eau dans le système pour satisfaire les besoins et / ou des droits des différents utilisateurs d'eau, donc éviter ou atténuer les conflits.

2. *Modèle Proactif* : il joue un rôle explicite dans la promotion accrue de la production agricole (plus de «grains par goutte») dans le bassin.

3. *Modèle de développement* : Promeut un large développement socio-économique à travers le bassin, assure l'allocation de l'eau aux usagers et aux secteurs qui offrent le plus «d'emplois par goutte» ou de «bien-être par goutte».

Les solutions institutionnelles sont regroupées avec les modèles opérationnels, et quatre combinaisons sont identifiées:

1. *Initiative du Bassin du Nil– modèle réactif*. Le « Nile SEC » et l'IBN dans son ensemble jouent un rôle limité dans le secteur agricole du bassin. Il fournira une certaine coordination, un point focal pour les formalités interétatiques et apportera un appui au cas par cas.

2. *Initiative du Bassin du Nil– modèle proactif*. Le « Nile SEC » et l'IBN dans son ensemble jouent un rôle actif dans la promotion de l'agriculture à l'échelle nationale ou du sous-bassin. C'est une organisation active, à la recherche d'opportunités pour promouvoir une efficacité dans l'utilisation de l'eau pour l'agriculture, préserver l'environnement, et encourager les différents pays riverains ou les sous-bassins à coopérer et à obtenir des avantages de tels efforts.

3. *Initiative du Bassin du Nil- modèle de développement*. Les tentatives faites par le « Nile SEC » et l'IBN dans son ensemble pour jouer un rôle actif dans la promotion de la sécurité alimentaire dans le bassin sont entravées par un mandat limité. Afin de promouvoir la sécurité alimentaire, le pouvoir et la confiance intégrés dans l'Accord Cadre de Coopération (CFA) sont nécessaires, et ce n'est pas le cas dans cette combinaison.

4. *Commission du Bassin du Nil- modèle de développement*. Le « Nile SEC » et l'IBN dans son ensemble jouent un rôle très actif dans la promotion de l'agriculture à l'échelle nationale, sous-bassin et bassin. En ayant le soutien de l'Accord Cadre de Coopération (CFA) et les principes associés, sa vision et la confiance mutuelle, et en se concentrant sur une approche complète GIRE (donc ayant un accent sur les activités de sécurité alimentaire liées à l'agriculture), le plein potentiel des ressources du bassin peut être mis à utilisation pour le développement et la croissance.

Les fonctions agricoles sont au nombre de quatre. Chacune est subdivisée en plusieurs sous-fonctions. Toutes les fonctions et les sous-fonctions sont décrites en détail dans le chapitre 6. Pour chaque fonction le rôle de l'IBN / NRBC est décrit, la manière dont la fonction proposée se compare aux fonctions et projets de l'IBN existant, l'avantage comparatif de l'IBN / NRBC à faire face au secteur visé par la fonction, et l'expérience pertinentes à partir des bassins et des OB dont la revue a été faite.

Enfin, dans la dernière étape ces quatre combinaisons ont été munies d'un ensemble de fonctions. Selon la caractéristique de la combinaison, différents types de fonctions sont attachés. Les combinaisons et les fonctions associées sont présentées dans le tableau 3.

Dans le tableau ci-dessous sont décrites les fonctions et sous-fonctions. La première fonction, la deuxième et la quatrième devraient être considérées comme valables pour tous les types de productions agricoles;

pluviales, irriguées, l'élevage, l'aquaculture et plus encore. La troisième fonction est probablement plus liée au développement de l'eau bleue, c'est à dire la construction de barrages pour la production d'électricité et d'eau d'irrigation, et le développement de systèmes d'irrigation.

Fonction 1: formulation des politiques et développement. Cette fonction fournit la base pour la coopération transfrontalières - la formulation de politiques et / ou des directives communes à l'ensemble du bassin. Il ne s'agit pas nécessairement les politiques traditionnelles, déterminées après beaucoup de travail, de négociation et de décisions gouvernementales, mais plutôt une approche flexible pour amener les pays à s'entendre sur les nombreuses questions qui les rassemblent dans un contexte de bassin partagé. Il peut parfois nécessiter l'élaboration des politiques officielles, peut-être sur des questions telles que la répartition de l'eau ou le commerce international, mais dans de nombreux autres cas, c'est plutôt un ensemble de lignes directrices communes. Qu'il s'agisse d'une «politique» ou un ensemble de «lignes directrices», il fournit un cadre commun afin d'aligner et d'harmoniser les approches nationales (politiques, directives), permet des approches partagées pour la communication et le partage d'informations, et offre des mécanismes de résolution des conflits. Il ya 6 sous-fonctions associées à cette fonction.

1. **Politique sur la gestion des connaissances**
2. **Politique sur les normes sur l'eau et l'agriculture**
3. **Politique sur la planification agricole dans le bassin**
4. **Politique sur les investissements étrangers dans la production agricole dans le bassin**
5. **Politique sur l'ouverture agricole et la résolution des conflits**
6. **Politique sur le développement du marché**

Fonction 2: La gestion des connaissances. La connaissance est une donnée placée dans un contexte et analysés, liée à un besoin particulier (utilisation), et bénéficiant de la recherche et de l'expérience acquise au fil du temps. L'accent de la fonction porte sur le contenu des connaissances des nombreuses activités que l'IBN / NRBC effectue, aujourd'hui et dans l'avenir. Elle comporte deux composantes principales: (i) le développement des connaissances et (ii) la diffusion des connaissances. La fonction est engagée dans la collecte de données brutes, leur conversion en informations, en y ajoutant l'expérience et les études spéciales, et ainsi, générer des connaissances. A partir de là, elle se concentre sur le partage et la diffusion d'informations et de connaissances par divers moyens, formats et groupes cibles. Il ya 5 sous-fonctions associées à cette fonction.

1. **Développer et mettre en œuvre des stratégies de Gestion des connaissances**
2. **La collecte, le stockage et le partage des données**
3. **Élaborer, réglementer les normes et les accords et faire le suivi de la mise en œuvre**
4. **La recherche agronomique et le développement des connaissances**
5. **Formation appliquée, y compris la diffusion des connaissances**

Fonction 3: le développement du Bassin. Le développement met en relation les ressources et leur utilisation durable et efficace, et génère ainsi plus de résultats par volume d'eau (et autres ressources) utilisée. Par rapport aux fonctions de gestion plus centrales, celle-ci met l'accent sur l'action, les investissements et génère des résultats bénéfiques, soit directement soit indirectement (par le biais de pratiques durables de gestion des bassins versants), et est en tant que telle situées le plus près que possible des utilisateurs. Cela implique alors une orientation par sous-bassin. Cela au cours du temps bénéficiera à la fois aux populations et à l'environnement dans le bassin. La fonction comprend quatre types de sous-fonctions:

1. **Plan d'aménagement du bassin;**
2. **Gestion agricoles par bassins versants;**
3. **Faciliter la préparation des projets; et**
4. **Projets d'appui à la mise en œuvre et à la gestion.**

Fonction 4: Le développement du marché. Dans les années à venir, étant donnés que les processus puissants tels que l'urbanisation, l'industrialisation, les économies de plus en plus libéralisées et le commerce transfrontalier sont en cours et auront une incidence sur la région, il est probable qu'une part croissante de la nourriture produite sera vendue à l'échelle régionale, nationale ou sur les marchés internationaux. Cela fera de l'agriculture une activité plus commerciale, où le coût des intrants tels que semences, engrais, énergie et eau, ainsi que le prix du marché pourles produits en vente, deviendront progressivement plus déterminants. Ces changements doivent être équilibrés par une plus grande attention à la commercialisation, au commerce et à l'accès à l'information par le secteur agricole. La fonction comporte deux sous-fonctions.

1. **Le marketing et la promotion de l'agriculture commerciale**
2. **Rendre l'information sur le marché facilement disponible**

Transformer nos bonnes intentions en action

Dans le chapitre final se pose la question «Que sera le contour du volet « aliments, eau et développement» dans le bassin du Nil dans les années à venir», en relation avec les fonctions agricoles proposées. Un certain nombre de facteurs de changement sont identifiés et trois conclusions formulées:

1. *Les recettes d'exportation en devises étrangères fortes doivent avoir un droit de priorité*sur les ressources en eau verte et (surtout) bleu disponibles - étant donné qu'ils constituent une utilisation efficace de l'eau produite. Ces résultats, conjointement avec d'autres transferts de capitaux, payent aujourd'hui pour environ 20% de tous les aliments consommés dans le bassin, et ce taux va augmenter très probablement dans un proche avenir. Les recettes d'exportation futures doivent être sécurisées.

2. *Maintenir les fonctions essentielles de captage en amont*. Probablement 30-40% de la population du bassin vit dans les «positions amont», c'est à dire qu'elles vivent dans les zones alimentant en eau 100 millions de personnes située en aval. Ces personnes dépendent de la quantité, la distribution et la qualité de l'eau qui descend d'en haut. Ainsi, les fonctions de captage en amont doivent être maintenues. L'agriculture pluviale en amont devrait s'il fallait mettre une priorité, être en première position par rapport à l'expansion de l'agriculture irriguée.

3. *Promouvoir la connaissance dédiée, ciblée et de pointe*. Les deux points ci-dessus dépendent fortement de la connaissance. Il doit y avoir de la capacité dans la région pour développer des connaissances spécifiques au contexte, et en ce qui concerne la terre, l'eau et l'agriculture, avoir une organisation attentive au sujet, capable de gérer les termes de référence, les contrats et le financement - et d'offrir des paquets adéquats de «connaissances» pour les utilisateurs.

En rapport avec le passage de l'intention à l'action il y a l'évaluation des coûts des fonctions en cours de mise en œuvre. Nous avons choisi l'approche suivante. Pour chaque sous-fonction le coût à deux niveaux de mise en œuvre est donné. Le premier niveau est «d'avoir la fonction en cours de mise en œuvre», quelque chose qui peut être petit mais pour autant perceptible. Le second niveau donnera aux fonctions « un sens et de la substance», bien qu'encore modeste en taille, et à une étape assez tôt dans le processus de faire la différence dans le bassin. D'autres activités dépendront des conditions qui prévalent, des priorités et des possibilités de financement. Nous n'avons pas essayé de calculer certains coûts «totaux» théoriques par fonction. Cela dépend de trop de facteurs inconnus et ne ferait que transmettre de faux messages. Dans la plupart des cas le coût se situe entre USD 25.000 et 80.000 par sous-fonction. La liste est fournie dans le tableau 7.

Dans une dernière section (tableau 8) sont mentionnés 6 objectifs liés à quatre sous-fonctions identifiées comme premières activités potentielles dans un programme de mise en œuvre des fonctions agricoles de l'IBN / NRBC. Toutes sauf une sont des activités préparatoires. L'exception est un projet pour faire un meilleur usage des connaissances déjà existantes au sein du système de l'IBN. Chaque sous-fonction est présentée par les activités nécessaires pour sa mise en œuvre, les résultats attendus, et les arrangements nécessaires. Le coût est comme indiqué dans le tableau 7. Les quatre sous-fonctions peuvent démarrer avec un total de USD 170 000 (travaux préparatoires), plus le projet dont le coût est 210 000 USD.

1. Introduction

1.1. The Assignment

1.1.1 Background

The Nile Basin Initiative (NBI) is a partnership of the riparian states[1] that seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security through its shared vision of "sustainable socioeconomic development through the equitable utilisation of, and benefit from, the common Nile Basin water resources". NBI's *Strategic Action Programme* is made up of the *Shared Vision Programme (SVP) and Subsidiary Action Programmes (SAPs).* The SAPS are mandated to initiate concrete investments and action on the ground in the *Eastern Nile (ENSAP) and in the Nile Equatorial Lakes sub-basins (NELSAP).* This study falls under NELSAP.

The Nile Basin Initiative (NBI) through the NELSAP programme seeks to promote agricultural development and improved food security in the Nile Basin region. NBI has given the task of defining NBI agricultural core functions (CAF) to the NELSAP Regional Agricultural Trade and Productivity project (RATP) located in Bujumbura, Burundi.

NBI is currently undertaking studies on the institutional design (NBI-ISP) of a proposed Nile Basin River Commission (NRBC). The outcome of that study and potential, subsequent decisions about a future NRBC can have many impacts on future agricultural functions in the basin. On the other hand, the agricultural functions don't necessarily have to be integrated with the ISP study. Much can be promoted as stand alone functions irrespective of the institutional design.

The Nile River holds significant opportunities for win-win development that could enhance food production, environmental conservation, energy availability, transportation, industrial development, and other related development activities in the region. Cooperative water resources management can also serve as a catalyst for greater regional integration, both economic and political, with potential benefits possibly far exceeding those derived from the river itself.

1.1.2 Agriculture Functions Study

The NBI Core Agricultural Functions study was launched in late 2010, with work initiated in January 2011. It is being finalised in the fourth quarter of 2011 with the submission of this report (and a French translated version).

The study will assist NBI to develop core agricultural functions for a future permanent basin organisation. Such an organisation may take the shape of a basin-wide Nile Basin Commission, two or more sub-basin commissions, or a developed version of the current NBI structure. When it is necessary to specify sub-basin organisations, we do so. As agriculture is the main economic activity in the Nile basin, engaging some 70-80% of all people, and also the single largest human-managed consumer of Nile River water, it is obviously of key importance to a future NRBC to have an agriculture agenda. Likewise, agriculture, whether rain fed or irrigated, is also the single most important activity that impacts the river and thus the health of the river. Thus, the overall purpose of the assignment, "*to respond to the increasing request by riparian countries to promote agricultural development and improved food security in the Nile Basin region"*, has to be seen within the context of maintaining a healthy and productive river, sustainable management, and trans-boundary cooperation.

The study thus:

(i) Proposes a framework and options for a set of core agricultural functions for the Nile Basin Initiative and a future NRBC;

(ii) Ensures that this agenda is within overarching umbrellas of relevant, regional agreements;

(iii) Harmonises and ensures that the options presented are acceptable to key stakeholders in the

[1] *Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda, Eritrea is participating actively in the NBI as an observer.*

basin; and

(iv) Ensures that the proposed options take into considerations the outcome of the NBI-IDS study.

1.2 This report

The present report is the last in a series of reports. The assignment started in early January 2011 with an Inception Report, outlining how the consultant intended to undertake the assignment. A number of tasks were then performed, focusing on:

(i) reviewing basins with agricultural functions being performed;

(ii) detailing the institutional design options of a future Nile Basin Commission;

(iii) making a regional stakeholder assessment;

(iv) undertake a study tour for senior officers of NBI to the Cauvery River in Southern India; and

(v) reviewing agriculture policies of various national and regional organisations. These tasks constituted the basis for three reports, namely a report on the study tour to India; an Interim Report on proposed framework and options for an agricultural agenda in June 2011; and a short version report on proposed framework, functions and options for a Nile RBO agricultural agenda in July 2011.

The mentioned interim reports and associated comments have provided the Consultant with an input for this Final Report on proposed framework, options and functions for an agricultural agenda. It provides a structure (framework) to define different types of options (i.e. alternative sets of functions depending on intended goals) and altogether four types of functions. These four functions are then divided into sub-functions.

This report was submitted through a validation process by the RATP steering committee in mid-October. The final version will be presented by the Client to the Nile TAC in December.

Throughout the assignment an open, productive and very supportive dialogue has been maintained between the Consultant and the Client and individuals associated with the Client. This dialogue has greatly shaped the work and positively contributed to the present report. The Consultant is grateful for this support.

Listed below is a summary of comments made by the Client and the Consultant's response. The comments have been lightly edited.

1. *"The focus of the proposed functions is not necessarily food security, but efficient water use in agriculture. Food security could be handled by some other organisation"*. Response: There is no contradiction between the two. Improved water use efficiency will contribute towards achieving food security, which in turn requires improved water allocation and use efficiency to become a reality. Also, the national workshops very clearly stated "food security" as the ultimate result of a better functioning agriculture sector in the basin.

2. *"We should include Basin Development [and thus the DSS model] at one level or another, coordinating, advisory, or managing".* Response: The issue has emerged due to the IDS consultancy stating that "Basin Development" (titled Strategic Planning) is not included in neither of the two so-called compromise institutional models. The Consultant strongly believes that this function should be included in a NBI/NRBC agriculture agenda, one way or the other. This is also proposed in our "compromise" model.

3. *"There is a need to make clear, even dramatically, the points why the interactions of the river and agriculture is critical to the health of the river and its productivity. Examples should be provided of poor management practices"*. Response: While much of this consultancy has focused on the collection of positive experiences from basins around the world, the negative experience of no-cooperation can also be reviewed. Thus, in the section titled "When shared concerns are handled as own concerns" (below) four cases of not so good experiences are outlined.

4. *"We propose that the study should include the option of no agricultural function as the minimal role, instead of the "reactive" option"* [linked to the assumption that NBI will have an agricultural agenda], and *"Is agriculture NBI's comparative advantage"?* Response: These are important issues that should be addressed. Obviously, there could be a "zero" option, although this is an unrealistic option. Based on the ToR provided for this assignment, as well as the general view we have come across during e.g. the national workshops, it is quite clear that we should assume that NBI/NRBC will have an agriculture mandate to address. That said, there are still good reasons to discuss and define what NRBC's comparative advantages are regarding agriculture in the basin. That is also linked to what other organisations are doing on this subject.

5. *"The agenda has to give an emphasis to managing agricultural community activities in order to sustainably preserve the interdependent terrestrial and aquatic environments".* Response: Yes, a good, sustainable agricultural agenda starts in the field, in the soil, with the farmers and their concerns. If good land management is achieved at that level, a long chain of downstream interlinked and positive outcomes will develop. Also, high levels of food production from year to year are an indication of sustainable practices; the productivity would otherwise go down. Likewise, the farmer should be promoted as a positive land manager; not a negative, degrading factor working against the environment.

6. *"Although the agriculture role of the NBI certainly relates to the 4 IDS options, they should not be taken as a strict framework of institutional options for the RBO*". Response: We are not. Actually, the compromise options proposed in the current report, providing the basis for the 4 functions, are a mix of institutional design and agricultural models.

7. *"As the future NRBC will have very little money, it is important to make the connection to energy production… building on energy related fears like siltation, soil erosion etc.".*Response: We do not specifically discuss e.g. soil erosion or infiltration capacity, but upstream agricultural practices are very much the focus of the "Knowledge Management" f*unction and "Capacity Building" sub-function, and we do raise the use of standards as a key tool in order to achieve better land and water management practices.*

8. *"The linkage between agriculture and economic growth needs to be discussed bearing in mind the trade-off between using water for agriculture and other needs". Response: This linkage is vital, considering e.g. the massive urbanisation taking place today, implying that more and more people find their livelihoods outside the agriculture sector. Also, a strong linkage exists between rural poverty and agriculture development, and thus to economic growth.*

9. *"Roles at the centre vs. roles at the sub-basin level". Response: This issue is elaborated on in subsequent sections and included in the main table on functions. In general, issues such as policy making, knowledge management and setting standards is more of "centre" issues; capacity building, data collection and market development intermediate; and basin development clearly "sub-regional". The more of hardware, investments, and direct results, the closer to the sub-regional level, and vice versa.*

10. *Based on the interim report and the "short version report" in July 2011, NBI submitted elaborated comments in early September. These primarily focused on three areas:*

11. *(i) A request to link the proposed agricultural functions closer to functions already outlined for the NBI and a NBRC,*

12. *(ii) To better align proposed agricultural functions with the specific context of the Nile basin, and*

(iii) Base the options on a new framework; one having only two alternatives: the current NBI structure and an upcoming NRBC. Response: These issues have all been addressed ■

2. Water, Agriculture and Development in the Nile Basin

2.1 Overview of water and agriculture in the Nile Basin

All the basin riparian states face serious water resources challenges in the years to come as a consequence of rising populations, improving standards of living, and possible negative effects of climate change. And as each additional individual requires about 1200 m^3 of water per year for their food, livelihood and domestic water needs, with food accounting for 90% or more of this, the need to find and effectively utilise more water is an urgent issue to address. The questions then are how much water is currently being used for food production in the basin, consumed by the basin population, and potentially available for future, enhanced production? Below is an overview of these issues.

As evapotranspiration rates, freshwater use and return flows are all well known for the Nile basin, so any presentation of the renewable potential is by definition inaccurate. The figurers presented below should thus be seen as estimates.

With a basin population of approx. 160 million, the required amount of water to sustain those people is about 190,000 mcm (based on 1200 m^3 per person/y, and primarily being water in food production). This can be compared with the figures provided by Zeitoun et al (2010), indicating a total soil water use for both rain fed and irrigated agriculture production in the basin of approx. 230,000 mcm/y, and the figurers by Kirkby et al (2010) on rain fed agriculture production (264,000 mcm/y) and irrigated agriculture production (65,000 mcm/y). The report by Kirkby et al (ibid) indicates that out of the total precipitation over the basin, approx. half is consumed by grasslands, a quarter by woodlands, some 15% in food production, and the remaining 10% is outflow. Zeitoun et al (2010) indicates that less than 10,000 mcm enter the Mediterranean Sea, a mere 0,5% of the total precipitation reported by Kirkby et al (ibid). Figurers do differ.

Almost all the water used in irrigated agriculture is being used in the Sudan and Egypt, whereas almost all rain fed agriculture takes place in the upstream states on the White Nile plus in Ethiopia.

In addition to these water flows, virtual water enters the Nile basin in the shape of imported food. This amounts to roughly 41,000 mcm/y, while the export amounts to roughly 14,000 mcm/y, including both crops and livestock (ibid). The net imported is thus about 27,000 mcm/y. More than three quarters of this is in rain fed crops, primarily wheat, maize and soybean from the US, Brazil and Argentina. These 'flows' are considered to substantially contribute to the water security of Sudan and in Egypt, in particular. Egypt imports more than half its food. In terms of the virtual water content, the country consumes approx. 60,000 mcm/y, out of which approx. 39,000 mcm/y is imported from other countries. As an average, the basin states depend on imported food to about 20-25% (FAO, 2000), a figure which compares well with the above stated total soil water use in the basin. Finally, average food consumption is only about 80% of that required for maintaining a healthy life (ibid), indicating that hunger is a major development concern.

The World Food Summit in 1996 defined "food security" as "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life". Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. In contrast, food self-sufficiency is defined as being able to meet consumption needs (particularly for staple food crops) from own production rather than by buying or importing.

The average per capita food production in most countries of the Nile basin has not been enough to feed their growing human populations. The net negative difference between food exports and food imports between the basin countries and globally has been growing steadily in recent years.

What water sources are then left for food production and society's development at large? As the basin's available water resources are finite, potentially even decreasing due to climate change, and the basin

population is rapidly increasing, the need to allocate more water for food production is obvious. This water is likely to be found within the following four types of sources:

1. Reduce unproductive evaporation losses and increase corresponding productive transpiration losses in both rain fed and irrigated agriculture (i.e. turn food production more water use-efficient).
2. Change "less" useful transpiration from savannahs, forests and wetlands to "more" useful transpiration from food production, i.e. convert natural ecological systems into man-made food production forms.
3. Increased the importation of food. This will provide virtual water to balance the gap between food demand and food supply.
4. Expand the use of blue water. This can continue until the basin turns "closed" (i.e. no more outflow into the Mediterranean Sea) or by a re-allocation of water from e.g. urban uses to irrigated agriculture production. But, as the Nile basin is moving towards a "closed" status, any re-allocation of water will soon become a zero-sum balance, i.e. increased use of blue water in one place will equal a decreased use of water somewhere else, probably downstream.

Besides these four sources there is not much more to rely on. Two additional options exist:

(i) to build desalination plants along the coast in Egypt, but such water will most likely be used for household consumption or for urban development (it is too expensive for any other usage), and

(ii) to ensure that effluents are not polluting and spoiling clean water resources, but the gain from that is still probably modest in the basin as most waters are not overly polluted.

Sulser et al (IFPRI, 2009) made projections about food production in the years 2025 and 2050. Their baseline scenario, including an impact of climate change, technology development and increasing food demand, indicates a modest 20-25% increase in consumptive water use in irrigated agriculture and a massive 100% increase in rain-fed agriculture consumptive water use. Similar figurers can be found in other scientific reports. Although the water use doesn't correlate fully with the amount of food produced (the water productivity is higher in irrigated as compared to rain fed agriculture), the message is still strong: Increased basin food production will mainly be rain fed. The increase in irrigated food production will be less.

How much food imports will be required and how much water will be used to feed the basin population will depend largely on the balance between demand and supply forces and is unknown today. It will depend on issues such as the access to funds to pay for buying food, the cost of such food, trade opportunities, and possibly national policy decisions on food security vs. food self-sufficiency. But today's trend of increasing dependency on imported food will surely continue and most likely increase as well. Thus, it is unlikely that the Nile basin will feed itself in coming decades without the support of rainfall falling in other parts of the world, subsequently converted into food by foreign farmers and bought by the basin countries.

To summarise this section on water, food and development in the basin, the following points are important.

1. **The basin cannot feed its growing population** and support a rising urban middle class by focusing on irrigated agriculture only. The basin is too dry in relation to the size of its population, a relationship which will be even further accentuated in the near future. Instead, a comprehensive basin development approach must be chosen, involving both rain fed and irrigated agriculture, the importation of food, and the development of an export-oriented service and industrial sector. For that to happen, such a sector must be given priority to the available blue water flows – or the money won't be there to pay for imported food.
2. **Rain fed agriculture produces most of the food** found in the basin today – and will continue to do so also in the future. In addition, the potential to increase land and water productivity in rain fed agriculture is very good. Before expanding the total area under agriculture, it is easier, less expensive and far less environmentally destructive to increase the productivity of the presently used land, and thus make better use of available soil water. A focus on rain fed agriculture also

provides major positive effects on rural poverty reduction, and on reducing the differences between rural and urban lifestyles.

3. **In order to sustain downstream irrigated agriculture**, typically involving investment in infrastructure and big money, catchment functions in upstream areas must work. There is no purpose in building a downstream dam if upstream areas suffer from land degradation, deforestation and social unrest: the dam will be flooded during rainy seasons, filled with silt in dry, and have its turbines damaged by debris in the water. The key to avoid this is to focus on the upstream land manager, the rain fed agriculture farmer. With this farmer engaged in a process of positive rural development and sound land use, a focus on environmental catchment functions turns both possible and mutually reinforcing. After all, the best active land use is one of long-term production at its *maximum:* this cannot happen without sound farming practices like terracing, mulching, covering open land surfaces, re-use of nutrients, soil water management, crop rotation and much more. Such production will not only produce a lot of needed food, but it will also protect downstream investments and make blue water available for growing urban middle classes.

2.2. Why a "no cooperation" option is not an option

2.2.1. Water and development options

To give a perspective: Sweden has plenty of water. There is an abundance of clean, cool water at all times of the year. All sectors of society can withdraw almost unlimited amounts in order to satisfy their needs. Water has no scarcity value. However, when the supply is not unlimited, water becomes an economic commodity, having a scarcity value and potentially limiting development and welfare. This is the case in many countries in Africa, Asia and the Middle East. Depending on the context, different strategies can be applied to address the situation, all with their particular cost, institutional and political implications (as well as other aspects). One way of displaying different contexts and their options is according to Figure 1. In the figure are countries plotted as their GNP per capita vs. available water resources per capita. Two lines are drawn, separating "richer" from "poorer" and "wetter" from "dryer" countries. Four categories of countries are thus defined, all with their particular combinations of wealth and water.

What are the water development options in these different categories of countries?

1. "Poor" and "wet": Water is available, most likely at a low cost. Other issues than water cause poverty and a need for development.

2. "Rich" and "wet": Water is available to all uses, although high levels of industrialization and consumption have generated often severe water quality problems. There is a need to introduce e.g. clean production technology, monitoring water quality, invest in treatment plants, and possibly change consumption habits.

3. "Rich" and "dry": Access to water is limited and quality issues are probably considerable. Two options exist on how to address water scarcity:

(i) huge investments in infrastructure, essentially "rebuilding nature". Examples of this include desalinization of sea water in Saudi Arabia and massive inter-basin transfer schemes in California and Colorado in the USA. It is based on an abundance of capital, technology and strong states. The other option is

(ii) a policy driven improved use and re-use of existing water resources. This implies strong national leadership, much public awareness, and focused, long-term development plans. Water demand management is a key concept. Examples of this include South Africa (post 1994), Israel, and Namibia.

4 "Poor" and "dry": Water is scarce and the development options are limited. Essentially, option (i) above is not available, it is too expensive and resource demanding. Left only is the policy driven improved use and re-use of existing water resources, in combination with pollution control and remediation. It certainly includes investments in infrastructure, to provide the basic functions required for development to take place, but not to the extent of option (i).

Most of the Nile basin countries are located in the "poor" and "dry" category, although with some possible exceptions. Downstream Egypt could probably afford somewhat more expensive infrastructure investments (category 3), and upstream Rwanda is sometimes regarded as water rich (category 1). Still, in general, most if not all of the basin countries are unable to "rebuild nature" (invest in large infrastructure projects) in order to address their water scarcity issues. They must thus focus on less expensive and technically difficult options.

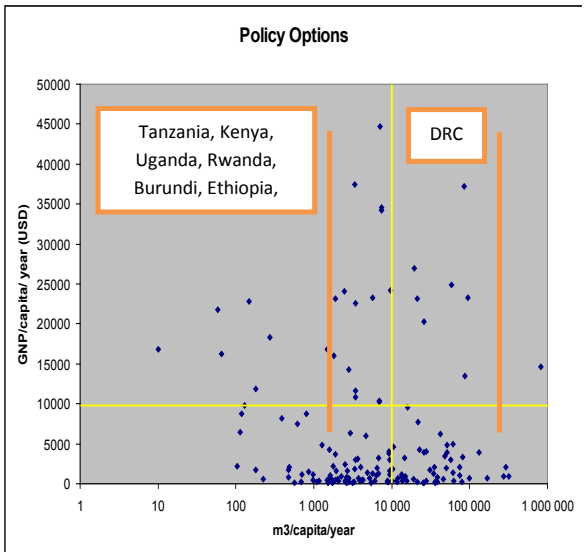


Fig 1. Policy Options – GNP/cap/y vs. available water m3/cap/y

Such options include a massive increase in water allocation and use efficiency. While the former focus on ensuring that those sections of society that generate the most "welfare per volume of water used" are given priority access to water, the second promotes in-sector water use efficiency as much as possible. The options also include water quality management from all perspectives; reducing the use of harmful substances, monitoring and treating effluents, re-use of farm nutrients, and ultimately change consumption preferences towards more environmentally friendly ones. Finally, regional or international trade of goods and services, all representing virtual water fluxes, may have positive impacts on the basin's water conditions.

However, while much of the above can be undertaken by single countries, it can turn exceedingly expensive and maybe even impossible to manage politically. Be having a regional, basin-wide initiative driving policy based improved use and re-use of already existing water resources many benefits are likely to materialize. For example, many of the above activities require much know-how, research or human capacity to implement, and that is expensive. Cooperation can split the cost among many.

2.2.2 When shared concerns are handled as own concerns.

We have around the world, unfortunately, an abundance of poorly managed water resources. East and West, South and North, all over we find discouraging cases of over-used aquifers, untreated effluents, inefficient water use, and a lack of cooperation to solve problems that require shared solutions. The incentives are misguided and sometimes money is wasted on lavish investments instead of appropriate development policies.

In the section some cases of poor water management are reflected upon and messages they convey to the Nile basin countries and their upcoming shared agricultural agenda are appraised.

India – little basin management.

The water situation in India is critical. Three issues linked to the Nile basin are discussed below. First, the

Indian economy, including its near self-sufficiency in food, is heavily dependent on dwindling groundwater resources. With 80% of domestic water supply and 70% of irrigation needs derived from groundwater, a dangerous dependency exists to the resource being severely over-utilised as well as poorly managed. A "race towards the bottom" exists, where competing needs are trying to pump the last few drops before aquifers close down. In addition, as India's population is rapidly growing and potentially negative effects of climate change on groundwater recharge rates are approaching, the sustainability of recent years' rapidly grown Indian economy is also at risk. This could be compared to the highly successful case of regional groundwater management in North Africa (http://www.oss-online.org/), initiated by a group of concerned scientist promoted as a so-called Track-2 initiative[2].

Second, appropriate environmental laws cover the emission of pollutions – but they are not being implemented due to corruption and weak institutions. There are many examples of large industries emitting highly toxic substances into nearby river systems, where only a short distance downstream the same water is used for household needs and irrigated agriculture. The institutions lack the capacity to monitor and implement what has already been decided.

Third, India does not have a structured system for river basin management. There are a few central government arrangements to handle upstream vs. downstream conflicts, but they are weak and their verdicts or regulations are often not followed (e.g. in the Cauvery River). The implications are many; water resources planning turns difficult, benefit sharing impossible to promote, and conflicts common. Conflicts are actually rampant in India today, and the costs of these, associated with lack of investments, sustainability and economic growth, are massive and increasing. A few years ago the then Minister of Water Resources P. R. Dasmunshi stated "*I am not the Minister of Water Resources but the Minister of Water Conflicts*" and in a much cited World Bank report it was concluded that "*Water conflicts are becoming endemic at all levels*" [in India][3].

Jordan River – the world's most securitized river

The Jordan River rises in Lebanon, flows through Lake Tiberias (Sea of Galilee), and receives water from its main tributary, the Yarmuk River, before entering the Jordan Valley and finally draining into the Dead Sea at 400 m below sea level after a total course of 360 km. The river flows through some of the most water scarce countries on earth. As a result, all of the river's water is utilised and what enters the Dead Sea is a mix of untreated sewage and salty agriculture drainage water. Water is scarce to the level that it limits economic growth and people's wellbeing.

However, what makes this river unique is the level of basin securitisation. As an effect of the Israeli-Palestinian conflict, sound water management principles have been replaced by security claims, military strategies and short-term concerns. Intelligence officers have replaced the role of hydrologists' and economists. The outcome is well known. Water is being inefficiently used, beneficial t sharing is not possible, and universal water rights are being grossly violated. Put in a different way, the cost of the current situation compared to one where water is managed at the regional level and allocation and use efficiency is given adequate attention is enormous. With peace and cooperation, enabling sound water management, the region's water potential, which is huge, could be released and allow welfare to replace poverty.

Euphrates-Tigris – the power of being upstream

The Euphrates-Tigris river system links upstream Turkey and Iran with downstream Syria and Iraq. This region, once the cradle of some of the first and finest civilizations on earth, is today water scarce, conflict ridden and dominated by the upstream country's massive water infrastructure projects. Today, large dams and inter-basin transfer schemes are being planned and built along the many tributaries of the Euphrates and Tigris in eastern Turkey and south-central Iran. Downstream Iraq complains, tensions rise

[2] ***Track II diplomacy*** *is a specific kind of informal diplomacy, in which non-officials (academic scholars, retired civil and military officials, public figures, and social activists) engage in dialogue, with the aim of conflict resolution, or confidence-building. This sort of diplomacy is especially useful after events which can be interpreted in a number of different ways, both parties recognize this fact, and neither side wants to escalate or involve third parties for fear of the situation spiraling out of control.*

[3] Briscoe, J and Malik, R.P.S. India's Water Economy. Bracing for a Turbulent Future. Found at: http://www.environment.harvard.edu/docs/faculty_pubs/briscoe_india.06.pdf

and cooperation suffers.

Compared to the Nile River, the geography is different. In the Euphrates-Tigris river system both water and power are associated with upstream countries, as compared to the Nile where these roles are separated. However, what links the two cases are the geo-political conditions; any attempt to utilise one of these roles in order to gain on behalf of someone else's loss will only make everybody poorer. When water is scarce and countries linked together, many water problems are shared problems, and as such they can only be resolved by shared solutions.

Rhine River – it required a disaster

The Rhine River, flowing mainly between Switzerland, France, Germany, Belgium and the Netherlands was in the mid-80s a severely polluted river. Biological life had ceased to exist. Many attempts were made to clean up the river, but they all failed. A catastrophe was needed in order to get real cooperation going.

On the first of November 1986, Europe woke up to the worst chemical spill ever experienced. The Rhine River had turned *red* following a catastrophic fire at a chemical factory near Basel, Switzerland, sending tons of toxic chemicals into the nearby river. The spill was caused by an early morning fire in a storage building used for pesticides, mercury and other highly poisonous agricultural chemicals. The effects downstream in the river were massive. Large urban water intakes had to close down, people were advised to stay away from the river, and the environmental conditions turned even worse. And entering the North Sea, the chemicals continued their deadly journey towards the north, badly polluting Danish, Swedish and Norwegian shores.

Following the disaster, the riparians finally got together and initiated much overdue work in order to take control of the river and its waters. The Rhine River is today a clean and pleasant river in the heart of Europe, full of life and an important driver for growth and development. However, the lesson learned is simple and straight forward; it should not take a major disaster to initiate much needed river basin management. The cost of establishing a basin management system was probably infinite compared to the costs associated with a foul and smelly river, keeping both people and investments away.

The Aral Sea – when water is wasted

Formerly one of the four largest lakes in the world with an area of 68,000 square km, the Aral Sea has been steadily shrinking since the 1960s after the rivers that fed it were diverted by Soviet Union irrigation projects. At this time, the Soviet government decided that the two rivers that fed the Aral Sea, the Amu Darya in the south and the Syr Darya in the northeast, would be diverted to irrigate the desert, in order to attempt to grow rice, melons, cereals, and cotton. It didn't go well. Many of the canals were poorly built, allowing water to leak or evaporate. From the Qaraqum Canal, the largest in Central Asia, probably 30 to 75% of the water went to waste. Today only 12% of Uzbekistan's irrigation canal length is waterproofed. In addition, excessive irrigation amounts caused rising groundwater levels, soil salinisation and salty drainage water – badly polluting the downstream lake.

Today we know the outcome. By 2007 the lake had declined to 10% of its original size and the region's once prosperous fishing industry has been essentially destroyed, bringing unemployment and economic hardship. The Aral Sea region is also heavily polluted, with consequent serious public health problems. The retreat of the sea has reportedly also caused local climate change, with summers becoming hotter and drier, and winters colder and longer.

The Aral Sea story can tell us much. When there is no openness and those that know do not dare to speak, development turns difficult. The disappearance of the lake was actually of no surprise to the Soviets; they expected it to happen long before. As early as in 1964, Aleksandr Asarin at the Hydro Project Institute pointed out that the lake was doomed, explaining "It was part of the five - years plans, approved by the

council of ministers and the Politburo. Nobody on a lower level would dare to say a word contradicting those plans, even if it was the fate of the Aral Sea". Good hydrologists, planners and agronomists were not allowed to do their proper, professional work; cost aspects where disregarded, the environment had no voice, and nature was regarded as an enemy to development. As an example of the latter, famous Soviet author Gorki supported plans to "make mad rivers sane". In conclusion sound water management requires openness, debate and the engagement of the many – e.g. engineers, sociologists, hydrologists, political scientists, planners and economists plus the voice of all the users to turn successful.

2.3 The comparative advantage of a NBI agricultural agenda

2.3.1 The role of NBI in basin agriculture

Based on the above discussion why a "no cooperation" option is not an option – i.e. the cost of not cooperating is so large that the basin countries cannot afford this option .The discussion in this section focuses on two issues:

(i) Does agriculture NBI/NRBC's have comparative advantage or could some other organisation perform that role? And

(ii) What are the criteria that should be applied to activities having the support from a basin-wide organisation?

Why should a NRBC deal with agriculture in the basin? Could some other organisation perform the task better? To some the answers may be obvious, but the questions should be raised in order to identify the comparative advantages and associated functions of a future NRBC. Four issues are discussed below.

1. The agreements that the NBI is based on, together with the proposed Cooperative Framework Agreement (CFA), provide the institutional arrangements that assist the basin countries to work together in the area of water management and basin development. It provides structures, protocols, mandates and much more that are linked to the efficient and sustainable use of the Nile. It has taken time, but the arrangements are now close of being in place and should as such be utilised.
2. Agriculture is linked to many processes/sectors in the Nile basin. Examples include employment, security, environment, growth, trade and much more. Agriculture could be organised by those concerned about e.g. economic development. However, being the single largest water consumer in a water scarce region, it is probably best handled by a "water" organisation, like the NBI/NRBC.
3. Both the present NBI organisation and a future NRBC contain much expertise in the management of shared water resources, located under one roof and under one management system. This will benefit the agricultural sector, being a huge water consumer and having impacts on all aspects of life and society.

The above issues indicate that today's NBI (and a future NRBC) is probably the only regional organisation available in North and East Africa that combines the necessary functions to act on regional agricultural concerns. It is also involved in water management and contains the relevant expertise. There are other organisations that engage in issues linked to agriculture, like the EAC, COMESA and IGAD, but their prime focuses are not agriculture, which is requires special attention in order to promote a strong water and agricultural agenda.

What are the criteria for those agriculture-linked activities that will gain from having the support of a basin organisation like today's NBI or a future NRBC? In other words, what should characterize work by NBI/NRBC in the field of agriculture – and not? We propose that the following criteria should characterize all agriculture activities performed by NBI/NRBC. The first three are valid to all activities, but the last when appropriate.

1. All activities will be firmly focused on the connection between water, agriculture and trans-boundary cooperation;
2. Two or more countries will benefit from activity;
3. There are clear win-win opportunities from having a shared approach;

4. Activities require the support (or approval) from basin countries, which NBI/NRBC can facilitate.

In other words, it is our view that NBI/NRBC should not become a *general support organisation to the agricultural sector in the basin*. That implies too broad and unfocused engagement. For food related issues outside of this focus other organisations (should) exist that are better suited to be involved.

Some examples of issues that should be *outside* the NBI/NBRC's agricultural agenda are :

1. Setting tariffs and custom regulation in agricultural trade;
2. Arrangement with agro-industry facilities for food processing; and
3. Promotion of Nile basin agricultural interests in global fora like the WTO.

NBI/NRBC could on demand act as a thematic expertise organisation and provide advice, experts and networking opportunities on such issues, but not to include them as core agricultural functions. In addition, considering the likely funding mechanisms for NBI/NRBC in the future, project-based with little core funding, it is also difficult to foresee funding for the three examples above.

2.3.2 Agricultural complementarity in the Nile Basin

As mentioned above and discussed further in Annex 13, there are many organisations involved in agriculture in the Nile Basin. NBI and upcoming NRBC is one such an actor, and why it should be involved in agriculture is discussed above. However, it cannot do "everything" and thus, what should other organisations do and how are the functions proposed in this report to be shared between NBI and other actors in the basin?

NRBC should be involved when the water and land chain linking soil-moisture to groundwater and surface and sub-surface runoff is *clearly linked to agriculture, food production and a healthy river*. The last issue is not the least important; if the Nile River is not maintained as a healthy river – implying characteristics like a stable runoff, clean water, and limited soil erosion, food production throughout the basin will suffer and development will become increasingly difficult. This is at the core of NBI's mandate. This is where an NRBC can act proactively and promote functions that directly benefit the basin's farming sector. However, the more we move away from these linkages, the less probable are NRBC engagement, and then probably only as demand driven tasks where the NRBC would act as an advisors or facilitator, and funded from sources other than their own.

3. CORE AGRICULTURAL FUNCTIONS

3.1 What are core agricultural functions?

Placing the term "agricultural functions" and "RBO" in an internet search engine provides few hints with the specific meaning of what a river basin organisation can do in terms of promoting agriculture in its area of jurisdiction. This is not a common term. This is also apparent from the many background studies that have been performed as part of the assignment. River basin organisations around the world do not deal explicitly with agriculture functions. Even more, they rarely deal with agriculture issues r. Most RBOs do not have an agriculture mandate, and if they do, it is vague and rarely implemented. This is particularly true for international trans-boundary river basins. They are concerned with water allocation between states, environmental issues, and hydropower. They do not have an agriculture mandate which they implement.

We – the team of consultants engaged in this assignment – regard the "agriculture functions" of an RBO as components of an RBO's "agriculture agenda", that is; they describe the role of the RBO in promoting agriculture in its area of jurisdiction. There are many overlaps between "agricultural functions" and other types of functions, like those for a river basin commission at large or those dealing with development agendas. The agriculture functions connect with all aspects of a commission's duties and engagement in its respective basin.

Furthermore, we would like to point out that a difference exists between agriculture functions and the activities that are linked to a specific function. The difference is a fine line, but important in this case. The activities describe how to implement an agriculture function. This may include several steps, like formulating a policy, coordinating with basin countries, employing staff and specifying the function's focus. That is the duty of the RBO once in place and working. Some of the agriculture functions presented in this report are close to the line separating them from activities (and in a few cases probably across as well), but we have tried to stay away from "how to implement agricultural functions". Instead, the focus is on the functions that together form the RBO's mandate. In essence, functions can be considered at the level of strategy – where activities are at the tactical level.

3.2 Boundary conditions

With a study as large and comprehensive as the present, ultimately focusing on more than 200 million people's access to food, boundary conditions have to be defined, is what limits the study. The work may otherwise go astray among the many issues that are linked to water and agriculture and indeed all very important in their own right, although of less immediate importance to this study. The focus has to be kept on water and food (and possibly "development") in the basin. This also refers to the many issues linked to the establishment of a Nile RBO and how the Nile basin agreement develops.

Thus, we outline briefly the following issues as boundary conditions for the study.

1. **The existence of a basin agreement**. A comprehensive basin agreement has been negotiated over many years and has now been signed by six of the Nile basin states. It is assumed that this agreement will provide the basis for the NRBC fourth option (see further down). It will also provide the cooperation and good faith that this option requires to be successful.

2. **Will NBI/NRBC's mandate include agriculture?** It is almost assumed that this will be the case and that the NBI/NRBC will have adequately strong institutional arrangements to perform a mandated agricultural mission. The mandate also has to be developed on issues

such as having a "facilitating" role rather than an "executive" function, and to what extent the RBO can influence national policy issues, and how funding will be arranged. We base our work on a *facilitating* RBO, able to influence national governments through positive win-win arguments, although with limited own funds and autonomy. Most funding will be project based.

3. **A 1+2 basin approach**. The Nile basin is large and very diverse. The functions appropriate for upstream, rain fed agricultural systems are not necessarily those benefiting downstream, irrigated systems. We thus identify and outline both full-basin and sub-basin functions.

4. **Functions are valid throughout the basin countries**. A complicated issue when dealing with both physical and political boundaries is to what extent they overlap and how to handle overlapping issues. For example, should a shared basin policy only cover the part of Tanzania that is within the basin, or also have jurisdiction throughout the country? In the former alternative it could imply having two policies within one country; making implementation complex. We believe that functions developed for the basin at large will also be integrated into national programmes simply due to their soundness and appropriate character.

5. **Maintaining a water and land focus**. During the course of this study, there have been suggestions that the agricultural functions should have clear connections to e.g. poverty eradication. Obviously agriculture is linked to poverty reduction and small-holder rain fed agricultural development. These are some of the best approaches to rural poverty eradication. While we recognise such potentially positive links, these issues are clearly beyond the scope of this study. The focus is on how to produce more food in a sustainable manner, promoting a healthy river environment, and support to trans-boundary cooperation and beneficial sharing. Given the fact that the vast majority of people in the basin are rain fed, small-holder farmers and that these land managers determine the volume and quality of water reaching downstream areas and its irrigated agriculture, it is of outmost importance to recognise the value of maintaining a healthy river system.

6. **The long-term goal is food security.** While the terms of reference for this assignment details the overall objectives and goal of developing an NBI/NRBC agricultural mandate. Food security is still an issue which could be further elaborated. The obvious goal of a comprehensive agricultural programme in the Nile basin should be that all people have access to a sufficient quantity, quality and diversity of food to support a healthy life. And the food should not only be available on the field or in the market but people should also have access to it through their own labour or purchasing power. It will take time for this goal to be achieved; sub-goals are thus needed. They may include the following (without any particular order of importance).

    1. No more famines. Famines are only rarely caused by unfavourable physical conditions, such as poor rains or soil erosion, or by too many mouths to feed. On the contrary the success of India over the last 50 years is an acknowledgement of this. It is typically inappropriate human systems that limit food production, its distribution, and subsequent consumption.

    2. Food growth should outpace population growth. As a minimum, the degree of food security should grow faster than the population in the basin. This also highlights the population factor in ensuring that all have enough to eat.

    3. Produce more food with less water. While there is still plenty of water in the Nile basin, considering both the total amount of rainfall in the region and the amount available per person as compared to countries like Jordan, Iran, and Turkey, there is also a serious water scarcity situation building up. Thus, more food must be

made available through the use of less water. If this implies improved water use efficiency or the importation of food from more humid parts of the world is an open issue, although of critical importance.

4. Increased food production promoted through sustainable basin management. To many this may seem like a contradiction but it is not. To maximise food production over long periods of time requires much knowledge and excellent soil, water and nutrient management practices. Such farms are sustainable components in the landscape and cause no danger to the basin.

5. The agriculture sector should contribute to export earnings. There will be a need to import staple food from abroad in order to feed expanding urban populations. The agriculture sector, as well as other sectors, should contribute to the payment of such food.

7. **Proposed functions that are feasible to implement**. Criteria that may affect this issue include the following:

1. The future NBI/NRBC will most likely have limited funds to undertake its important work. Funds available are likely to be project-based.

2. Functions must provide distinct win-win opportunities. Countries will not engage in trans-boundary basin activities, potentially giving up some of their sovereignty, if they are not to gain more than what they give away.

3. The institutional arrangements must be adequately simple in order not to act as a limiting factor.

4. BACKGROUND STUDIES

4.1 Basin reviews

4.1.1 Introduction

The basins reviewed were selected from a long list of basins with an RBO (Annex 16). The long list was the output of a global review of basins with RBOs. Two types of reviews were undertaken, (I) literature reviews and (ii) in-depth reviews. The former were desk studies based only on information available over the internet and from reports and scientific articles, whereas the latter were in-depth and included a visit to the basin by one of the consultants.

The selection criteria for the literature reviews considered international trans-boundary basins where agriculture is important; where much water is allocated and used within that sector, where a river basin organisation exists, and where agriculture functions exist to review. In reality it proved difficult to satisfy all three criteria, particularly the last one. Very few basins have agriculture functions in place. As a consequence, we refined our selection criteria and aimed for both national and international basins, where agriculture is important, and where some type of support functions for agriculture exist – whether provided by an RBO or some other type of institutional arrangement.

The in-depth basin reviews followed more or less the same development. Basins equipped with an RBO, where agriculture is important and agricultural functions are being implemented, are rare. In addition, as they had to be visited by a member of the Consultant team, they also had to be reasonably close to the consultant's respective home base. Two of the three selected basins displayed agricultural functions delivered by an RBO, whereas the third, located in Southern India, displayed a host of activities linked to agricultural functions (or "services") but with no river basin organisation.

From the aforesaid, it is not easy to find basins with an RBO performing a range of explicit agricultural functions. On the contrary, they typically do not exist. What we found were a mix of bits and pieces, linked to agriculture of some relevance to the present study, but no discrete ideal type to learn from.

4.1.2 Literature and in-depth reviews

The development of agricultural functions for the Nile Basin has involved a review of selected basins from around the world where agriculture functions have been implemented. The aim has been to gain knowledge and experience on how these functions are implemented and to contribute to the development of the CAF project.

The river basins reviewed were the Red (China and Vietnam), the Mekong (Cambodia, Lao PDR, Thailand, Vietnam, China and Myanmar), the Murray Darling (Australia), the Guadiana (Spain and Portugal), California central valley (USA), the Garonne (France), the Volta (Burkina Faso, Ghana, Togo, Benin, Mali and Cote d'Ivoire) and the Niger (Guinea, Cote d'Ivore, Mali, Niger, Bukina Faso, Benin, Cameroon, Chad and Nigeria). Apart from these eight rivers, in-depth studies were carried out in three rivers. These were the Komati (South Africa, Swaziland and Mozambique), the Cauvery (India) and the Moulouya (Morocco). These three rivers were studied in detail including a visit to the basin and on-site interviews with stakeholders. The basins presented a diversity of functions from different parts of the world, thus potentially providing typical functions to learn lessons from.

4.1.3 Synthesis of basin reviews

Introduction

The review presented in this section is a synthesis based on eight literature reviewed basins and three in-depth reviewed basins. Details of the reports for each basin are in the appendix.

All the 11 rivers are trans-boundary in nature either passing through several countries like the Niger, passing nine countries, or several states like in the case of Murray Darling shared by five states in Australia. The catchment areas of these basins range from 46 700 km^2 for the Komati River to 1 Million km^2 for Murray Darling River. Guadiana is the shortest with a flow distance of 778 km while Mekong is the longest with 4800 km. The rivers traverse diverse ecological zones, presenting a variety of issues and challenges which are cross-border in nature. The rivers receive high rainfall at their origins which decreases gradually in their lower reaches. Rain fed agriculture occurs in the highland areas while the middle and lower reaches of the rivers are characterised by irrigated agriculture. The Mekong River presents a unique case in that during wet seasons it fills up Ton Le Sap Lake in Cambodia, increasing the lake area from 3000 km^2 to 13000 km^2. However, during dry seasons the flow levels go down to a level below the lake level causing a backflow into the Mekong River. Other interesting scenarios include that of Komati River, where the river flows from South Africa to Swaziland and back to South Africa. In such a case cooperation becomes inevitable because hydrological changes in the basin affect both countries directly.

Functions of River Basins

Hydrology

The use of basin resources to meet socio-economic demands depends very much on water availability, both spatially and temporally. To avail this water, the river basin functions as part of the hydrologic process that determines water availability at specific locations. A basin converts rainfall into runoff flows which sustains both surface and groundwater storages. The amount of rain that is converted into runoff depends on the terrain of the basin, land cover (like natural forests or rain fed agriculture), soil and geologic formations, and hydro climatic conditions. In Moulouya basin for example, rainfall varies from 110 mm/year to more than 515 mm/year. Surface runoff discharged into the sea is about 1150 Million m^3/year, while 1210 million m^3 is used for irrigation and potable and industrial water supply. In Guadiana basin, 34% of the rainfall is converted in runoff on average. This is the major source of water available to balance water demands in the basin for various uses. In other cases the runoff is completely or almost completely utilised, thus turning the basin into a so-called “closed basin”. The Mekong and the Cauvery are close to this stage, implying that no or little water drains into the ocean. By far the largest single consumer of blue water is irrigated agriculture. Whereas a global average of water use in irrigated agriculture vs. total blue water use is about 70%, in many tropical developing countries this figure is 80-90%.

Land Resources

A basin is endowed with resources in the form of geologic formations, soils and vegetation that are useful in generating socio-economic benefits. Geologic formations may contain mineral reserves that when exploited can enhance gross national product. This can enhance industrial development and improve living standards of the basin inhabitants. In the Komati River in South Africa, industrial water use was a major activity which affected the river flow into Swaziland significantly. Soils in a basin provide the function of supporting agriculture; hence soil surveying is usually carried out in order to derive optimal gains from using the land. Soils on hills slopes are shallow and exposed to erosion and therefore require effective erosion control measures. At the foot slopes and floodplains, the soils are deep derived from fertile alluvial deposits. They are therefore conducive for agriculture so long as water can be provided through Irrigation since such areas are usually prone to low rainfall. A classic example of this is the Central Valley in California, USA. The valley is a large sedimentation bowl, collecting both water and nutrients coming down from high altitude slopes to the East. The favourable farming conditions have today made the valley one of the most productive and developed farming areas in the world. Supported by university research, an active extension service and positive incentives to produce more, land and water productivity is very high today. Another example is the Moulouya basin where annual rainfall is 350 mm/year in the plains as compared to 600 mm/year in the highlands. The terrain also favours irrigation in the lower reaches as compared to hill slopes. The lower reaches of the basins are also characterized by wetlands which are invaluable especially during dry seasons and are often cultivated because of proximity to water resources.

Biodiversity

River basins often provide great biodiversity in the form of forest areas, shrub lands, grasslands, savannahs, wetlands and water bodies both surface and sub-surface. The biodiversity sustains the ecosystems and their survival should be taken into consideration in planning water use. In addition, rich biodiversity promotes tourism which is a major contributor to the economy of most developing countries. For example in Red River Basin, tourism along with recreation contributes a significant component of income generation and employment in the basin. Biodiversity can be enhanced through incorporation of conservation areas in planning river basin management. Such areas will provide environmental services such increased good quality water and preservation of indigenous species adapted to the local environment, and associated benefits such as medicinal values. Such conservation areas have been set aside in Komati basin. One of them is Krueger National Park in South Africa for preservation of wildlife and the promotion of tourism. In Murray Darling basin, conservation of biodiversity is prioritized especially in wetlands which are as many as 30,000. Sixteen of these are recognized under the RAMSAR convention on wetlands as being of international significance. The conservation efforts diversify income generation in addition to promotion of environmental services. In the Central Valley in California wetland protection is an old and controversial issue. For long, the few remaining wetlands in the valley have suffered from both lack of water and salty drainage waster. A change seems to be on the way now, with a more active wildlife movement.

Livelihoods

River basins in many developing countries are characterized by rural lifestyles where people earn their living through agriculture. This practice varies between a life supporting activity (subsistence farming) to one of leisure farming, essentially a social benefit, often mirroring wealthy urban lifestyles. In Murray Darling basin in Australia, the basin has been sustaining the lives of the Aborigines for the last 50 000 years providing their cultural, social, economic and spiritual needs. Apart from subsistence agriculture, pastoralism is also a fundamental practice that complements income and wealth within the basin. However, the situation today in the Murray Darling is one characterised by a prolonged drought, causing people to leave the land and move into the cities. There are linkages to climate change effects. Mekong River is another type; it supports a population of 60 Million with about 100 different ethnic groups in its lower reaches, which has emerged as a result of immigration into the basin. In the case of Cauvery River in India, located within a country experiencing rapid economic growth and thus linked to rapid urbanization and increasing urban needs for water, conflicts can easily develop between rural and urban needs for more water.

Observing the culture and values of the inhabitants in a basin can promote cohesiveness and significantly assist in fostering cooperation in river basin management. One should therefore not interfere with cultural traditions if changing water use patterns are to be brought in a river basin. Still, changes are inevitable in order to improve income to meet livelihood demands of the inhabitants within the basin and outside. One such (unplanned) change was introduced in Komati basin in Swaziland by converting 50 ha of grazing land into sugarcane growing at a cost of 30000 Rand per hectare without consulting the local community. In response the community burned down the sugarcane farm and restored the grazing land. This is an indication that consultation needs to be carried out in order to promote new programmes.

Land tenure systems

A land tenure system defines how a person or a group of persons relate with land either legally or customarily. This relationship has direct effect on agricultural production and by extension agricultural functions. In Swaziland for example three types of land tenure systems are recognized. These are the Swazi National Land System or communal land constituting 60% of the total land which is held in trust by the King on behalf of Swazi people and administered by the local chiefs. The socio-economic activities in the basin are carried out on this land on leasehold basis. The other systems are title deed land (12%) and concession land (5%) which is small and insignificant in comparison to the former. The Komati Downstream Development Project in Komati Basin for sugarcane growing under irrigation is a success story of smallholder irrigation project. The development of the project recognized leases and organised the farmers into 1-3 ha farmer-groups which is economically viable without interfering with the social set up of the community. This enhanced participation and benefits accruing from the project. One indicator for this is the poverty levels were reduced from 69% before the project to 63% after the project.

Other types of land tenure are mainly privately owned land, which is the norm in France, Spain, Portugal, California and India. Land in Vietnam and Cambodia belongs to the state on paper and to individual farmers in reality.

Economy

River basins in developing countries are often characterized by the rural economy where a majority of the inhabitants live below the poverty line. This is because the subsistence agriculture that is often practiced has low economic returns. In Mekong basin for example the poverty levels are very high with majority of the population living on less than one USD per day, and this is emphasized if there are linkages to commercial farming. In most of the river basins, especially in the lower reaches, rice-growing on a commercial basis is prevalent. This is partly because of the conducive terrain which promotes flood irrigation needed for rice crops. Other crops grown in the Mekong basin, apart from rice, are vegetables, fruits and industrial crops. Overall agriculture provides 85% of employment in the basin and it contributes 52% GDP in Lao PDR, one of the six countries in the basin. Also in Almeria, one of the provinces in the Guadiana basin, irrigation accounts for 80% of water use with agriculture constituting more than 80% of employment (although this is one of the bread baskets of Europe).

In the Murray Darling basin, which hosts two million people and supports a total of 3 million people, agriculture is a major economic activity, with 65% being practiced under irrigation. In total 39% of Australian national income is contributed by agricultural production, mainly from cereals fruits. Dairy and beef farming, sheep and pigs are also reared to diversify income generation and create resilience in the economy. In the Komati basin and in particular in Swaziland, agriculture is a major economic activity contributing to about 20% of employment and 10% of the GDP. Sugarcane alone which is mainly grown through irrigation contributes 60% of the GDP from agriculture. These statistics show the importance of agriculture in river basins for the economy and hence the need to emphasize agricultural functions.

In Moulouya river basin the economy is moderately agriculture focused, although the net contribution to the nationals GNP is still small, approx. 15%, still some 45% of all employment is within agriculture. A major concern in the Moulouya river basin is unemployment, some 25% compared to the national average of 15%. Similar conditions prevail in the Niger basin and the Volta basin as well.

Issues and challenges

Though the river basins are endowed with attractive resources to sustain livelihoods, the same areas are prone to disasters which may cause destruction and loss of property as well as loss of lives in certain instances. Such disasters include floods, droughts and water related accidents in the lower reaches while the hill slopes experience deforestation. Floods and droughts are experienced in all the river basins studied and only varied in magnitude from one basin to another depending on hydrological variability as determined by land use changes, the weather patterns and lately by climate change impact as well. In the Guadiana basin in Spain for example it leads to a mismatch between demand and temporal variability of water resources. When community land management is not able to cope with increasing population pressure, raising demands for food, and demands for commercial extraction of timber, the resulting land use patterns are often devastating, not only for people living close by, but also for downstream areas. Both floods and perennial rivers turning ephemeral can be linked to deforestation, mismanaged farmland, and a disregard for areas of key environmental functions of a catchment.

Water scarcity to meet agricultural demands is a major issue experienced in all the river basins hence the need for developments to create storage like in the Komati River. In this basin about 10 dams were constructed by the year 2001 out of these five are in the Komati basin. The dams stabilize the flow and ensure consistent supply to meet the demand for the various uses. In the Murray Darling River in Australia extended droughts coupled with the impact of climate change have resulted in prolonged water scarcity problems. In the Niger River basin, droughts have also been experienced which has led to water scarcity problems and a massive dam building programmes (5 major and some 400 minor), as well as in the Cauvery River in India. On the other hand, due to water conflicts in Southern India, any attempt to further develop the infrastructure is blocked. Water scarcity in the central valley in California has taken a different route. Due to recurring droughts, a water bank has been created, from which urban areas can buy farmers water at a market price.

Degradation of flora and fauna is another challenge in the management of river basins. These challenges include soil erosion, proliferation of aquatic weeds and loss of biodiversity as noted in the Niger River. In the Garonne River in France, the morphology of the river has been modified due to dam construction which has caused alteration of the biological balance of the aquatic ecosystem in the river. Apart from river banks, soil erosion is more severe on hill slopes characterised by steep topography. The eroded soils are deposited on the floodplains in the lower reaches where the topography is characterised by flat and gentle slopes as well in storage dams. This results in siltation of the dams and consequently leads to reduction in storage capacity and reduction of water availability. This is also a major problem in the Moulouya river basin in Morocco. Apart from the siltation of reservoirs, wetlands in lower reaches are also recipients of eroded materials from upstream which results in reduction in their storage capacity and consequently loss of biodiversity. This has a negative impact on the ecosystem and environmental services and eventually the benefits derived from the ecosystem; both social and economic.

Pollution is another challenge experienced in river basins and more so in the ones with agriculture-based industries. This is a result of chemicals, poor sanitation and accidental waste discharges. In the Guadiana River an accident occurred in 1998 which resulted in spillage of toxic wastes affecting both terrestrial and aquatic ecosystems. In the Mekong basin pollution is aggravated by sea water intrusion into the delta area especially during dry seasons. This quite often causes loss in production due to reduced irrigation potential. In addition to this, sea water is also not fit for domestic water use therefore the intrusion which eventually gets into shallow wells causes pollution of the wells. In the Moulouya basin the industrial pollution load is estimated at 2500 tons of oxidisable material and this is expected to increase to about 3600 by the year 2020 if no remedial measures are taken. Currently about 85% of the industrial pollution load is discharged directly into the environment which further increases the level of pollution in the basin. Domestic pollution levels in the basin are around 19000 tons out of which 20% is discharged directly into the environment. As the human population in a river basin increases due to improved livelihood opportunities, sanitation demand also increases and if this is not addressed, pollution is bound to increase and this has a direct impact on development in the basin. Finally, in the Cauvery River no pollution control exists and effluents enter the river system completely untreated, from both urban areas (raw sewerage) and industries (toxic and salty effluent).

Water sharing is a major issue in river basins especially during scarcity periods when the deficit between water availability and demand is quite high. The situation can be worse and can lead to conflicts depending on the magnitude and diversity of water use as well as extended periods of droughts. Water sharing is a management issue and requires agreed procedures and modalities to ensure equity among the parties concerned. Usually principles and concepts of Integrated Water Resources Management need to be observed in water sharing in order to ensure effectiveness and sustainability. Some of these include considering the interests of downstream water users like in the case of Mozambique with South Africa and Swaziland. In this arrangement the agreement between South Africa and Swaziland to develop and utilise the Komati River takes care of the interest of Mozambique through a tripartite agreement. In this arrangement, $2m^3/s$ is allowed to cross the border to Mozambique over a period of three days per week; but the figure is currently being negotiated to increase it to 2,6 m^3/s. The water bank in California has already been mentioned, which in reality is an extremely advanced form of water allocation.

In the Red River basin in China and Vietnam, persistent water related problems resulted in conflict in the management of water resources. This was after effecting policy change which was viewed to have been adequate to address the persistent problems. Through the policy change new institutions were created to address the problems comprehensively. However, it resulted in overlapping mandates with the institutions in charge of managing natural resources. These conflicts resulted in slow implementation of Integrated Water Resources Management. This is an indication that institutional development, though widely agreed on as a viable solution for addressing water related problems but the mandates should be quite distinct and well defined to avoid conflicts and other associated problems which would affect the lives of the people directly. This case was observed in the Red River basin where the basin organisation was legally under the Vietnamese Ministry of Agriculture and Rural Development (MARD) while the responsibility for the management of water resources was under the Ministry of Natural Resources and Environment (MONRE).

A major issue in Morocco and thus in the Moulouya river basin – and this has clear references to the Nile

and food production – is the fact that the agricultural sector's development remains thwarted not only by a lack of water but also by constraints linked to out-dated technology and land tenure systems; the smallness of the vast majority of farms and old practices. The private sector is also constrained by difficult access to credit, high interest rates, land issues, administrative delays and legal uncertainties. Also some gaps in managerial, technical and operational skills have been mentioned. The state has long been heavy, overly intrusive, impeding free market and competition. Serious deficiencies still affect the products and services, in terms of compliance with quality standards and adopting effective marketing strategies. This results in a low external competitiveness and excessive vulnerability of the economy to the international situation.

Basin Governance

The nature of water related issues and challenges are related to basin functions and characteristics as already described. They are either cross-border, involving several countries or several states/provinces in a country, cross-sectoral or cut across different cultures. To address these problems effectively and comprehensively in a sustainable way, some form of coordination is inevitable. This can be realized through some form of basin governance with a focus on water resources. Such an arrangement can be initiated either through demand for better services by the public or from top policy to ensure effective use of resources for socio-economic development. In the Komati basin for example, the establishment of KOBWA originated from the ground due pressure on the use of water resources for industrial purposes upstream in South Africa, middle stream in Swaziland for agriculture and downstream in South Africa. These uses were not giving due regard to downstream water users including Mozambique further down. The establishment of KOBWA through treaties signed and observed by two or the three parties as appropriate resulted in harmonious use of water resources by the three parties and created significant socio-economic gains with minimum impact on the environment. KOBWA is a show-case of a governance structure created with parties observing the principles of Integrated Water Resources Management (IWRM). In a similar way the same principles are adopted in the Mekong River down to the basin scale which has resulted in successful implementation of programmes. In other river basins like in the case of the Red River where the IWRM principles are not honoured, the situation resulted in organized conflicts and waste of resources.

The establishment of a governance structure in a river basin is not a one-time event, but a series of interconnected events and it is dynamic as new challenges are encountered. In the Murray Darling River for example, the process started with creation of the River Murray Waters Agreement (RMWA) with the purpose of facilitating water sharing between the southern states of Australia. The RMWA was transformed into the Murray-Darling Basin (MDB) where all the six states of the basins were involved through an agreement. Initially the functions of the RBO were executed by a commission; the Murray-Darling Basin Commission and later by the Murray-Darling Basin Authority (MBDA). As an Authority, MDBA has more functions with the goal of achieving sustainable management of water resources in the basin. This progressive development of a river basin organisation ensures confidence building as well as more involvement of stakeholders and incorporation of emerging issues in the RBO. In the case of the Niger River basin, a commission was first set up to manage the basin with the goal of minimizing the risk of conflict in the use of the water in the basin. This was not an immediate problem when the commission was established but it was anticipated. This was a strategic approach with a high potential of ensuring sustainability of water resource use in the basin. The commission grew to become the Niger Basin Authority (NBA), which is an intergovernmental organisation in West and Central Africa with the goal of fostering co-operation in managing and developing the resources in the Niger basin. In this case also, the responsibilities have increased with the growth of the basin organisation.

In establishing river basin governance, a general structure has been observed to be adopted in most river basins. The structure mainly consists of a top policy decision making body, technical operations body and a forum for stakeholder engagement. Each level may be further structured depending on the complexity of the issues in the basin. A typical example of this arrangement is found in the Komati basin. In this case top policy decisions are made through treaties signed by heads of state from the three countries of South Africa, Swaziland and Mozambique as appropriate depending on whether two or three parties are involved. One of the agreements that involved only two countries is the treaty on the development and utilization of the water resources of the Komati River basin between South Africa and Swaziland. The same treaty established the Komati Basin Water Authority (KOBWA) for development and utilization of

Komati basin waters. A strong feature in the Moulouya river basin is the open and participatory approach employed in basin management. The Moulouya River Basin Agency is set up with a very comprehensive assignment, in close collaboration and involving key actors. Key principles adopted are (i) the principles of participatory approach and subsidiarity; (ii) the agency's website is a framework for comprehensive information and tools on the basins' characteristics, data and activities; and (iii) the governance of the Agency is strengthened by a solid National legislative framework, and very high level representatives on the Board of Directors.

An example of a tripartite agreement is the one on the Komati River Basin between South Africa, Swaziland and Mozambique that established the Tripartite Permanent Technical Committee (TPTC) which provides advice on technical matters pertaining to the sharing of rivers of common interest within the Komati basin. At the lower level is the Komati Joint Operations Forum (KJOF) comprising of water users from South Africa and Swaziland who are dependent on the Komati basin waters and provides an avenue through which KOBWA accesses water users for participatory implementation of its functions. Thus although KOBWA only includes two of the three basin states its operating rules and thus the volume of water it can allocate to users, are derived from and monitored by the tripartite agreement and the TPTC respectively. In the Red River basin, shared between China and Vietnam, three river basin organisations have been established, namely the Red River Basin Organisation (RRBO), Cau Sub-Basin Organisation (CSBO) and Day Sub-Basin Organisation (DSBO). The first RBO focuses on the main Red River basin while the remaining two focus on Cau and Day-Nhue sub-basins of Red River. Inasmuch as this arrangement may be effective, it subjugates the two sub-basins to the RRBO thereby reducing their autonomy in operations and subsequently on the effectiveness on delivery of functions. This probably could have contributed to the management problems experienced in the Red River. In the Guadiana basin, the basin functions are executed through the Commission for the Development and Application of the Agreement (CADC) established through the Albufeira agreement between Spain and Portugal. This is also a three level operation based on a single agreement. The implementation of functions is undertaken through the Guadiana River basin councils which provide avenues for stakeholder participation and information exchange at the ground level.

Development of RBOs needs to recognise regional protocols to ensure uniformity and ease of implementation of programmes as well as coordination of RBOs in the same region. Cases where this has been done have resulted in better functioning of the RBO with minimum conflicting issues associated with the functional structure. An example is the Mekong River where the Mekong River Commission (MRC) embraces the regional protocols such as the Greater Mekong Sub-region Economic Cooperation Programme (GMS), ASEAN Mekong Development Cooperation and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). In a similar way, the establishment of the management framework in the Komati basin took into consideration the provisions of Southern Africa Development Community (SADC) just like the River Niger basin Authority (NBA) accommodated the requirements of (ECOWAS) while in the Guadiana River's CADC observes the European Union Water Framework Directive obligations. The regional blocks also subscribe to international agreements. Through these processes the management of river basins is likely to be grounded on similar fundamental principles and concepts and have commonality in operations that promote information exchange and sustainability in the river basins.

The functions of an RBO are dependent on the socio-economic needs of the people, level of national development, environmental concerns and the different water uses as well as trans-boundary nature of the water resources. In MRC, the focus is on food production, drinking water, sanitation, hydropower, transportation and tourism. These uses are cross-cutting taking into consideration local level subsistence demands for food production, up to tourism and hydropower which are more national. In the basin these functions are executed through facilitation, coordination and balancing of investments in the basin. The Commission also supports countries at the strategic planning level and programme implementation to ensure uniformity at national levels. In addition to these functions, MRC also facilitates resource mobilization for research. In the Moulouya River basin, the Hydraulic Basin Agency (HBA) coordinates development of a master plan for integrated water resources management on water allocation for various uses which include agriculture and organizing for resource mobilization to execute common programmes. In the Murray-Darling River basin, the MDBA executes it functions through various structures which include MDB Ministerial council, Murray-Darling Basin Officials Committee (BOC), the Basin Community Committee (BCC) and the Sub-Basin Committees. Through these structures, the MDBA is involved in policy development, coordination and implementation of its functions which focus on irrigation, environmental

water, indigenous water, urban industrial and recreational water sector issues. The involvement of MDBA at various levels is because it is in one country, though different states, but governed by the same law. In the case of different laws, it is difficult for an RBO to be actively involved in implementation and still perform.

Agriculture related functions

The review and in-depth study of the selected river basins reveals that most of the functions of the RBO's emphasize water allocation between parties based on their demands. This was most conspicuous in the Komati basin. How allocated water is utilised by each party in the various uses is based on the policies and legislation in the individual countries in the basin. An exception was found in Murray Darling basin which uses a common water act in all the states thus involving MDBA in functions undertaken by the five states in the basin. Thus, the agriculture related functions outlined below have all been derived based on the comprehensive review of the selected rivers basin, and furthermore, almost all of these are among those proposed for the NRBC.

1. Setting up guidelines for diversion of water for irrigation and management of infrastructure to ensure efficient and harmonious water use among the parties involved.
2. Coordination of catchment protection programmes to reduce the rate of catchment degradation to minimise siltation in rivers, storage dams and wetlands.
3. Coordination of research in areas such as the development of drought resistant crops to adopt to conditions of less water and survive low rainfall seasons, monitoring of land use changes and baseline survey studies for supporting strategic planning in agriculture.
4. Harmonisation of standards for use and protection of riparian zones since they are prone to encroachment, and yet they need to be protected to buffer the water resources.
5. Regulation of reservoir operations to guarantee water availability to meet the demand as required by various water uses and minimise disaster potential downstream.
6. Harmonising specifications of river stretches, design of hydraulic structures and conditions of water abstractions taking into account properties and rights of riparian countries.
7. Setting conditions for minimum flows under normal rainfall conditions and coordinating monitoring of compliance.
8. Promoting access to markets in agriculture industries based on agricultural products from the basin.
9. Harmonisation of standards for water quality monitoring and coordinating water quality monitoring in order to determine pollution sources and develop strategies to address problems emanating from poor quality water resulting from various uses.
10. Providing a platform for engagement in resolving disputes resulting from the use of water resources in the basin.
11. Coordinating planning of infrastructure development to increase water availability to meet demands for various uses.
12. Supporting acquisition and management of data for planning and projection to meet future water needs for agriculture and other competing water uses.
13. Provide a platform for capacity building and information exchange on best practices in agriculture.
14. Promoting efficient water use through the use of modern technology in agriculture and water saving irrigation methods as well as re-use and or recycling of water for irrigation.
15. Coordinating resource mobilization to support the basin wide programmes and build synergies between parties.

Lessons Learned and Messages for the Nile Basin

The river basins reviewed have diverse characteristics with similarities and differences to the Nile basin. This diversity has brought to the fore comprehensive lessons and messages that are relevant to the Nile basin in as far as development of agricultural functions are concerned. These are outlined below.

1. The functions of an RBO should be implemented progressively as the RBO grows. In this context the emerging issues can also be addressed and confidence built among the parties in a similar way as it happened in the Komati basin.

2. Need to have a strategic approach to the establishment of an RBO, like in the case of the Niger River, rather than wait for issues to emerge, like what has happened in the Red River, where it resulted in conflicts leading to establishment of institutions charged with managing the basin.

3. Regional protocols should be incorporated in the establishment of RBOs because it builds confidence and enhances mutual understanding among the parties sharing the basin.

4. Knowledge-sharing enhances mutual understanding and benefits in the utilization of common resources.

5. Platforms for stakeholder participation are essential for the involvement of stakeholders and confidence building and participation should be expanded to include the public and private sectors as well as civil society organisations.

6. RBOs should have autonomy in executing their functions and not be subject to governments' bureaucratic programmes that can hamper effectiveness in executing their functions.

7. Political will is essential for an RBO as it creates the enabling environment necessary for the functioning of the RBO.

8. Data management – collection, storage and sharing – has to be adequately un-bureaucratic and easily handled to bring advantages to the basin. A too heavy system will simply block the sharing and use of collected data.

9. It is important to promote agriculture as both a *beneficiary of sustainable watershed management*; having access to a steady supply of clean water and electrical power, and a *supplier of ecosystem services*; maintaining infiltration capacities and reducing soil erosion.

10. An RBO should be adequately structured so that issues of policy, coordination and stakeholder platforms among other structures, if any, are clearly defined with specific functions without overlaps in responsibilities.

11. Integration of agriculture with other related fields such as forestry or energy within the context of IWRM can enhance benefits and resource mobilization for the support of basin-wide programmes.

12. Cooperation is enhanced in a pragmatic way through joint identification and implementation of concrete projects in areas of mutual benefits.

13. Providing support to countries at the level of strategic planning and project implementation is vital to ensure a common approach is adopted across the board. This can, however, be carried-out through piloting.

14. Diversification of income generation and promotion of entrepreneurship is essential in mitigating risks and enhancing benefits from investments.

These lessons and messages for the Nile basin form a basis for defining the role of a future NRBC in executing its functions in agriculture and promoting cooperation among parties forming the organisation.

4.2 A basin study tour

A Study Tour was organised for senior NBI staff and officials in mid-May 2011. The purpose of having a study tour included in the Terms of Reference of the present assignment was to provide NBI with the opportunity to visit and review a real case where an RBO exists with a set of agricultural functions. However, as thoroughly discussed in the attached Cauvery basin in-depth review, despite an initial global review of basins having an RBO (Annex 16), no one single basin was found that satisfied the following selection criteria:

1. Located in Africa or West/South Asia (due to travel distances and or the difficulties linked to arrange with Schengen visas to travel to Europe).
2. Trans-boundary or national boundary.
3. Existence of an RBO/regional office exist, engaged in relevant issues, and open for visits
4. Some kind of regional, coordinating/facilitating water functions including those that promote agriculture and food production.
5. Adequately large to show different conditions up/downstream.
6. Adequately small to enable a visit that could cover key issues.
7. A suitable local host, capable to handle local arrangements (accommodation, travel) and engage identified lecturers, guides and the like.

It simply proved impossible, except in one case, to find a river basin that somewhat satisfied all of the above criteria. That only case was the Komati River in southern Africa. It does contain an RBO with an agriculture mandate, although it is a rather small basin with limited geographic scope between up and downstream. All the other basins reviewed were either located too far away (like the Murray-Darling system in Australia and California's central valley) or did not contain an RBO with an agriculture inclined mandate to implement. The latter was typically the case. Many basins have RBOs, engaged in the river's management, but the management primarily focuses on water quality, environmental issues or the allocation of water between different states. Examples include the Danube (water quality, environment), Indus (allocation of water), Mekong (environment, development), Rhine (water quality, environment), Orange (basin planning), Okavango (environment), and the Senegal (infrastructure). Very few of the RBO's contained anything about agriculture. The only RBOs that do that are typically located in developed economies, like the Murray-Darling (Australia), Guadiana (Spain-Portugal), California central valley (USA), and the Tennessee Valley Authority (USA).

It was therefore decided jointly by the client and the Consultant to take the study tour to a basin where agriculture is of paramount importance to food security, employment and regional economics, but an *RBO where an agriculture mandate is lacking*. The Cauvery River in southern India was thus selected. The Cauvery basin is a regional bread basket, full of water-related development problems, and located in the midst of a vibrant, growing economy. It is a case that shows the importance of an active government involvement in the field of agriculture and water management, what water-related problems that can develop if not adequately addressed, and a possible example for the future of the Nile countries.

The Cauvery basin displays a "smorgasbord" of water-related issues. These include e.g. a quite serious up- vs. downstream water conflict, deteriorating water quality, rapid population increase and subsequent rising demands for more water, growing urban areas demanding more water, and falling groundwater levels. It is all there. The basin is also home to a very interesting civil society, with bottom-up attempt to resolve a long standing water conflict between two neighbouring states, Karnataka and Tamil Nadu. The approach can be used to resolve any water (or other scarce resource) related conflict.

The tour started in Chennai and ended 5 full days later in Coimbatore. The days were quite intensive, full of presentations, field visits, meetings and discussions. Many critical water issues were thoroughly reviewed and discussed. A full travel report has been submitted to the Client. During a final reflections and summary session, the following issues were highlighted:

1. Indian agriculture is massively subsidized. All aspects, from water and energy to seeds and insurance for crop failure, are supported by either a State or the National Government.
2. The country depends on groundwater to 50-75% of all its needs (agriculture, urban uses, industry etc.). This is very high, and also alarming considering that groundwater levels are falling across India and the demand for water is continuously increasing.
3. The country has a huge pollution problem. Essentially, all effluents – from people as well as from industries – are released untreated into the nearest river. There is a legal framework to prevent this, but it is not being enforced.
4. A civil society initiative from 2003 is today almost at the point of resolving a bitter water dispute between two neighbouring states. The initiative – the Cauvery Family – is the outcome of an open, democratic society, where people act when their government fails.
5. India is very water scarce. Much more so than the Nile Basin. Still, economic growth is impressive and people have in general enough to eat. In a society where urban areas are rapidly increasing and wellbeing is booming, food security is the norm.
6. The collection of climatic data and the subsequent distribution of repacked information for farmers are extremely cost effective. The benefit-cost ratio is huge and society gains tremendously from such schemes.
7. Urbanization and industrialization are sometimes blamed for using up scarce water resources. It is true that they are large point-users of water and point-sources of pollutants, but they are also efficient in turning water into jobs and welfare. The problem is not cities or industries, the problem is how their pollutants are handled: dumped untreated or properly treated and reused?
8. The Cauvery basin is completely lacking an overarching structure for coordination and cooperation. The cost to society is tremendous, although difficult to assess and use as a basis for decisions aimed at improving the situation.
9. In conflicts, the hard-liners always lose sooner or later. Still, one should always look for the win-win opportunities, keeping away from a “sense of dissatisfaction” and “injustice” felt among the partners. It may include disconnecting water and politics.
10. The extension service in Karnataka is highly successful. What was the driver? “Trust between scientists, policy makers, politicians and farmers”

4.3 National, regional and global agriculture policies

Agricultural policies emanate from forms of law, regulations, institutional changes and economic measures. The effects of agricultural policies are usually influenced by policies in other sectors involving market structure, trade regimes, taxation, land tenure, technological development, farmer organisation and the provision of credit and educational services. Primarily agricultural policy making in the Nile basin has remained within the domain of national governments. But, the substantial and effective policy changes or reforms affecting agriculture are politically very sensitive and often difficult to achieve at the national level as involve complex processes.

Agricultural policies as such have strong international dimensions as well as crops, commodities and seeds move across the border. Their movements are governed under a number of international, regional and bilateral agreements and regimes. Some of the important international treaties directly affecting agricultural policies are, the Convention on Biological Diversity (CBD), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the World Trade Organisation (WTO), the International Union for the Protection of New Varieties of Plants (UPOV). However, very limited progress has been achieved and few tangible achievements have been made in the agricultural policy making processes at the international level. Involvement of large number of countries and their varied demand and needs, absence of democratic decision making structures are some few reasons for this.

The challenge is thus to find a suitable structure for the agricultural policy making at the regional level. There are several strong reasons in favour of regional agricultural policy making in the Nile basin region: Strong complementarities between areas of agricultural production and demands and the ecological diversity, many natural resources, such as rivers, bio- diversity reserves and underground aquifers are shared among countries, and an effective cross-border trade policy helps to promote the agricultural sector. However, there is an absence of an effective regional organisation in the Nile basin, which has the skill and power to develop policies that put sustainable agriculture at the centre. This topic is further elaborated on in Annex 13.

4.4 Stakeholder Review

The Nile basin countries are in the process of agreeing through a cooperative framework to use, develop and protect the Nile River waters and its catchment area. In the development of the water resource, agriculture is one the sectors to be prioritized. This is because the economy of the Nile Basin countries is highly dependent on agriculture either through rain fed or irrigated agriculture. In the upper Nile countries like Kenya, Uganda, Tanzania, Burundi, Rwanda, DRC and Ethiopia agriculture in the basin is mainly rain fed while lower basin countries such as Sudan and Egypt agriculture is undertaken through irrigation. As the main water user, most of the countries have a great proportion of GDP coming from agriculture, for example in Burundi agriculture contributed 51% of GDP in year 2000 (www.wri.org). In Kenya agriculture contributed about 20% of the GDP in year 2000 (www.wri.org) and it provides the biggest proportion of employment. Similar scenarios are observed in the other Nile River basin countries. It is therefore imperative that agricultural functions be mainstreamed in the Nile basin cooperative framework.

The individual countries are currently undertaking and promoting agriculture in accordance with their individual policies and legal frameworks. In Burundi, policy development to enhance agricultural production is currently being emphasized at top management level. In Kenya agriculture is being promoted at top policy level through the developed of irrigation policy with emphasis on use of efficient technologies and strengthening of institutions. The country initiatives need to be coordinated for effective and sustainable use of the Nile waters which can be provided by a framework of cooperation of the Nile basin countries (see Annex 14).

5. REVIEW OF NBI/NBRC FUNCTIONS

5.1 Review and analysis of NBI Strategic Action Program

The purpose of the NBI Strategic Action Plan is to set out policy guidelines for taking strategic action which is necessary in order to realize the potential of the Nile for the good of all and realize the vision through action on the ground. The programme contains two complementary sub-programs; the *Shared Vision Programs* (SVP) and the *Subsidiary Action Programmes* (SAP).The former consists of eight basin-wide projects, focusing on building trust, confidence and capacity in member countries as well as creating an enabling environment for trans-boundary investments, while the latter focus on planning and implementing action on the ground in the two main sub-basins.

In general, while the Nile Secretariat has focused on management issues, the SAP programme has focused more on development issues. Overall, the SVP projects have resulted in gains in three key areas:

1. Increase in trust, dialogue and confidence amongst basin stakeholders;
2. Enhanced institutional and technical capacity in the basin; and
3. Promotion of a basin-wide approach to the management and development of the basin resources.

In reviewing five SVP projects with a focus on agricultural development, several questions arise: where are the many small-holder farmers? What specific functions are expected to support them, given their often precarious and difficult situation to produce more food? What are these five programmes focusing on in practice? Issues such as political engagement, regional integration, win-win scenarios and support to universities (picking one from each “pillar” category), will that make farm families located far away from the centres to not only produce more food, but also to do so at a pace higher than the current population growth and in a manner being more water use efficient?

It could also be argued that these five projects hardly provide a field-level support to the basin’s vast majority of people; the small holder farmers. These are different compared to commercial and/or irrigated farmers. The latter benefit from factors such as easy access to market information, new drought tolerant seeds, possibly well-targeted subsidies, and international trade. In addition, given the purpose of the SVP programmes’ to provide an “enabling environment” for action-oriented investments, the question remains: is it an enabling environment aimed at poor small-holder farmers or for the many other types of people and organisations involved in the basin’s agricultural sector? Obviously, this cannot be an either or issue, but the question remains: where are the concerns of small-holder farmers represented?

Or is the case such that what is outlined in the five SVP’s projects *is* truly trans-boundary in nature, and as such well linked to the mandate of NBI or a future Nile RBO, but much of what really has an impact on the ground for small-holder farmers is local or national? Issues such as openness, easy access to markets, corruption, cultures and values, are these better handled as national issues? Is NBI or a future NRBC by its very structure already of little importance to the many small-holder farmers in the basin – and should as such only focus on blue water, big investments and trans-boundary issues? In this report we argue the contrary. But investments in blue water dams and irrigations schemes, and their potentially positive benefit sharing effects, can only succeed if the catchment is in good shape. Catchment functions like the delivery of clean water at a steady rate, silt- and debris free flow, and productive rain fed agriculture (avoiding an excessive pressure on downstream, irrigated agriculture) are crucial for the well-being of all in the basin.

These are some questions and concerns, but they provide part of the background to the proposed options and functions in Chapter 6.

The two Subsidiary Action Programmes focus on moving from planning to action. A long list of possible development options are provided in the strategic action plan. Again, mirroring the issues that were raised above, where are the direct programmes that will benefit small-holder farmers in the short range? In the medium to long term they may, as indirect effects of framework investments such as energy pooling, pollution control, and regional transport, but may not be so in the short-term. Reviewing the list, it is primarily "watershed management", "water use efficiency" and "marketing and storage" that have obvious linkages to small-holder farmers.

We suggest that the five SVPs and two SAPs are assessed in light of what NBI's/NBRC's development niche is in the area of agriculture – i.e. the connection between water, agriculture and trans-boundary development – and how this links to different categories of food producers in the basin. There may be a need to either state that small-holder farmers are not benefitting (at least not in the short and medium term) from basin-wide cooperative efforts *or* to strengthen these programmes so they also give distinct benefits to these type of farming communities.

5.2 Review of specific NBI projects/functions

In Task 2 of this study, we review and analyse the current NBI institutional structure related to agricultural functions, including their strengths and weaknesses. A Task report is attached as Annex 15. Below is an edited summary of issues highlighted in that report.

The analysis of past and present agriculture-related functions show achievements at the subsidiary level, although the major achievement has been the fact that agriculture has been included in the regional cooperative agenda of the Nile Basin, an issue that has been considered as the most controversial and politically sensitive.

A review of four projects (EWUAP, ENSAP's watershed management project resp. irrigation and drainage project, and NELSAP's regional agriculture trade and productivity project) reveals both successes and challenges.

EWUAP

This project has now closed but has left a legacy of promoting a basin-wide approach to the planning and development of agriculture in the basin. Supposedly, the outcomes and products of the Project have been streamlined to the activities of Nile-SEC and the SAPs, but it remains unclear how influential they can be in the implementation of future agriculture projects, that often are 'national' projects and not regional-based ones. The challenges associated with the EWUAP, including mainly consultative tasks performed, an absence of clear guidelines, weak communication and coordination with SAP projects, and not readily available outputs (reports, studies, guidelines), could become weaknesses of a future Commission's agriculture functions. And since the EWUAP was closed in 2009, other new challenges can be identified, namely the ever increasing phenomenon of foreign direct investment, including the leasing of several thousands of hectares of land for commercial agriculture in several of the Nile riparians (e.g. Sudan, Ethiopia, Kenya and Tanzania).

ENSAP's irrigation and drainage project

It is intended "to support the development and expansion of irrigated agriculture in the Eastern Nile region, and improve productivity of small and large-scale agriculture through efficient water use" (ENTRO, 2009). The project has a more on-the-ground development approach to it than the SVP projects, with direct goals of expanding irrigated agriculture in the sub-basin, although for the moment is still at the small-scale, at least compared to existing great potential for irrigation in the Eastern Nile Basin. So far, the project has supported and facilitated the identification of 100,000 hectares of fast-track irrigation development projects in each of the three countries for feasibility studies. The other most important achievement of this ENSAP project had been the development Cooperative Regional Assessments (CRA),

which are joint assessment and analysis of opportunities for irrigation development (projects and policies) with multiple regional benefits (inception and analysis completed). The most relevant and important feature of the CRA, is that is a study that for the first time includes a "no-borders"/trans-boundary analysis to identify challenges and opportunities for irrigation development and propose mechanisms for regional cooperation in this particularly politically sensitive area of cooperation. Still, challenges exist. The regional dimension is not always present and the number of projects identified and implemented are still of very small scale.

ENSAP's watershed management project

This project has the objective to "improve standards of living of the population living within selected watersheds in the Eastern Nile region, decrease population pressures and increase land productivity so that sustainable livelihoods and land use practices can be secured for the target populations" (ENTRO, 2009). Project achievements include the preparation of pre-investment projects and appraisals of fast-track projects and that the Eastern Nile Knowledge Base has been developed and expanded. The Knowledge Base components, known commonly as CRA, are the first of their kind in East Nile to provide a comprehensive and systematic wide analysis of the watershed situation and a long term joint programme to address the challenges facing sustainable watershed management. Despite the achievements mentioned above, the project has faced some serious challenges: Projects were mainly identified and implemented on a national basis, and their scale is so small that it is difficult to show the expected regional benefits; riparian states have only afforded the project a low political priority; hence the need to reinforce the focus and importance of agriculture and land-use practices within watershed management policies; and to raise funding for CRA projects that require large-scale investment, which t have received little commitment from riparians or donors.

NELSAP's regional agriculture trade and productivity project (RATP)

This project aims to promote a core agricultural agenda for NBI, improve crop productivity (irrigated and rain fed) and promote regional trade in agricultural products. Phase one of the RATP has been completed, with the main outputs related to activities being to identify and further elaborate on opportunities for regional trade and productivity increases. Challenges associated with the project include, a still missing scoping study on needs and opportunities for regional agriculture projects, lack of data on irrigated as well as rain fed agriculture in the region, and a need to link to the basis of this study, the definition of NBIs core agricultural functions.

To summarise challenges and achievements of the above four projects, some key issues emerge:

1. There are distinct achievements associated with the above mentioned projects – but they are very limited considering the time and efforts invested. It is high time to move from studies to development for most of them.
2. A major and still unresolved challenge is the development of upstream irrigation in light of the political and legal context that influence and determine regional cooperation and development. In order to move towards basin food security, this issue has to be resolved. As a start a comprehensive joint assessment of agricultural development potential of land in the basin would need to be carried out.
3. At present, most functions are performed at the national level. However, in the long run it is necessary to move these functions, in particular the management issues, to at least the sub-basin level if not the basin-wide level in order to fully explore the potential of the Nile Basin. Otherwise the rationale behind the NBI and its shared approach to development is undermined.
4. Communication, information sharing and inter-project coordination can be improved.
5. The move from *national development* to *basin development* has been taken. This is a major achievement. Progress is evidently slow and cumbersome, but it is happening, which in turn provides great opportunities for enhanced food production.

6. As mentioned in the former section, the small-holder farmers are not specifically targeted, despite their large numbers in the basin.

NBI's data and information sharing protocol and guidelines.

These are key documents in order to make data available for the successful implementation of NBI projects and programmes. The document describes in detail the objectives of data sharing, procedures to follow, roles and responsibilities of the NBI and more.

However, from the review of river basin commissions undertaken as part of this assignment and the common situation where data is collected and then locked up in a government office and rarely made use of, we would like to raise a few issues in terms of data sharing. Compared to similar procedures in the MRC (Mekong River Commission), the Volta Commission and in the Garonne Basin Authority, as well as others, the process outlined in the protocol seems excessively cumbersome. In our view, there are too many requests, criteria and formalities involved in the sharing of data. Of course, this mirrors the level of trust and faith countries have in each other, as well as an old view that data is power and should as such be controlled. As of 2011 much information was available whether or not countries want to share it with their neighbours (through means of advances in space technology and more). It is also important to consider research studies involving several countries; if one country does not want to share data, the whole study may lose much of its credibility. In the three basins mentioned above, the protocols for sharing are more open and positive to sharing (in particular MRC).

In order to give the development of information and knowledge a strong boost, data should be freely available to download via the internet from a central NBI database. This might be a far-reaching goal that should be the goal that all basin countries strive towards.

5.3 Analysis of the CFA in terms of agricultural functions

The table below is an analysis of the CFA Article 3 vis-à-vis basin food production and impact on agricultural functions. A conclusion is that the CFA provides plenty of room for promoting food production in the basin, but how is a matter of interpretation. This is even further accentuated when it comes to define specific agricultural functions. For example, Article 3:4 on equitable and reasonable utilization provides both rights and responsibilities on how the water is used; for what uses as well as how efficiently. This, together with Article 3:4 on water's social and economic value could be interpreted as an argument that food security should over time replace that of food self-sufficiency, considering the basins water scarce conditions and the opportunities for enhanced cooperation that exists.

In general, Articles 3:13 and 3:14 are very strong and have potentially huge impacts on the basin's water management. It links up with sustainable water utilization i.e. not to overuse or pollute the resource and to protect environmental flow functions , and maintain the balance between water's social and economic value to form a strong instrument in the basin's water management.

Table 1. The CFA – Interpretation and impact on agricultural functions

CFA article 4 / statement	Interpretation in terms basin food production	Impact on agricultural functions
1. Cooperation	Countries shall cooperate in order to optimize food production	Shared policies, standards, regulation, land use / strategic planning,
2. Sustainable development	Land & water degradation, over pumping groundwater, excessive use of pesticides/herbicides: all not allowed	Standards, basin management, research,
3. Subsidiarity	All have a right to water for primary needs; food self-sufficiency must balance with other key needs like household use, key productive use and environmental needs.	Food self-sufficiency only half-way goal ; food security full goal
4. Equitable and reasonable utilization	Excessive use (misuse) of water and agrochemicals not allowed.	Standards, water quality, monitoring, data exchange
5. Prevention of the causing of significant harm 6. Right to use water within (State's) territories 7. Protection and conservation of Nile River Basin and its ecosystems. Information concerning planned measures	Not to farm steep lands, close to streams, maintain environmental flows and recharge areas. Water quality, wetlands, priority.	Standards and monitoring. Policy, environmental / land use planning. Data exchange.
8. Community of interest 9. Exchange of data and information	Data of use in agriculture should be shared readily Large e.g. irrigation schemes have to undertake EIA.	Easy, fast exchange of data, information – if at cost. Openness, information exchange, proper planning
10. Environmental Impact assessment and audits 11. Peaceful resolution of disputes 12. Water as a finite and vulnerable resource	As above, supply and use must balance, IWRM key principle,.	Standards on water use efficiency, IWRM policy in place and implemented. Applicable KM available.
13. Social and economic value of water	Water to be re-allocated to highest economic use, agriculture has no priority.	IWRM based re-allocation, promote water use efficiency.
14. Water security for all Nile Basin States.		All has right to water, but efficient use is a prerequisite. A wasteful use is not compatible with water security.

5.4 An analysis of secretariat functions in terms of agriculture

According to the CFA, the Secretariat of the future Nile Basin Commission will be responsible to carry out studies and performance of other activities when and as proposed by the Nile-TAC and authorized by the Council (CFA, Article 30(7)). This t can also include studies and activities related to the agriculture functions to be assumed by the future Nile Basin Commission. Besides, the Secretariat will also be responsible for 'compiling available data and information and coordinating the monitoring of information relating to the Nile Basin, including information concerning water resources, the environment and socio-economic matters, reviews and synthesizes the information with a view to integrating it into basin-wide databases and establishing standards, and develops mechanisms for the regular exchange of information where needed (CFA, Article 30(9)). As such, the Secretariat is also expected to include the agriculture component in its integrated approach to the management and utilisation of the Nile water resources for agriculture purposes.

It is important however to highlight that any agricultural or multipurpose project will be guided by the principle of subsidiarity in its planning and implementation phases (CFA, Article 10). As such the projects should be planned and implemented at the lowest level possible, but the Secretariat should also ensure that any project and related agreements should be consistent with the basin-wide framework (CFA, Article 10(b)). This will include a close coordination between the Secretariat and the sub-basin organisations (ENSAP and NELSAP), and the Secretariat is expected to "receive reports from sub-basin organisations and transmits the reports to TAC for its consideration (Article 30(10)).

6. FRAMEWORK, OPTIONS AND FUNCTIONS

6.1 Introduction

The overall purpose of the core agricultural function (CAF) assignment is "to respond to the increasing request by riparian countries to promote agricultural development and improved food security in the Nile Basin region." This implies that the NBI/NRBC should be able to play a role in promoting agricultural production in the basin, agricultural trade within the basin as well as agricultural trade between the basin and global markets. People living in the Nile basin should have access to enough food – whether this is produced locally or bought from traders with the proceeds of productive economic activities. A future NRBC could operate in a variety of ways depending on whatever approach is adopted to ensure food security.

Agriculture is recognised as a major water user in the proposed Nile Basin Cooperative Framework Agreement under water security, which is one of the general principles to guide the use of the Nile waters in future NRBC. In addition to this, agriculture generates about 80% of employment in the basin and is a major contributor to GDP in the region. Therefore mainstreaming it in the future NRBC will make it more focused and well-coordinated and subsequently enhance productivity which is a prerequisite for food security. Agriculture is one of the major consumptive uses of water and therefore efficient water use in this sector has a major bearing on availability of water for other sectors like power, domestic use, industry and environment. It therefore needs to be well coordinated in the region to maximise production per unit drop of water which requires a framework hence the necessity of an NRBC.

Initially a framework defining alternative core agriculture functions and options is described. The structure is based on two institutional alternatives (one based on a request by the Client and one based on work done by the Institutional Design Study (IDS) group) and three alternative operational models on how to address agriculture in the Nile basin. Four proposed options for organising the functions are outlined. Following this, the proposed agricultural functions are described and in a final section specific functions are attached to the four alternative options. In this section the comparative advantage of NBI/NBRC to undertake a particular function is also discussed. Details of the approach are given under each section.

Depending on the level of development and countries involved, a function can be coordinated by the NBI/NRBC or a sub-basin programme. The sub-basin programmes promote bi-lateral or multi-lateral projects mainly at implementation level while the umbrella NBI/NRBC focuses on coordination of policies and programmes to promote food security in the region.

6.2 An agriculture functions framework and derived options

6.2.1 Institutional design

In a previous report by the Consultant, four different institutional alternatives were proposed (based on IDS work). However, following a discussion with the Client, this has been reorganised into two: one involves an extension of the current NBI arrangements, and one being an amalgamated and function-focused version of the four IDS alternatives. The institutional alternatives for agricultural functions in the Nile thus consist of the following two options.

Option 1: The Nile Basin Initiative

The current NBI structure should be maintained, strengthened based on the Strategic Action Plan and turned into a permanent institution. We base this option on officially available information (www.nilebasin.org) about the NBI. Which reads thus "*The Nile Basin Initiative (NBI) is an inter-governmental organisation dedicated to equitable and sustainable management and development of the shared water resources of the Nile Basin* "and *"Recognizing that cooperative development holds the greatest prospects for bringing benefits to the entire region, and aware of the challenges, the Nile riparians took an historic step in establishing the Nile Basin Initiative. Formally launched in February 1999, the initiative provides*

an institutional mechanism, a shared vision, and a set of agreed policy guidelines to provide a basin wide framework for cooperative action".

Our interpretation of this option in terms of future core agricultural functions is as follows:

1. Proposed agricultural functions should be closely aligned to existing NBI functions and basin projects. The three main functions are "Water Resources Management", Water Resources Development" and "Building Cooperation and Capacity" while the various basin projects include eight shared vision programmes and two subsidiarity programmes, including the latter's specific agricultural projects. New functions or sub-functions should be avoided.
2. Proposed agricultural functions should not attempt to have full basin coverage, as this requires too much coordination and shared actions. Rather, the focus should be on the sub-basins and, when relevant, to support national water management projects.
3. An agriculture agenda should give less attention to large, comprehensive food security approaches – as this requires much planning and coordination – and more attention on national or sub-basin food self-sufficiency approaches.
4. In any case, an agricultural agenda for the Nile basin has to be based on the realities of food production in the region; that over 70% of the people within the basin depend on subsistence rain-fed agriculture for their livelihoods and that this type of food production is far more important than irrigated agriculture (except in the case of Egypt). Such a reliance on rain-fed agriculture is today becoming more problematic with the increasingly unpredictable and variable rainfall occurring in the region. Land degradation, erosion, low crop yields, negative effects of climate change, unsustainable water use and sharing of water resources are also all important issues that need to be addressed. All of these factors relate to the waters of the Nile and have profound implications on blue-water management.

Option 2: A Nile River Basin Commission

A Nile River Basin Commission is established based on the Cooperative Framework Agreement. This agreement provides the basis for the commission and assigns it a mandate and a set of functions to perform. The character of the commission was the focus of the Institutional Design Study (IDS). A draft final report has been circulated and discussed within NBI, and the description below of proposed alternatives has been taken from that report (dated August 2011). Based on this report four alternative institutional arrangements are as follows.

1. *A coordinating commission*
2. *A compromise "Lite"*
3. *A compromise "Full"*
4. ***A big commission***

A coordinating commission is very small and focus on coordination, it is active on demand, and doesn't include key functions like knowledge management (KM), planning or water resources management. In this option there will be no basin-wide programmes, so there is little need for resource mobilization. It does not do strategic planning, but performs only critical tasks required to more cost-effectively harmonise functions across the three centres. It performs functions related to communication and internal administration.

The two *"compromise"* options are larger and more active, although also to varying degrees lacking key core functions that we believe are needed in order to promote agriculture in the basin. The compromise Lite resembles the *coordination commission,* but has a marginally expanded set of functions that will add strengthened communication capacity, strategic planning and development, plus a limited focus on water resources management. As this option is mainly focused on coordination there is little need for resource mobilization at the centre as this will mainly be done by the SAPs for development purposes. The focus is mainly management type of activities, like financial management, monitoring and modelling, information

and communication and stakeholder engagement.

The *compromise full* will add capacity to the functions noted above, especially the capacity to develop basin-wide programmes, but will not add new core functions unless external funding is secured for a longer period. This option entails more of *development* functions like strategic basin planning, policy development, and operation and management (though not development) of shared infrastructure.

The big commission has the largest range of core functions. It includes all of the above, and has extensive independent executive powers conferred on it by member states. These agencies have very substantial information technology capacity supporting large KM facilities (databases, models, DSS, etc.) that are operated by agency staff. These RBOs have research capacity and undertake extensive public participation and public consultation.

For a more detailed description on these options, please review the original document – IDS Component 5, Consolidated Report and Options, August 2011.

Based on these four IDS options, we used a "compromise" commission option for our assignment. It is located somewhere in between the "full" and the "lite" IDS compromise options (although closer to the "full" version than the "lite" version. This option includes a mandate to perform those functions that we believe are required in order to promote agriculture in the basin. In our interpretation, and for the purpose of this assignment, in this option the two sub-basin units are considered part of the NRBC and linked to its management agenda in terms of financial management, monitoring, setting standards, modelling, data and information sharing and openness and stakeholder engagement. The sub-basins would retain autonomy in terms of their development agenda and its linked activities, like policy development, strategic basin planning, and infrastructure promotion and possibly management. Few if any functions are actually executed (performed) by the central commission. Rather, the role is one of coordination and facilitation, defining processes and directions, issuing Terms of References and ensuring that needed work is undertaken, and be an impartial custodian of the Nile waters and their utilization. Monitoring and evaluation of sub-basin and national activities and ensuring that they are in line with the provisions of the CFA would be another important responsibility. The role will also include the task to identify win-win opportunities and to promote the sharing of data, information and knowledge, all linked to cooperation and the basin (or sub-basin) scale of mandated functions. The commission is rather small, probably in the scale of 10-15 professionals plus administrative support services. The scale is defined by the number of subject matter areas the commission is engaged in.

The functions are based on the context of water scarcity, a distinct up and downstream perspective, a rapidly growing basin population and linked to this rapidly growing demand for more food. And similar to Option 1, the demand for more food is seen within the context of the Nile basin, i.e. that over 70% of the people within this region depend on subsistence rain-fed agriculture for their livelihoods and that green-water rain-fed agriculture produces the vast amount of food in the basin.

Our overall interpretation of this option in terms of future core agricultural functions is as follows:

1. Proposed agricultural functions should be aligned to issues identified in, or deducted from, the CFA text. This includes a number of functions, e.g. on data and information management, water quality monitoring, and efficient water use. They should also build on existing NBI framework functions (Water Resources Management", Water Resources Development" and "Building Cooperation and Capacity") and various basin projects (the shared vision programmes and the subsidiarity programmes, including the latter's specific agricultural projects), although the proposed functions should be expanded and made more comprehensive when needed in order to meet the demand for support to the basin's agricultural sector.

2. Proposed agricultural functions should have a full-basin approach (reflecting the CFA's mandate). This includes e.g. strategic planning, knowledge management, and basin-wide policy development, although it is likely that the focus will primarily aim at sub-basins and support to individual countries when relevant, rather than attempting large scale programmes.

3. A focus on food and development should both give attention to the small-scale issues, like rain-fed agriculture water use-efficiency and local water quality management, and to basin-wide issues like land-use planning, energy-water nexuses, and setting standards and norms. While the above NBI option is inclined towards food self-sufficiency at different scales, the commission's option is clearly inclined towards basin and sub-basin food security.

6.2.2 Proposed agricultural models

The following is a description of three agricultural operational models which the NBI/NRBC could follow. It should be noted that these are not institutional architecture models, but rather functional models linked specifically to the types of interventions the member states wish the organisation make. The performance of these functions could be done through a variety of institutional designs and will thus link up to the options developed under the NBI IDS currently being concluded.

One of the core issues to consider for a new NRBC is the mix between water management functions and water resources development functions. The standard approach is to ascribe only management functions to a more minimalist RBO, while a well-developed RBO would, in addition to performing management functions, carry out development functions. A similar approach can be followed when determining the core agricultural functions of the NRBC. The Commission could be engaged purely with the management of water but not much with the development of agriculture. Or, it could become progressively more executive, involved in the implementation of agriculture and eventually broader socio-economic development programmes, thus making a broadly defined contribution to food-security .

The Consultant has to some degree decoupled the possible models for core agricultural functions of a future NRBC from the eventual institutional model decided on. Thus irrespective of whether the Commission is formed as a "light weight" or a "heavy weight" Commission in terms of its water resources management and development functions, it can play a different role in terms of agricultural functions. To some degree the two are correlated – a Commission with a large set of water resource development as well as management functions is likely to be able to play a greater role in agricultural development than one with fewer functions. However it is possible that a Commission may have a large set of functions for a specific water development and management sector, such as hydro-power, but then a relatively limited mandate for agricultural development.

What follows is an overview of three operational models linked specifically to agricultural functions of a future NRBC. In terms of agricultural functions the first model is focused purely on the management of water, essentially making sure there is enough water in the system to satisfy the needs and/or rights of various water users, thus avoiding or mitigating conflict. This is called the Re-active Model. The second model plays an explicit role in promoting increased agricultural production (more "crop per drop") in the basin – hence it is called the Pro-active Model. Finally the Development Model would promote broad-based socio-economic development across the basin, allocating water to users and sectors which provide the most "job per drop" or "welfare per drop".

Re-active Model

Under this model NBI/NRBC does not have a great role in promoting agriculture in the basin. That is not to say it is not heavily involved in other water resource management and development issues such as hydro-power or navigation, just that the agricultural functions are few. Essentially the main task of such a arrangement (in terms of agriculture) is to monitor water-use by countries and ensure compliance with water use agreements. In the absence of a water-use or allocation agreement the aim would be to mitigate possible conflicts over water use in line with the provisions under relevant documents (such as the CFA to promote "harmonious utilisation" and prevent the cause for "significant harm" to other basin states). NBI/NRBC would serve as a repository of data and information regarding agricultural water use in the basin, using cooperative mechanisms to balance user conflicts as they arise. The precise mechanisms such institution could use would be dependent on the powers delegated to it by member states. If it purely has an advisory mandate it would seek to persuade states to change actions, but if it had enforcement powers it could bring some other form of sanction against contravening states. NBI/NRBC could also serve

the role of recipient of instruments of prior notification of planned development projects, allowing other member states to lodge their concerns and the applicant state to respond. It would act as a trusted broker that identifies mediatory or compensatory measures if substantial harm is suffered by one party due to the actions of another. The prime purpose of such an institution in terms of agriculture would be conflict avoidance and mitigation.

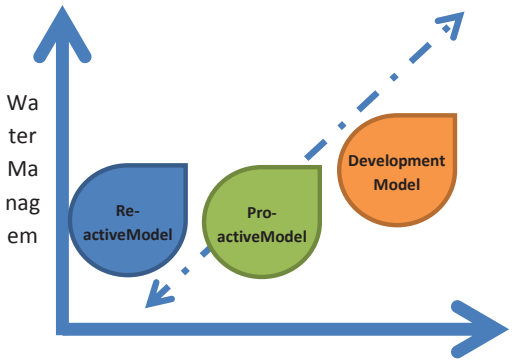


Figure 2: RBO Water Management functions vs Development functions

Pro-active Model

NBI/NRBC would become fully engaged in the development of agriculture in the basin by promoting research, capacity building, investments and other initiatives in agricultural production, storage and transport projects across the basin. The same types of water management activities would be performed as under the Re-active Model; that is playing a conflict avoidance and mitigation role through balancing water use. In addition it would promote the development of rain-fed as well as irrigated agriculture in countries across the basin, seeking to facilitate the construction of new schemes as well as improving the productivity of existing agricultural schemes. The exact level of engagement would again depend on the responsibility which states cede to the NBI/NRBC but the guiding rationale would be to promote added value from cooperative projects at the trans-boundary level. Thus large-scale agricultural developments (rain fed as well as irrigated) involving two or three basin states could be identified and promoted by NBI/NRBC. In addition to promoting increased production of agricultural products across the basin, the institution would become engaged in improving the storage and transport of these products within the basin. However the primary emphasis would be on increased productivity – with the improvements in storage and transport infrastructure primarily being the responsibility by national governments or other regional development entities. These inputs would have a strong reliance on promoting basin-scale food self-sufficiency in an effort to achieve food security in the basin. As most food in the basin is produced – and will continue to be so – under rain-fed, green water farming, the main effect of agriculture on the Nile flow is indirect; by efficient, sustainable rain-fed food production, more water will enter the Nile and less will be demanded for irrigated production. Furthermore, there will also be less land degradation and soli erosion and thus fewer problems associated with dam siltation, flooding and poor water quality downstream. The focus under this model should clearly be on rain-fed agriculture.

Development Model

The Commission steps out of the water sector and out of the Nile basin and instead looks at regional socio-economic development with agriculture as a core element. In addition to performing the tasks assigned under the first two models this Commission would seek to balance water allocation across the entire basin and promote the most economically efficient use of water. Whatever activity creates the most economic well-being across the basin would attract the greatest allocation of water either at a national level or within the basin. Economic benefit should be defined as more than purely contribution to GDP and should include an assessment of the number and type of jobs created. If more jobs can be created through tourism

or manufacturing than through agriculture then water would be allocated to those sectors. Again, the degree to which such a Commission implements these approaches depends on the amount of autonomy it receives form member states. It seems likely that for the foreseeable future the Nile Commission would not have much autonomy in executing its own decisions – remaining answerable to the member states. Thus a Commission following this model would, for now, be acting largely in an advisory capacity, conducting inter-sectoral basin planning and optimization studies for the countries to make decisions on. Food security is achieved through broad-based socio-economic development across the basin plus food production within the basin. While the focus in the pro-active model was clearly on rain-fed agriculture, the focus under this model is wider, including more of irrigated agriculture and, primarily, virtual water, embedded in the food imported.

6.2.3 An agricultural functions framework

The two institutional design alternatives and the three operational models to promote agriculture in the basin could form a matrix, or a framework, of institutional designs and agriculture production (Figure 3). The proposed core agricultural functions are then defined from within this framework.

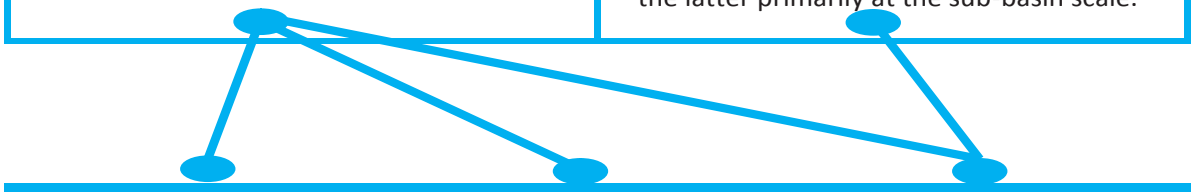
Whether the entry point into the agricultural function's matrix is the institutional alternatives or the agriculture models, can be discussed. We have chosen the institutional alternatives as the first entry point, as one of these is likely to become the overall structure for the upcoming commission. The institutional alternatives are presently being discussed within the NILETAC.

Obviously, when combining two alternatives with three models, the resulting outcome is six combinations ("options"). However, for the sake of clarity and realism, only four combinations are presented below. These are, on the other hand, quite different and make only a certain set of functions possible to align to each combination. Furthermore, compared to the 12 combinations presented and discussed in the June 2011 Interim Report, the actual scaling down and re-definition of likely options have been guided by discussions between Consultant and Client, a desire to align them and their associated functions to the extent possible to already discussed functions of the NBI in general , and a stated need to give due considerations to what is realistic to propose for an upcoming NRBC's role given the political, institutional and funding context found in the basin. While it can be argued that a larger number of functions are more precise and focused, it can also be argued that a fewer number, named as already existing NBI functions, helps in converging different documents and proposals. The message to have fewer albeit more comprehensive functions has been strong.

The four options are all linked to agricultural functions the same way. Each option consists of four categories of functions, typically subdivided into several "sub-agricultural functions".

We have not considered the *activities* that will move an agriculture function from the planning stage into an actual support service, except in the cost estimate of each function (Annex 15) where this is included to some extent.

Option 1: The Nile Basin Initiative	Option 2: A Nile Basin Commission
1. Institutional arrangements are similar to those of today's NBI 2. Focus is on sub-basins or national entities. Limited basin-wide mandate. 3. A coordinating and facilitating role 4. Limited opportunities to make full use of the possibilities provided by engaging a full basin. 5. Nile Sec has few management functions. Development functions are located in the sub-basins.	6. An independent, legal entity supported by a basin-wide mandate 7. Focus is on both basin-wide and sub-basin issues. 8. Some executive powers; although primarily a coordinating and facilitating role 9. Focus is on both small and big scale issues, and "most welfare per drop". 10. With time a full palette of both management and development functions. The former primarily at the basin scale, and the latter primarily at the sub-basin scale.



Reactive Model	Proactive Model	Development Model
11. Objective: Limited scope of CFA implementation. 12. Policy: On demand address specific sectors according to CFA. 13. All functions are the direct outcome of stated terms in the CFA.	14. Objective: Food self-sufficiently, national or sub-basin. 15. Policy: Agriculture IWRM not explicitly linked to other water using sectors. 16. Through improved agricultural practices achieve national & sub-basin development.	17. Objective: Full basin food security. 18. Policy: Through comprehensive IWRM optimize basin food security and well-being. 19. Through comprehensive development, engaging many water using sectors, achieve basin-wide welfare

6.2.4 Framework derived options

The four above identified combinations can be described as follows in terms of agricultural functions.

1. **Nile Basin Initiative-Reactive Model**. Nile SEC and NBI at large will play a limited role in the basin's agricultural sector. It will provide some coordination, a focal point for inter-state formalities and assist in a case by case basis. The secretariat may have a dedicated agricultural-water specialist, or otherwise this is out-contracted when a need occurs. Most work related to agriculture is undertaken either by national agencies or by regional organisations. The focus is support to national or sub-basin development. The secretariat is only involved in management activities;

all development activities are associated with other organisations. The main concern is conflict mitigation. This option is probably too small and limited to be seriously considered as an option for the Nile's future.

2. **Nile Basin Initiative-Proactive Model**. Nile SEC and NBI at large play an active role in promoting agriculture at the national or sub-basin scale. It is an active organisation, looking for opportunities to promote water efficient agriculture, sustain the environment, and encourage individual or sub-basin based countries to cooperate and achieve benefits from such endeavours. The secretariat is primarily involved in *management* activities, whereas the sub-basins are involved in *development* activities. It maintains competence of its own through a limited but professional staff. Most work is undertaken by the sub-basin organisations, which is where the results appear and where development takes place. The focus is primarily on promoting food self-sufficiency at different levels. This is because the scope of trust, cooperation and capacity to handle IWRM and benefit-sharing programmes isn't there, and thus a more comprehensive food-security approach is unlikely to take off.

3. **Nile Basin Initiative-Development Model**. The attempts by Nile SEC and NBI at large to play an active role in promoting food security in the basin are hampered by a limited mandate. In order to promote food security, the power and trust embedded in the CFA is needed, yet that is not the case. . Food security can probably be promoted between two or three neighbouring countries, in sub-basins, but the benefits derived from this are limited. As stated above, the secretariat is primarily involved in *management* activities, whereas the sub-basins are involved in *development* activities. This is an inherently unlikely combination.

4. **Nile Basin Commission-Development Model.** Nile SEC and NBI at large play a very active role in promoting agriculture at the national, sub-basin and full-basin scales. By having the support of the CFA and its associated principles and vision and trust, and focusing on a full IWRM approach (thus having a food security focus on activities linked to agriculture), the full potential of the basin resources can be put to use for development and growth. This was the stated goal by the participants at national workshops undertaken in June 2011; food security, integrating agriculture with other water using sectors and promoting more welfare per drop of water used in the basin, and ultimately benefit sharing rather than water sharing. The secretariat in this case is engaged in both management activities and development activities, although the latter dominates and the character of the functions is still linked to coordination and facilitation. The secretariat maintains its own expertise within a number of key competence areas. Still a word of caution, the move from today's situation to the one outlined above is long and difficult and will take time.

6.3 Description of proposed functions

The four categories of agricultural functions presented in this report represent a broad spectrum of functions that the NBI/NRBC may perform in order to promote agriculture in the basin or its sub-basins – whether or not the objective is to achieve food self-sufficiency or food security. The proposed functions contribute towards both, although many are more closely linked to the broader and much more comprehensive goal of food security. In many cases several functions are linked together in a chain of support mechanisms. For example, data are needed in order to promote the knowledge which in turn is embedded in a new policy.

All four proposed functions are titled similarly to already existing NBI functions or tasks

In the list below and in Table 6, it is the *function* which is described and outlined, not a full list of activities that should be undertaken as part of implementing the function to benefit the basin. In many cases examples are given of what a certain function can "do"; such as promoting research on climate change or developing appropriate technology, although these are merely *examples*; not an exhaustive list of activities and function that should be incorporated. Additional examples include research on water harvesting, improved land management practices, and how to provide small-holder farmers with new and improved crop types. This is an important distinction; we provide functions and suggest example of activities to undertake but not a full list of issues that should be addressed.

The functions described are generally fundamental in nature, as they indicate areas of potential cooperation rather than detailed topics that NBI/NRBC can address. They provide support to develop bilateral and multi-lateral projects within the region. They are broad in nature but provide a niche for direct engagement in identifying common areas of interest that can promote agriculture in the region.

For each function the following information is given:

1. The function's focus; what it is intended to "do";
2. What additions the proposed function provide compared to existing NBI functions and projects;
3. The comparative advantages of NBI/NRBC to implement particular functions; and
4. Relevant experience from basins and RBO's reviewed.

The four functions are outlined in the table below, then further elaborated in the text underneath, and finally detailed in Table 6.

Function	Focus
1. Policy Formulation and Cooperation	This is a core NBI/NRBC in-house function. It is a management function.
2. Knowledge Management	The development, management and dissemination of knowledge is critical to the basins future. Much already exists, but it is lying idle, and much is needed, but it is not identified and generated.
3. Basin Development	Basin development implementation; planning, facilitating and possibly ownership. Compared to the above two functions, focusing on *management*, this function focuses on *development.*
4. Market Development	Market development focuses on the development of markets and sharing of market information.

Table 2.Overview of the four functions and their sub-functions

6.3.1 Policy Formulation and Cooperation

Function focus

This function provides the basis for cooperation across borders – the formulation of shared, basin-wide policies *and/or guidelines*. It is not necessarily traditional policies determined after much work, negotiation, and government decisions, rather, it is a flexible approach to get countries to agree on the many issues that bring them together under a shared agriculture interest. It may sometimes require formal policy development, maybe on issues such as water allocation or international trade, but in many other instances it is more like a set of shared guidelines. These can be defined during meetings with technical experts, endorsed by senior management under the auspices of shared documents, and then utilised. Whether it is a "policy" or a set of "guidelines", it provides a common framework to align and harmonise national approaches (policies, guidelines), enables shared approaches for communication and information sharing, and offers conflict resolution mechanisms. The function is an in-direct support mechanism to enhance agricultural production and food security. Examples may include guidelines on issues such as data sharing, openness and transparency in water decision making and capacity building. The policies/guidelines may be Nile basin wide or focus on the two main sub-basins. It may also be more local, as long as two or more countries are included and the overall focus is agricultural and water development and a link exists to the basin unit for cooperation. The policies or guidelines developed under this category focus on any issue of relevance to food production and basin development.

Finally, an important objective of this function is the process itself; reviewing the issues, finding a common understanding, and making a shared decision.

Function description

The function has 3 sub-areas with altogether 6 sub-functions to address. The titles all include the word "policy". The meaning is both a more formal statement and a very direct, concrete set of guidelines; it is determined by the context. The sub-areas are: (i) **Agricultural policy development**. These are policies that provide a direct support to food self-sufficiency and/or food security, (ii) **Policy development in the area of agricultural openness, security and cooperation.** These are policy issues linked to an enabling environment for the promotion of agriculture in the region; and (iii) **Policy development linked to market development**. This is policy development that assists farmers to market their products, get better prices and more security in their practices.

Sub-function 1: Policy on Knowledge Management. Such a policy should cover the areas mentioned below, all linked to agriculture, water and development in the basin. They include:

1. Data collection, storage and distribution. The key issues are: (a) Given NBI/NRBC's mandate, what type of data should be collected, stored and shared?; (b) How can data quality be assured?; (c) How can this process be organised in order to obtain data quickly and easily accessed when needed? The last issue links up with formalities, payments, technology and more. However, in order to make use of data, it is imperative that access to data is an easy, inexpensive and un-bureaucratic process.

2. Water and agriculture research. This focus should provide answers on issues such as: (a) what should NBI/NRBC's role be in terms of research and new knowledge? Probably not turning into a research institute of its own, but one that is partner in identifying research needs and facilitates their implementation; (b) What are suitable formalities and arrangements to link with partner institutes (universities, national research institutes, international organisations and more) engaged in research and national and regional research programmes? (c) How can funding be arranged for research facilitated by NBI/NBRC? (d) How is research results disseminated to the end users?

3. The use of in-house NBI/NRBC knowledge capacity. Considerable in-house knowledge is

today available within NBI (e.g. the DSS model and on marketing issues). How should the use of this capacity best be organized? Funded? Available at an inexpensive, easy to use and un-bureaucratic manner? And furthermore, the massive amount of "knowledge" (data, information, experience, and reports) adding on massively in the near future: how will that be handled? Much of such knowledge remains idle today, not being put to use. How can such a situation be reversed? These issues need to be addressed in a comprehensive way, through a policy development process. The ultimate result is the establishment of a learning and knowledge-sharing culture.

Sub-function 2: Policy on Water and Agriculture Standards. This policy provides guidance on the use of standards to promote the water and agriculture sector in the basin. It provides support to develop, regulate and monitor standards and agreements. Standards can focus on many issues:

1. Water use in agriculture – rain fed as well as irrigated – in order to promote efficiency;
2. Use of inputs in agriculture (pesticides, herbicides, fertilizers);
3. Water quality in general, as linked to effluents, production technology and more;
4. Land protection and degradation; what type of lands should be protected and/or only allowed to limited use? Environmental standards like environmental flows and biodiversity, And guidelines on wetland protection.
5. Subsidies; the harmonization of support to the farming sector.
6. Food quality; content, labelling, packaging,

Sub-function 3: Policy on Basin Agricultural Planning. This focuses on vital still undecided issues; what are the criteria for making use (withdrawing) for Nile water for basin development? T he two issues are the following:

1. Under what conditions can water be withdrawn for new agricultural uses in the basin, possibly upstream, and re-allocated from one area to another based on improving water use efficiency? Obviously, these issues are linked to the CFA and the interpretation of reasonable and equitable use and not to cause significant harm. Linked to this, what will be the role of NBI/NBRC on this? Most likely, NRBC will have important roles to play in terms of providing background scientific information, identify win-win opportunities, and suggest new policy directions for decision makers to decide upon. It could also provide the mechanism through which states provide prior notification of activities which could have an impact on other basin states
2. Having a food security focus, the re-allocation of water in between sectors (agriculture, industry, services and environment) becomes a key issue in basin development. There is a need for policy development in this area. And again, as above, what will be the role on NBI/NRBC in this area?

Sub-function 4: Policy on Foreign Investments in Basin Agriculture Production. This is an important and emerging issue, having many effects and being highly political. It links with the function on market development. Under what conditions – if at all – should foreign investments in food production with the intention to take the food out of the basin be allowed? As it consumes vast amounts of water and land it is also an issue that NBI/NRBC should address.

Sub-function 5: Policy on Agricultural Openness and Conflict Resolution. There are at least two issues linked to this.

1. How to handle conflicts. Most of these are probably small scale, unknown to most, but potentially very destructive locally. Conflicts may take many shapes, e.g. downstream farming communities suffering from upstream industrial waste water or nomadic communities crossing borders with their cattle and thus causing resentment among settled farmers. Potential solutions should preferably be based on those legal frameworks

or regional agreements that already exist to handle such issues. The role of the NBI/NRBS also needs to be defined. It may include two principally different modes; (i) engage in early warning mechanism to intervene for conflict prevention; and (ii), when conflicts develop, facilitate support to position harmonization, negotiations, consensus building, mediation, arbitration, and when needed, arrange compensation. The actual activities may include to arrange with background information, potentially through its knowledge management function and by providing a platform for meetings and discussion, the inclusion of expert views, and, if needed, the more active role of a mediator.

2. Promote openness. A strong message from most of the basins reviewed as part of this assignment was the importance of openness, dialogue, access to information, and respect for all views. To allow true participation in decision making is not easy, but an absolute necessity if major land and water use changes are planned. In the case of the food security model, we can envisage future re-allocation of water out of the agriculture sector and into urban needs, for example. Resolving conflicts, with openness, dialogue and possibly compensation can handle. For example, in the Cauvery River basin in Southern India, two state governments are unable (today) to resolve a longstanding water conflict, sometimes turning violent and now also proving very expensive. Instead, a popular grass-roots initiative has appeared, driven by dialogue, common concerns and a strong sense of responsibility to resolve the situation, and now being close to find a common solution agreeable to all.

Sub-function 6: Policy on Market Development: Market development is already an ongoing activity associated with the RATP project. Studies have been undertaken, plans written and more, although to our knowledge not based on a comprehensive policy focusing on all pertinent issues linked to market development. These concerns should be determined, and then developed into a policy, providing guidance to activities promoting market development.

Role of NBI/NRBC

The role of NBI/NRBC in the development of policies is to (i) define the ToR for the task; (ii) identify and contract a group of specialists to undertake the work. This group probably consists of both in-house and outside individuals; and (iii) provide support services to assist the working group.

Proposed functions as compared to existing NBI functions and projects

To our knowledge, the above described policy documents do not exist – except as statements in the Strategic Action Programme and the CFA, plus the protocol and guidelines on data and information sharing.

Comparative advantages of NBI/NRBC to address function

The policy issues above are all focusing on well-established, in-house NBI functions at large. There is no other organisation besides NBI/NRBC that can initiate and drive this process.

Proposed functions as compared to other regional organisations' functions and projects

Generally speaking, the particular focus of this function – a support to countries to collaborate through the provisioning of practical policy statements and shared guidelines – is hardly addressed by the various regional or Africa-wide organisations found in the area. Many of these, like COMESA or the AU, promote knowledge management in agriculture and argue for enhanced trans-boundary cooperation, but they do not provide the particular focus of this function.

The Policy Formulation and Cooperation function is unique in its balance between being Nile basin specific, making big and complex issues comprehensible, and enabling countries to work together. This

is not provided by other organisations; it is a NBI/NRBC niche. However, in one area, Sub-function 5, on openness and conflict resolution, much can be learned from IGAD's experience. Within IGAD, the Conflict Early Warning and Response Mechanism (CEWARN) operates an indicator-based early warning system focused on cross border and interstate pastoral and related conflicts, monitoring specific factors in so far as any aspect relating to them could be a peace-promoting or conflict generating. Collection and analysis of information received from the field is done through national research institutes, independent bodies contracted directly by CEWARN.

Finally, the overall statements and policy declarations by the African Union's NEPAD program "Comprehensive Africa Agriculture Development Program" (CAADP), established by the AU assembly in 2003, provides a background to much of what this report proposes as NBI/NRBC agriculture functions. The CAADP provides a common framework for fostering broad-based agriculture-led economic growth in African countries, and is as such focused on improving food security, nutrition, and increasing incomes in Africa's largely farming based economies. It aims to do this by raising agricultural productivity by at least 6% per year and increase public investment in agriculture to 10% of national budgets per year. The CAADP focuses of four key areas in accordance with its four pillars: 'Sustainable Land and Water Management'; 'Market Access'; 'Food Supply and Hunger'; and 'Agricultural Research".

The AU Commission has also been involved in federating river and Lake Basin authorities under the aegis of the African Network of Basin Organisations (ANRBC). It has developed policy and institutional framework guidelines with regard to cooperation for sustainable management of trans-boundary water basins.

This section within the agriculture function on policy development and cooperation shows that there are a number of overlapping possibilities which exist between what is being proposed and what other regional organisations are engaged in. Care has to be taken so to ensure that proposed policies and guidelines are embedded within overarching statements and concerns. Still, many of these politically driven and large scale statements and concerns are slow processes, difficult to implement and somewhat removed from field reality. Thus, NBI/NRBC has a niche to occupy and develop: Well-focused, practical and Nile basin context-specific policies and guidelines, possible to implement, and based on best possible expertise – that will make a difference.

Relevant experience from basins and RBO's reviewed

As partly reviewed above, some specific experiences were encountered during the basin reviews that have bearings on the policy issues. These include:

Openness and popular participation. Cauvery River, India: two state governments are unable to resolve a longstanding water conflict, sometimes turning violent and today also being very expensive. Instead, a popular grass-root initiative called the Cauvery Family has taken the lead and is now step by step bridging the conflict and uniting diverging views across borders, classes and interests. Today's near success is a tribute to India's democratic system, allowing for debate, different views and grass-root meetings.

In the Volta River, national forums in Ghana and Burkina Faso are providing platforms for the local communities to share their concerns with the heads of local authorities. A joint local trans-boundary committee has also evolved from two national forums to coordinate joint activities across borders, solve any local level water use problems and disputes, and strengthen cooperation between the two countries.

Policy on data sharing and openness. We did not come across reliable documents on this, but some information dealing with the Volta and Garonne Rivers indicate an open and flexible process – at least on paper, albeit not necessarily in practice. In the Komati basin the stakeholders (water users) are invited to bi-monthly meetings to determine shares of water based on the preceding two-month's hydrological record. In the Mekong River, the MRCS has a data and Information strategy approved in 2003-4. The strategy is quite simple. In summary: All (all means, any type of data and information; GIS, books, reports, time series, movies, file, audios etc) MRCS data is made available via one Catalogue (The Master Catalogue

MC). It is only Quality Assured Data with metadata attached that is included. All data is freely available for MRCS and the countries. Intellectual property rights and copy rights must be respected. For outsiders an access can be granted via a License agreement. The agreement ensures that no misconduct takes place. All this is now automated on a new portal (http://portal.mrcmekong.org). All data is stored on servers, not on personal computers, and access is via the internet. The major issue today is to get timely and reliable data from the member countries. This is not yet solved satisfactorily.

6.3.2 Knowledge Management

Function focus

Knowledge is data put into a context and analysed, linked to a particular need (use), and benefitting from research and experience gained over time. The function focus on the *knowledge content* of the many activities that NBI/NRBC performs, today and in the future. It has two main components: (i) knowledge development and (ii) knowledge dissemination. The function is engaged in the collecting of raw data, converting it into information, adding experience and special studies, and thus generating *knowledge*. From that it focuses on sharing and dissemination of information and knowledge through different means, formats and focus groups.

Function description

This is the umbrella function for a large family of inter-inked knowledge focused agricultural sub-functions. The function deals with five key areas for agricultural development in the Nile basin:

1. Develop internal NBI/NRBC knowledge management strategies;
2. Data collection, storage and sharing;
3. Develop, regulate and monitor standards and agreements
4. Agricultural research and the development of knowledge; and
5. Applied training, including the dissemination of knowledge.

Sub-function 1: Develop and implement applied knowledge management. This sub-function is about the management of knowledge (i.e. neither the generation of knowledge nor the sharing of it, but the "handling" of knowledge). The sub-function mirrors the application of policy development as described above. As previously described there is need to develop a systematic method of identifying, developing, sharing, and using knowledge. Three activities can be identified; (i) strengthening knowledge learning and sharing processes; (ii) develop an appropriate knowledge management infrastructure; and (iii) promote a supportive knowledge sharing culture. This sub-function includes a focus on KM within the NBI itself.

Sub-function 2: Data collection, storage and sharing. Good quality, detailed and consistent data are prerequisites for formulating and implementing projects and policies well. The function includes both an assessment of what data that is already available, what is currently being collected, and what should be collected. In other words, it is building on already on-going data collections process as well as identifying new needs. It includes the following sub-functions:

The term "data" in this case includes any type of data within any thematic area linked to agriculture, water and basin development in the basin. This may include data on, for instance, agreements, national policies, water flows, land use patterns, urban effluents, water-use efficiency in rain-fed agriculture, and global food market prices and much more. The function provides the NBI/NRBC with the data that it needs in order to perform its agricultural mandate. It is essentially about collecting raw data, and to ensure that it is safely stored for future use, and, when in demand, shared to those having a right to access it.

Sub-function 3: Develop, regulate and monitor standards and agreements: This sub-function is closely linked to the functions of data collection, storage and sharing and research and knowledge development. The function identifies existing standards and agreements of relevance to regional agricultural development and, when needed, defines new ones that will promote agricultural production in a resource efficient,

sustainable and cross-border equitable manner. For example, standards could be developed on water-use efficient practices in rain-fed and irrigated agriculture, the treatment and deposition of urban wastewater, and food management in cross-border trade. In other words, standards are more than merely setting water quality parameters. They are actually key instruments in order to harmonise and improve agricultural practices in the basin and then, step by step along a long process, increase their requirements and possibly move towards basin food security.

Furthermore, the function can also keep track of agreements and policy papers, and the compliance of these in a basin-wide approach. Depending on the NBI/NBRC mandate, this function can stretch all the way from setting water quality standards to monitor their compliance, and potentially assist in policing those not adhering adequately to agreed norms.

Four different terms are being used in this context. To develop standards implies to identify appropriate standards, learn about their importance and how they relate to the basin context; to regulate implies to set standards (e.g. a maximum use of 1500 litres of water per kg of rice produced); to monitor their compliance implies to check (measure), for example, the amount of water used per kg of rice produced; and to enforce implies the policing of those not adhering to agreed standards.

The term “monitoring” is often explicitly used for data collection (and its subsequent storage and sharing) of a particular, site-specific parameter of special interest. Examples may include the collection and analysis of water samples downstream of a major city or irrigation scheme, the protection of mountain forests, and agreed export subsidies. It is thus closely linked to standards and is thus included under this function (and not under the data collection function, as that function is specifically about the collection, storage and sharing of raw data).

This function is regarded as a key function for NBI/NRBC. It links up very well with a RBO’s role of facilitating development, working through others, and having a basin-wide or a sub-basin focus. Further to this, non-compliance is a potential area of conflict, and this sub-function can thus provide NBI/NRBC with an important role to engage in.

Sub-function 4: Agricultural research and knowledge development. This sub-function is closely linked to all the other agricultural functions, as research and knowledge development is located at the very heart of agriculture development in the Nile basin. It also links closely to the data management sub-function, as knowledge is data put into a context and analysed, linked to a particular need (use), and benefitting from research and experience gained over time. This sub-function involves a focused and coordinated analysis of knowledge needs, potentially involving stakeholders in the field. The process leads to the development of adoptable interventions. In short, key activities being part of a research management agenda include: (I) review existing needs for new knowledge in the basin; (ii) what is already available; (iii) define priority needs that NBI/NRBC should promote; (iv) review implementation opportunities and modes of action; (v) implement (write ToR, contract partners, facilitate funding); (vi) receive results, quality control, and dissemination.

An example of the above is the following: Based on a NBI/NRBC Policy on Knowledge Management, clarifying the modalities of promoting research together with priority issues to study as well as the funding opportunities, NBI/NRBC can engage in research in several ways. First, it can make agreements with partner organisations on “who will do what”. This could imply that NBI/NRBC would promote research in e.g. water quality management, the International Water Management Institute (IWMI) in irrigated agriculture and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) in rain fed, staple crop farming. Second, within its particular focus-area, NBI/NRBC would enter into agreement with identified centres of research excellence to actually carry out specific research studies.

The knowledge development component of this sub-function includes the packaging of knowledge into adoptable interventions. Such “packages” are made for specific needs found in a certain context. The packages probably include not only the knowledge “hardware”, but also the “software” of how to implement, disseminate and promote.

Examples of research include:

1. State of the art research - promoting "green revolution" activities. This can include topics like water-use efficient agriculture, rainfall harvesting, GM-food, food and virtual water trading, the effect of and adaptation to climate change, and benefit sharing in basin development. This also includes bringing international experience and knowledge into the basin and to make reviews of current knowledge within selected areas.
2. General background studies linked to e.g. other functions and activities of the NBI/NRBC. Examples of this may include undertaking a study on the potential of agricultural land development in the basin and making a comprehensive study on environmental flow and associated functions.
3. Promote an exchange and utilization of existing knowledge between countries. This may include issues such as the farmers insurance program today existing in Ethiopia, the vast experience existing in Egypt on irrigation technology, and how to protect although still utilise areas of environmental importance in Rwanda/Uganda.
4. Initiate focused, shared programmes on knowledge management. These may include two or more countries and focus on e.g. benchmarking water use efficient agriculture, sustainable land management, and water treatment plants; the development of extension services; and issues of basin-wide concern like the status of international food trade negotiations or modelling future water demand in agriculture production.
5. Piloting new approaches**.** This is a type of large-scale research located half way between the research plot/laboratory and large-scale implementation. Piloting is a useful approach in order to test and promote new knowledge. Through pilot studies it is possible to directly engage with individual countries and end-users, and to promote mutual understanding among member countries. This will benefit development as many new water projects are likely to be trans-boundary in nature. As pilot projects grow in numbers and scale, countries will internalise their approaches and see the value of cooperation and harmonise agricultural policies. The further up-scaling of outputs from pilot studies will be the responsibility of sub-basins and individual countries, but it can be coordinated by NBI/NRBC if demanded.

Sub-function 5: Applied training, including the dissemination of knowledge: This sub-function focus on taking existing knowledge – derived from NBI/NBRC's own knowledge development process, as described above, or from other sources and organisations – and disseminate it to users. This can involve many forms; applied training, information services via mobile phones, national extension services and senior management seminars. The applied training, which is located at the core of this function, implies targeted cooperation with universities, actively building centres of excellence, and targeted knowledge transfer schemes. An example of the latter could be the following. It is likely that small-scale conflicts over scarce (water) resources will become increasingly common in the

1. Experience existing in Egypt on irrigation technology, and how to protect and simultaneously utilise areas of environmental importance in Rwanda/Uganda.
2. Initiate focused, shared programmes on knowledge management. These may include two or more countries and focus on e.g. benchmarking water use efficient agriculture, sustainable land management, and water treatment plants; the development of extension services; and issues of basin-wide concern like the status of international food trade negotiations or modelling future water demand in agriculture production.
3. Piloting new approaches**.** This is a type of large-scale research located half way between the research plot/laboratory and large-scale implementation. Piloting is a useful approach in order to test and promote new knowledge. Through pilot studies it is possible to directly engage with individual countries and end-users, and to promote mutual understanding among member countries. This will benefit development as many new water projects are likely to be trans-boundary in nature. As pilot projects grow in numbers and scale, countries will internalize their approaches and see the value of cooperation and harmonise agricultural policies. The further up-scaling of outputs from pilot studies will be the responsibility of sub-basins and individual countries, but it can be coordinated by NBI/NRBC if demanded.

Sub-function 5: Applied training, including the dissemination of knowledge: This sub-function focuses on taking existing knowledge – derived from NBI/NBRC's own knowledge development process, as described

above, or from other sources and organisations – and disseminating it to users. This can involve many forms; applied training, information services via mobile phones, national extension services and senior management seminars. The applied training, which is located at the core of this function, implies targeted cooperation with universities, actively building centres of excellence, and targeted knowledge transfer schemes. An example of the latter could be the following. It is likely that small-scale conflicts over scarce (water) resources will become increasingly common in the basin in years to come. The situation in India is an example of this (see reference in section "Why shared concerns are handled as own concerns"). Preparing for that, NBI/NBRC should develop a targeted "Conflict Management Guideline" package, including capacity building in its use, and support for its implementation when needs arise.

Although the actual dissemination process itself is probably a national responsibility in most cases, the content and form can be researched, developed and promoted as a basin-wide undertaking, thus saving money and time. Even if services are not "copied" from one country to another, a bit of national "service harmonisation" within the basin will probably bring benefits to all. Still, the dividing line between the development of knowledge and the dissemination of knowledge is fine and may in reality disappear, e.g. when the same university institute *both* develops a new type of drought tolerant sorghum and is involved in the dissemination of seeds and farming practices, the two roles integrate.

Specific training programmes address all types of learning needs and end-users, whether they are professional water and agricultural specialists or groups of active farmers in the field. As mentioned above, the role of NBI/NRBC is primarily the one of a facilitator, not a training provider. That role is given to a. professional training institute, experienced in capacity building and equipped with the resources and experience to organise such sessions.

In the discussion leading up to this document, it has been noted that capacity building will take place as part of all the proposed functions and that a separate component is not needed. However, we do not fully agree with that view. Certainly, capacity building will and should take place within each function, as an integrated component, but there is also a need for separate, over-arching and independent training activities that can be organized when needs arise. Such training may be multidisciplinary, crossing the focus of several functions, or have forms that are difficult to locate to a certain function area. Below are four potential examples.

1. Internal, in-house training of own staff. Topics may include e.g. communication skills, accounting, river basin hydrology, modelling, and policy development;
2. Senior management seminars on emerging water, development and population issues;
3. TV-Radio-Internet-Cell Phone based dissemination of new farming practices, aimed at local farming communities.
4. Facilitate networks of cooperating universities and other training institutes in the areas of water management and agricultural development in order to better use available expertise. An example of this is the Water Net network in southern Africa

Role of NBI/NRBC

The role of NBI/NRBC varies between the different sub-functions. For some, it acts as a facilitator, while for others it is engaged as an implementing actor. In the first two sub-functions, to develop and implement a knowledge management strategy, storage and data sharing, , it is engaged as an implementing actor. For the latter the CFA specifically mentions the compilation, synthesis, and sharing of data. In the latter three sub-functions, the role is not given in the steering documents. However, it is not only unlikely but also impossible for NBI/NRBC to become anything else than a facilitator of these functions. NBI/NRBC would be responsible for moving the process forward; being the centre point to approach when new needs emerge, keep track of on-going processes and how these relate to knowledge management, and have a network of research institutes working together with. Based on this, and the governing policy on knowledge management, it defines new initiative, provides Terms of References, facilitates resource mobilization, and contracts implementing partners. It should be noted that the role of defining a research agenda is not only large and important, but also powerful. In this particular case, it may determine e.g. what types of crops future Nile basin farmers will grow, institutional arrangements in linking rural and urban areas closer together, and the use of new technology in information sharing. All these three examples have the power to change the way farming is conducted in the basin. Thus, to set a research agenda is an important task.

This function is extensively discussed and outlined in relevant NBI-linked documents (strategic action plan, CFA, and NELSAP KM strategy). The discussion above draws much from these documents.

Proposed functions as compared to existing NBI functions and projects

1. The two documents on data and information sharing and exchange – the procedures and the guidelines – focus on the formalities of this process, not on what data the NBI/NRBC needs in future work, what is missing (gap analysis), assuring quality, and how data can flow easily and uninterrupted from source to user. The CFA includes "exchange readily available and relevant data" in Article 7:1, which can be interpreted as also including an easy access to the data by a potential user.
2. Research, the creation of new knowledge or a scientific review and summary of existing knowledge, is not addressed in current NBI documents. Still, several issues have been mentioned by NBI as important or as planned activities, like to arrange a climate change adoption conference in the near future or to "work together with universities". However, NBI/NRBC needs to define its role vis-à-vis research in a much more organized and comprehensive manner. As mentioned above, what should NBI/NRBC's role be in terms of research? Probably not to undertake research on its own, but the one engaged in defining e.g. needs and gaps, and to arrange funding, i.e. a facilitating role.
3. The issue of in-house knowledge management is extensively discussed and outlined in the NELSAP KM knowledge management strategy. Maybe the issue doesn't need a policy paper on its own, although that would probably help in order to establish routines on how to categorize, store, and share knowledge in an organized and structured way.
4. The setting and use of standards is an efficient and relevant way for NBI/NRBC to address its mandate. Standards work indirectly and will if well planned and implemented have huge, positive effects. To our knowledge, this is still an issue that needs attention.
5. How to handle conflicts is included in the CFA, in article 3:12, as well as indirectly addressed in 3:4 and 3:5. However, these principles need to be interpreted and turned into policy guidelines and instructions for practical application.
6. The issue of openness is central in NBI and in the CFA (for example in Article 3:8 on information). The main addition here is how easily the data is accessible for a potential user. If it is a lengthy and cumbersome process, the potential users will most likely simply give up with the result that important data will not be put to use.

Comparative advantages of NBI/NRBC to address function

This depends on what sub-function and what role we discuss. For the sub-function on data collection, storage and sharing, the CFA very specifically states that this is a NRBC task to perform. Given that, there are no options.

Regarding the very first sub-function, knowledge management strategies, this is an internal development function which should be coordinated by NBI/NBRC itself, but implemented with the use of experts on the various issues brought up.

For the following three sub-functions, NBI/NRBC certainly has a strong comparative advantage to define and facilitate these functions – as the custodian of water, agriculture and trans-boundary cooperation in the Nile basin. No other institution could perform that role with the same knowledge, insights and sense of responsibility. However, NBI/NRBC does not have a comparative advantage to *implement* these functions. NBI/NRBC is not a research institute capable to perform e.g. research in a field such as GM crops. And likewise, nor is it a professional training institute or a centre of expertise on developing and setting standards. Hence, for these tasks there are other organisations in or outside the region that are better suited to perform these specific assignments, as based on ToR provided by NBI/NBRC. NBI/NRBC would still have a very competent function to perform in this regard – to write proper, professional Terms of Reference and ensure quality control of implemented studies and other activities. This requires an in-depth knowledge of the topic, the context, and how the contracting of consultants is best arranged.

Proposed functions as compared to other regional organisations' functions and projects.

A number of regional organisations are involved in agriculture and Knowledge Management. For a review of these, see Annex 13.

COMESA is engaged in issues such as climate change, agriculture and infrastructure. These all include a major component of knowledge management, i.e. research, training, and knowledge dissemination. It has a climate change initiative, aiming at "addressing climate change and its impacts in a manner that builds economic and social resilience for present and future generations". In agriculture it has a 2015 vision which requires massive inputs of new knowledge and linked practices. It also states e.g. two cross-cutting areas, "Academic and professional training, and support to farmers' associations" and "Information and knowledge systems". A future NBI/NRBC KM agricultural function clearly can both support and gain from this overarching programme.

Likewise, in the area of market research and development, the "Guiding Investments to Strengthen Agricultural Markets in Africa" (GISAMA) initiative has a number of potential similarities to the NBI/NRBC KM agricultural function. It is a research and outreach program that focuses on investment analysis for the agricultural sector in Africa. It is being funded by the Bill and Melinda Gates Foundation and the Michigan State University which in turn has sub-granted the COMESA Secretariat. The program seeks to support the translation of knowledge into action and implementation, by disseminating research findings to a broad range of implementing organisations.

Several other well-established and competitive research organisations or regional programmes exist in the Nile basin region. These include IWMI in Addis Ababa and ASARECA. The latter aims at increasing the efficiency of agricultural research in the region, so as to facilitate economic growth, food security and export competitiveness through productive and sustainable agriculture. Among its members are all of the NBI countries. It operates under a multi donor trust fund. NBI/NRBC and ASARECA should be able to work together and generate synergies in the area of research and knowledge management.

Climate change is also an issue in focus for IGAD's "IGAD Climate Prediction & Application Centre" (ICPAC), with a particular focus on the Horn of Africa. IGAD is also engaged in agriculture development, and then with a particular focus on dry land issues like rainfall harvesting and dry land crops.

It is clear from this section that Knowledge management is a huge agriculture function. It is a necessary but not sufficient function in order to boost the Nile Basin's agriculture production and enable food security to become reality. NBI/NRBC has a very distinct niche in that regard. While other organisations in knowledge management have other geographic focuses (global, continental or only part of the basin), are not concerned about *all* the KM-linked water and agriculture issues found in the basin, or are too far removed from the daily concerns found at ground level in the basin, like NBI/NRBC, a niche develops. NBI/NRBC cannot (and should not) perform research or implement large-scale KM projects. Instead, it should be the broker; facilitating well-defined and planned KM programmes, manage and define KM-needs, write Terms of Reference and contract implementation, and link funding with needs. Such a role will be far more powerful and successful as compared to one of trying to do it all. Still, a challenge exists; to maintain in-house, top-quality thematic competence. This is a typical problem for many government departments today; they are assigned the role to define activities, write ToR and contract implementation partners, and monitor and evaluate. In the long-term this scares away the best staff as it is not adequately challenging.

Relevant experience from basins and RBO's reviewed

Several cases of this were encountered. They include the following:

1. The website of the MRC (www.mrc.org. A well organized and very informative website. Massive amounts of information (reports, protocols, background documents, policy papers and more) can easily be downloaded for review.

2. Data sharing. State of Karnataka in Cauvery River basin, India: Scientists in this state have developed a real-time system for sharing weather information to farmers by the use of mobile phones. Farmers receive small-scale, accurate information about factors such as the arrival of rainstorms and dry periods, as well as flood warnings. It is highly appreciated and estimates indicate that the system is profitable; the cost of collecting and distributing information is essentially nil compared to the benefits generated by larger crops and an avoidance of flood damage. The Komati River basin also displays an easy transfer and access to information, as an outcome of trust and cooperation in the basin.

6.3.3 Basin Development

Function focus

Basin development links resources with their sustainable and efficient uses and thus generates more outputs per volume of water (and other resources) used. As compared to more centrally-located management functions, this function focuses on action, investments and generates beneficial outputs, either directly or indirectly (through sustainable watershed management practices), and is as such located as close to the users as possible. This then implies a sub-basin focus. This will over time benefit both people and the environment in the basin. The function includes four types of sub-functions:

1. Plan basin development;
2. Agricultural watershed management;
3. Facilitate project preparation; and
4. Support project implementation and management.

Description of function

Sub-function 1: Plan basin development. This sub-function aims at assessing the basin resources, undertake land use planning, and model the alternatives, thus optimizing the use of scarce resources in a sustainable and resilient way. "Resources" in this context are regarded in their broadest possible definition; it includes resources like trained people, strong cultures, water and land, ecological functions, large altitude differences over short distances, export-earning capacities and much more. In the planning process, these resources are matched with opportunities for productive and sustainable uses. The focus is obviously on agriculture, and depending on the overarching goal of food self-sufficiency vs. food security, basin food production will vary. The use of the DSS-project model obviously belongs to the planning stage.

Sub-function 2: Agricultural watershed management. Whereas the above sub-function has a direct, productive focus (e.g. identifying opportunities for benefit sharing and facilitating their implementation), this sub-function has a more *protective* focus. The function focuses on basin services that provide the basis for long-term, sustainable use of the basin and its resources. This can include the identification and protection of environmental flows, preserve watershed areas of importance for groundwater recharge, the reduction of rapid surface runoff, the promotion of farming practices that enable infiltration and thus the reduction of surface erosion, and an avoidance of farming close to streams and rivers. It is important to not allow a contradiction to develop between these two first sub-functions, being "productive" and "protective", as they are actually *supportive* of each other. Downstream irrigated agriculture does not want to have short-spells of floods and excess water – and then nothing for long periods. In other words, they depend on the upstream farmers, managing the watershed functions, and delivering a steady, reliable flow of water throughout the farming season.

Sub-function 3: Facilitate project preparations. This implies to facilitate project preparations by investment studies, resource mobilization, and decision making. The implementation can be done by individual countries but coordinated by the NRBC directly or through its sub-basin programmes, all depending on the scope of the project. The first issue is about assessing the funding needs of a proposed and outlined project, the second about arranging the actual funding of the project, and the third about facilitating the decision making to actually build (implement) the proposed project. The function includes activities like reviewing and assessing the issues/ needs involved, to communicate and coordinate with concerned countries and funding agencies,

and to assist in making appropriate conclusions, following a participatory process that engages stakeholders at all levels. Concrete cases may include the facilitation of a regional no-objection for a new hydropower plant or to facilitate investment studies on cross-border irrigation schemes, all including the identification and mobilization of potential funding sources.

Sub-function 4: Support project implementation and management. This activity focuses on the implementation of projects and, depending on ownership conditions and the role of NBI/NRBC, the subsequent management of investments made, either as the owner of the investments (unlikely) or as a contracted management consultant. Investments may include a hydropower installation, a water transfer scheme, a food export-import agency, or a meat processing factory. The objectives of such an engagement by the NBI/NRBC could be to address deficiencies in the food value chain, to provide impartial ownership and management of strategically important investments, or generate an income for the commission's own benefit. Still, many of these issues are open for debate and NBI/NRBC are probably not yet ready for such a role in terms of investments.

Some of the issues mentioned in this function are linked to concepts like *benefit sharing*, *virtual water*, and *water and energy synergies*. Benefit sharing implies sharing the benefits derived from the use of water rather than the water per se. An often referred to example is the exchange of hydropower from mountainous terrain with food from flat, lowland areas. If both areas produce both power and food, water would be wasted. Instead, by trading the benefits of water use in hydropower and food production, massive amounts of water could be saved and thus increasing the total output. Virtual water is linked to food trade; either within the basin or between the basin and the outside world. It is a kind of benefit sharing. However, if food is going to be imported, something else has to be exported, which in turn requires an adequate allocation between sectors and water available for export products. Water and energy synergies are also a kind of benefit sharing. If water is available (e.g. on hilly land), energy can be produced. And if energy is available, water can be produced from sea water or by treating effluents to drinking water standards. It is typically less expensive to move energy over large distances than water over long distances. The opportunities for optimized water-energy systems are good when the geographic scale is enhanced and borders are open for trade and exchange. In summary, all these three terms, critical to Nile basin's development, depend on a planning approach that manages the basin's resources and puts them to productive, sustainable and equitable use.

Role of NBI/NRBC

This function consists of both management and development sub-functions. The planning is clearly a management function, located at the centre (Nile SEC) primarily, whereas the subsequent two are development functions, located with the two Subsidiary Action Plans. Overall, the function at large belongs more to the sub-basins than to the full basin. This is also indicated by the content of the two Subsidiary Action Programs; action-oriented projects, the same as the main focus of this function.

Proposed functions as compared to existing NBI functions and projects

Part of the function is today being implemented through the two Subsidiary Action Plans. Their roles are to (i) identify projects with regional benefits and carry out pre-feasibility and feasibility studies, and (ii) prepare for implementation a portfolio of investment projects, including hydropower, irrigation and multipurpose projects. In addition, the SVP project DSS provides a modelling tool that is able to match resources with their uses, and to optimize the output.

When reviewing the CFA, the basis for an upcoming NBRC, together with the NBI Strategic Action Program, many areas are quite similar. Development should be based on the principles of subsidiarity, equitable and reasonable utilization, prevention of significant harm, and protection and conservation of ecosystems. The issues mentioned are found in Section 6 of the action program and in Articles 3:3-4-5-6-7 and Articles 4, 5, 6, 10 and 31 on the arrangement of sub-

basins in the CFA. In summary, much of the Basin Development function's scope can be found and implemented in the two sub-basins, supported by the NBI Strategic Action Document. However, without the CFA approved and the two terms of equitable and reasonable use developed to the context of the Nile basin, the full scope of this function cannot be realized.

However, this is not to say that the function is fully implemented as of today. While the function's scope is in place, the content of the activities are not necessarily addressing all identified needs. The current focus is on expanding irrigated agriculture, watershed management, and, if including the SVP projects, on modelling natural resources utilization and promoting efficient water use. Additional activities, often of complementary nature, are as follows:

1. Expand the irrigation and drainage project approach to the full basin (including upstream areas;
2. Give at least equal support to rain-fed agriculture;
3. Actively involve and make use of the DDS model when available;
4. Identify and protect areas of vital environmental functions;
5. Study the potential benefits from a re-allocation of water from one sector to another, also including trans-boundary water re-allocation.

Comparative advantages of NBI/NRBC to address function

The role of NBI and a future NRBC will differ depending on which sub-function that is being addressed and where it is being addressed. With the NBI option, the core – Nile SEC – should maintain its facilitating and managing role. It will provide basin-wide planning (if and when needed) and ensure that the governing principles in basin development are followed, "the role of the overall (basin-wide) framework is to ensure appropriate consultation and involvement of those affected on the one hand and subsidiarity on the other". In other words, it will provide management functions and regulate that the sub-basin development function is carried out according to agreed principles and documents.

With the NRBC option in place, the role of the core will turn more complex. With a more dynamic management of the basin, focusing on benefit-sharing and food security (which the CFA provides for), the planning role will turn much more important and demanding.

Given the focus of this function, NBI/NRBC has a very strong comparative advantage to perform the outlined functions. Except in one case: it has been mentioned that the NRBC could take on a management role of the projects it has facilitated. This represents a completely different type of capacity compared to all other functions discussed in terms of NBI/NRBC, and is as such not recommended.

In the case of infrastructure projects there are three main roles to share. They are ownership, management, and regulation. It is not advisable to keep several of them in the same institution. If NBI/NRBC has been engaged in the facilitation of such projects, a good role to maintain is the one of the regulator. This role is outlined in the Strategic Action Plan and also links up favourably by facilitating the data management sub-function and the sub-function on standards.

Proposed functions as compared to other regional organisations' functions and projects

For the first three sub-functions, there are hardly any other regional organisations with the capacity and position to take on the tasks outlined. To *plan basin development* and to *manage the watershed* is closely linked to the use of the DSS model, a NBI/NRBC developed tool for planning and development, and of being the prime custodian of all water and land resources in the basin. There are certainly good opportunities for collaboration in some areas like in the environmental field with organisations like IUCN and WWF, and with universities in the region, but there is no other organisation than the NBI/NRBC with the same large-scale approach.

To facilitate trans-boundary *project preparations* is certainly something which many can do, like EAC or COMESA, but only one has its base in the water and land resources of the basin: NBI/NRBC. That fact is enough to give NBI/NRBC a decisive role in that field of activities.

Finally, to support project implementation and management is a very different type of function as compared to the first three sub-functions under this heading. This is more about business, management and handling investments, which are not comparative advantages of NBI/NRBC. There are other organisations that are better at that, like large engineering firms, professional infrastructure companies, and multi-national firms. This function is not foreseen as a core NBI/NRBC agricultural function for a long time to come.

To conclude this section: Three out of the four sub-functions mentioned under the *basin development* function are clearly linked to comparative advantage on behalf of NBI/NRBC. The fourth is more questionable, there are most likely better suited organisations for that particular function. It is also within the basin development function that NBI/NRBC can generate an income to itself through a support to infrastructure development. For example, the DSS model generates outputs which are valuable and can be sold. This is also true for catchment management, a function closely linked to hydropower. If water entering a dam is full of silt and debris, the lifespan of both dam and installed turbines is quickly reduced. Huge investments can be lost by not managing the catchment properly. The world abounds of sad examples showing this.

Relevant experience from basins and RBO's reviewed

1. Some of the world's most advanced *basin development programs* are found in the Mekong River under the auspices of the MRC. These plans are much elaborated, starting at grassroots level and engaging many groups all the way into national ministries of water resources and development. The plans are detailed and comprehensive – and still very difficult to implement.
2. A non-experience is India, including all its basins. Basin management is not taking place in India. RBO's are nonexistent and there are no forums for participation and decision making. As a result, the water sector is in poor shape; water resources – rivers, lakes, and groundwater – are being grossly over utilised, and fresh waters are being polluted to the extent of turning unusable.
3. The French system for basin management is well established. It is being found today throughout Europe in the form of the European Framework Directive. Two key components of this system are the weight put on participatory decision making and on watershed planning.
4. Land in California's central valley is scarce and highly valued. As a consequence, many local communities, where agriculture is important, actively work against the spreading of urban land use, i.e. encroaching onto agriculture land. Urban development is highly planned and only allowed to happen on land less suitable for agricultural production.
5. In the Murray-Darling basin (and elsewhere in Australia) much attention is given to catchment functions reducing soil erosion, loss of surface soil nutrients, rapid runoff (implying downstream flooding) and groundwater recharge zones. These are sometimes regarded as environmental functions, although they are also fundamental to a catchment's well-being, providing benefits to farmers, energy production, urbanites and industrialists throughout the basin, all the way down to the ocean.

6.3.4 Market Development

Function focus

Subsistence farming is still the main form of agricultural production in the Nile basin. The food produced is primarily consumed by the farming family itself, with a small balance being sold at a local market. In

coming years, however, considering that strong processes like urbanization, industrialization, increasingly liberalized economies, and cross-border trade are at work and will affect the region, it is likely that an increasing share of the food produced will be sold at regional, national or international markets. This will make farming an increasingly commercial activity, where the cost of inputs like seeds, fertilizers, energy, and water, together with the market price for products on sale, will turn progressively more important. In addition, as it is likely that international food prices will rise in the future, driven by growing demands from large developing countries such as China and India. The opportunities for farmers to produce for the market and to make some "profits" from their work will grow.

Commercial farming is also being promoted by regional economic blocks like the East African Community (EAC). It has already addressed the removal of cross-border barriers in order to allow free movement of commodities and access to markets in the region. Although the new conditions encourage agricultural production and trade, challenges still exist, which include increasingly difficult conditions for urban poor (due to rising food prices), the risk of soil mining (linked to quick and unsustainable agriculture profit-making practices), increasingly costly food imports, and even more large-scale agricultural schemes aimed at foreign consumers. These issues must be addressed in order to ensure sustainable agriculture production and regional food security targets.

The Green Revolution in Asia is an example of the above issues and their linkages to agriculture, development and food security. Although debated, it is regarded as a great success by most studies. On the other hand, the environmental implications of producing more food are often severe. For the Nile basin a more balanced approach should be found, providing both incentives and opportunities to farmers to produce more, while also ensuring that the negative, long-term environmental effects are contained. A particular issue is how inter-basin and out of basin food trade can be both boosted and still remain supportive of basin-interests.

The case of Northern Ethiopia in the mid-1980s could be mentioned in this context. Due to poor rainfall, famine developed over several years causing massive destruction to people and society. However, the difficulties were not only caused by poor rains but also caused by a dysfunctional market, open for exploitation by food traders. The lessons learned were that food markets need to be regulated and information must flow freely.

From the discussion above, it is clear that market development is an agriculture function. This function is developed and includes a number of sub-functions that focus on the promotion of an increasingly market-oriented agriculture sector. The proposed sub-functions are as follow.

Description of function

The function has two sub-functions.

Sub-function 1: Marketing and the promotion of agriculture trade. Marketing and trade, whether local or global, are key components transforming subsistence farming into market oriented agriculture. Marketing is needed in order to find buyers, and trade in order to move the goods from producer to buyer. This is also a means to offset the expensive option of storage. Storage is typically the answer to poor trading opportunities. However, it causes food damage, is expensive, and works against turning food production market oriented. It is better to sell excess food in good years and buy food in poor years – as long as the internal trade barriers are reduced.

Trade is promoted by the removal of tariffs and non-tariff limitations. Physical communications infrastructure, including road and rail links along with border crossings all need to become more efficient at transporting large quantities of food across the region as needed. Depending on the circumstances, tariffs can still be maintained for out of region trade, while removed for intra-regional trade. This may also include the effects of foreign involvement in the basin's food production potential, to establish and market a food brand called e.g. "Nile Basin Quality Food" that represents eco-quality and water-use efficient production.

Sub-function 2: Make market information easily available. From around the world, examples abound of the positive effects of easily available market information on farmers, development and welfare. By making the local market prices for common commodities available over mobile phones farmers turn more market oriented, avoid being cheated by middle men, and increase their profits by choosing to plant the

most profitable crops and then marketing them in the correct location

Role of NBI/NRBC

The function "Market Development" is a somewhat odd fellow in our set of proposed agricultural functions. While all the other functions have distinct linkages to water, agriculture and trans-boundary cooperation (all three issues), the linkages for market development are poor. Should this be taken as an argument for excluding market development from the list of core agricultural functions? And allow other organisations to engage, possibly better suited to handle issues such a food trade and marketing? The answer is possibly yes. NBI/NRBC is an expert organisation on "water"; that is what unites NBI/NRBC together. It could focus on that and leave other issues to other organisations.

Market development is also already a central activity of NBI, supported by the Strategic Action Programme (Section 6), and much important work has already been undertaken by the Regional Agriculture and Trade Programme in Bujumbura, Burundi. A future transformation of NBI into NRBC may not change this much. While the CFA does not mention "market development" or anything related to that issue, the CFA should probably be regarded as a document which allows anything which is not explicitly prohibited. Hence, market development as an agriculture function is possible.

The Subsidiary Action Programs briefly outline the possibilities for joint development projects. In one such area of opportunities, titled "Trade and Industry" several options are given. They are all acknowledged and internalized in this document except one: the combined option of marketing and storage. We do not regard storage as a process towards increasingly flexible and market-oriented farming in the basin, on the contrary. It limits trade, makes stakeholders less aware of costs and benefits, and is very expensive. As a consequence, "marketing" is joined together with the promotion of trade and "storage" is not included at all.

In the comments made by the client to the consultant in early September, one issue focused on how to operationalise this function. What should be the role of NBI/NRBC in terms of market development and agriculture? By starting at the other end, what should *not* be the role of NBI/NRBC in market development, the issue may clarify. The role should *not* be one of negotiating trade agreements and trade conditions with foreign governments or international forums like the WTO, as that role belongs to national governments. Then, what should the role be? Three roles are proposed here:

To study and learn about existing and new market opportunities. This includes activities such as to visit overseas markets and learn about their particular requirements and opportunities; participate in marketing campaigns; assess the opportunities of new crops to find buyers; and study how to access credit, land tenure issues, and how government bureaucracy affects a market oriented agriculture. Such knowledge can then be internalized and subsequently utilised in order to promote food production that answers the demands of the market. Such information can also be utilised to feed into the second role – see below.

Act as a technical advisor and information source. As already mentioned**,** NBI/NRBC represents a lot of knowledge about the Nile and its resources and their use. It has the DSS model, a huge network of specialists, and access to the single best source of data about the Nile. Obviously, this has a value. Many opportunities exist; to support governments to promote agriculture friendly business environments, to participate in international studies on food supply and demand, and to turn the Nile expertise into commercial support services.

Pro-actively promote market issues as a lobbyist. NBI/NRBC represents a certain set of values and interests in terms of water, land and development in the basin. This interest is not necessarily shared by the basin governments. Thus, there are opportunities for NBI/NRBC to pro-actively argue for more open, efficient and flexible agriculture sectors in the basin, in line with its market-oriented focus.

Proposed functions as compared to existing NBI functions and projects

The RATP project in Bujumbura focuses very much on the above issues. Trade issues are very much the focus of the RATP, there is e.g. an on-going study on the export of live animals to the Gulf region, and the whole issue of moving subsistence farming into market-oriented agriculture is a major concern. The proposed Sub-function 1 is already to a great extent being addressed by the RATP. The two other sub-

functions to a lesser degree or not at all.

Comparative advantages of NBI/NRBC to implement function

As mentioned above, even if the linkages between marketing and water are weak, some still exist, at least indirectly. These also constitute the comparative advantages of NBI/NRBC to be involved in the market development sector. There are three arguments. First: It can be argued that with farming turning increasingly market oriented, the inputs – water, land, fertilizer, labour – will turn increasingly valuable and important to conserve and use efficiently. A linkage therefore exists between water, land and food production *and* market issues. Second: A linkage also exists in terms of NBI/NRBC being an expert organisation on the Nile, its resources and their use, thus linking production – location, amount and quality – to market supply and demand, and thus food prices in general. The DSS model will also be extremely useful in predicting food prices and thus the potential for trade and food security. Third: As the value of agriculture production in the Nile basin is massive and directly linked to a healthy and functioning catchment, the role of NBI/NRBC as a custodian of sustainable farming (and other) practices in the basin is of great importance. Without a pro-active and engaged NBI/NRBC in preserving vital ecosystem services and productive rain-fed agriculture systems, the total basin agriculture production will fall and huge values will be lost. The negative market implications will be massive.

Proposed functions as compared to existing regional organisations' functions and projects

The introduction of a common market in East Africa in 2010, one of the main goals of the East Africa community (EAC), is beneficial to both food producers and consumers in the member states as new tariff structures create better conditions for world-market exporters, by reducing input costs and by reducing upward pressures on the exchange rate. EAC's Agriculture and Rural Development Strategy outlines the strategic interventions for accelerating the agricultural sector development, which consist of improving food security and accelerating irrigation development. The Economic Community of the Great Lakes Countries (CEPGL) has as one goal the transformation of subsistence farming into marked-based agriculture by creating a socio-economic climate conducive to growth and adaptation. This correlates closely with the RATP objectives and the promotion of market-based agriculture.

Relevant experience from basins and RBO's reviewed:

To our knowledge there is no RBO engaged in market development activities. For example, the Mekong River Commission is not, and neither are the commission for the Rhine or Danube in Europe and Orange in Lesotho/South Africa.

India is not a case of RBOs being involved in market development, but a case of food production being boosted through a combination of political support, active extension services and strong direct support to farmers. Farmers are (it is on-going) provided with large amounts of subsidies, like free water and energy, no income taxes, low cost seeds, fertilizers and machinery, and protected markets. This can be debated, and the negative effects on excessive removals of groundwater are apparent today, but food production has grown massively over the last few decades.

The agriculture sector in the Moulouya River in Morocco is constrained by out-dated technology, complex land tenure systems, and the smallness of the vast majority of farms and old practices. The private sector is also constrained by difficult access to credit, high interest rates, the land issues, administrative delays and legal uncertainties, while the managerial, technical and operational skills are limited. The state also has a long history of being overly intrusive, and impeding the free market and competition. All of this negatively affects the modernization of the agriculture sector, and certainly a move towards being more market responsive and ultimately more productive.

6.4 Options with functions

In this section the above listed functions are linked to the three described options. In order to help the reader, the different options are summarized below.

1. **Nile Basin Initiative-Reactive Model**. Nile SEC and NBI at large will play a limited role in the basin's agricultural sector. It will provide some coordination, a focal point for inter-state formalities and assist on a case by case basis.

2. **Nile Basin Initiative-Proactive Model**. Nile SEC and NBI at large play an active role in promoting agriculture at the national or sub-basin scale. It is an active organisation, looking for opportunities to promote water efficient agriculture, sustain the environment, and influence individual or sub-basin based countries to cooperate and achieve benefits from such endeavors.

3. **Nile Basin Initiative-Development Model**. The attempts by Nile SEC and NBI at large to play an active role in promoting food security in the basin are hampered by a limited mandate. This is an inherently unlikely combination.

4. **Nile Basin Commission-Development model.** Nile SEC and NBI at large play a very active role in promoting agriculture at the national, sub-basin and full-basin scales. By having the support of the CFA and its associated principles and vision and trust, and focusing on a full IWRM approach (thus having a food security focus on activities linked to agriculture), the full potential of the basin resources can be put to use for development and growth.

It is important to note that the table below is not a work plan on how to implement a basin agricultural agenda. It is the agricultural functions themselves, i.e. the different modes on how NBI/NRBC will support the basin directly or in-directly with a set of agricultural functions implemented.

"In-direct services" refer to services that provide an enabling environment for enhanced food production or security (e.g. policy development, the promotion of transparency, establishing standards), whereas "direct services" refer to services that directly support the farming community and increased food production or security (e.g. real-time weather information via mobile phones, demand driven capacity building, and the development of new seed types).

The colours indicate our view on what function is more or less "important" to implement. Green is high priority, blue is medium priority, and yellow is low priority.

The writing "Bw" (Basin-wide) and "Sb" (Sub-basin) indicate where in the Nile basin the particular function is best implemented (or managed).

Table 3. **Proposed functions and sub-functions**

Proposed functions and sub-functions.

Function / Sub-function	Past and present activities/ results	New, additional activities/results	Role of NBI/ NRBC	Op 1	Op 2	Op 3	Op 4	Comments
Function 1: Policy Formulation and Cooperation				Basin-wide (Bw)/Sub-basins (Sb)				
1: Knowledge Management 2: Water and Agriculture Standards 3: Basin Agricultural Planning. 4: Foreign Investments in Basin Agriculture 5: Agricultural Openness and Conflict Resolution 6: Market Development	1. Strategic Action Programme, CFA, many principles in need of interpretation, Data sharing protocol, Sustainability framework, (NELSAP KM strategy) 2. No comprehensive policy papers. 3. KM on in-house issues; data sharing on formalities, not practicalities. 4. Concepts on popular participation, incl CFA statements 5. On-going project focusing on this.	6. Formulation of policy statements and guidelines in all required areas; 7. Data: focus on easy transfer, and practicalities. 8. Issue of foreign investments in food production 9. Policy on upstream vs downstream water withdrawal, based on CFA articles. 10. Market Development: Based on and complement on-going work.	Develop, monitor		1:Bw Sb	1:Bw Sb	1:Bw	Relatively easy, uncontroversial. Much needed to handle research, new knowledge, e.g. CC
			Develop, monitor		2:Bw Sb	2:Bw Sb	2:Bw	Strong indirect tool for basin management. Many options, gradual development
			Develop, monitor			3:Bw Sb	3:Bw	Aims at water allocation, benefit sharing and food security. Requires much trust, good faith and coop..
			Develop, monitor				4:Bw	Politically controversial, difficult to approach.
			Develop, monitor	5:Bw Sb	5:Bw Sb	:Bw Sb	5:Bw	An indirect long-term support function. When need appears it is usually too late to act/plan
			Develop, monitor	6:Bw Sb	6:Bw Sb	6:Bw Sb		As previously discussed, it is not apparent why NBRC should include this issue. Not focus area.
Function 2: Knowledge Management				Basin-wide (Bw)/Sub-basins (Sb)				

1: Develop and implement KM strategies& guidelines 2: Data collection, storage and sharing 3: Develop, regulate and monitor standards/agree 4: Agricultural research and KM 5: Applied training, incl. dissemination of K	11. Internal KM paper 12. CFA on conflict and data sharing 13. Data formalities	14. Comprehensive KM guidelines	Develop, facilitate	1:Bw	1:Bw	1:Bw	1:Bw	Mirrors KM policy development., but more pragmatic, provides guidelines and action on KM.
			Develop, facilitate, implement, fund		2:Bw	2:Bw	2:Bw	Builds on already on-going work. Promotes openness and easy access.
			Develop, facilitate, arrange funding			3:Bw	3:Bw	Important, major in-direct function of NBI/NRBC
			Develop, facilitate, implement, fund		4:Bw Sb	4:Bw Sb	4:Bw Sb	Supports (i) other functions, plus (ii) identified needs. Many forms, contents, and audiences..
			Develop, facilitate, arrange funding			5:Bw	5:Bw	An important knowledge function. Structured, long-term support to KM.
Function 3: Basin Planning				Basin-wide (Bw)/Sub-basins (Sb)				
1: Plan basin development 2: Agricultural watershed management 3: Facilitate project preparations 4: Support project implementation and management	15. Much on-going via SAPs/SVPs; planning, coordination & funding 16. DSS, major support mechanisms	17. Moves DSS from development into everyday work 18. Also other needs than irrigation & power, e.g. environment, rain-fed, small-scale. 19. Active management of infrastructure. Executive role.	Facilitate, plan, coordinate				1:Bw Sb	If comprehensive, also full-basin and incl allocation of land & water. Politically difficult. OK at sub-basin
			Facilitate, plan, coordinate		2:Sb	2:Sb	2:Sb	Provides support close to users, thus more inclined towards sub-basins.
			Facilitate decisions, funding			3:SwSb	3:SwSb	Demand driven, from sub-basins. Natural role, obvious niche. Likely to be successful.
			Implement				3:Sb	Requires an executive commission with broad powers and mandate. Boundary conditions required.
Function 4: Market Development				Basin-wide (Bw)/Sub-basins (Sb)				
1: Marketing/ promotion ag trade 2: Market information easily available	20. RATP established 21. On-going work on trade, market development, such as meat export to Gulf states.	22. Focus on bringing action to field 23. Emphasis on cooperation with others; NBI not driver	Lobbyist, advisor, information source			1:Bw Sb		Promotion of trade, export/import, lowered tariffs. Mandate within NRBC questioned..
			Lobbyist, advisor, information source	1:Bw Sb	1:Bw Sb	1:Bw Sb		Make market information available via openness, modern technology and awareness.

7. TURNING GOOD INTENTIONS INTO ACTION

This final chapter focuses on moving the agricultural functions into an implementation stage. Three questions are briefly addressed: What drivers for change have an impact on the food situation in the Nile basin, what are the function cost estimates, and "how to get the functions moving"?.

7.1 Drivers for change

What will shape food, water and development in the Nile basin in years to come? There is obviously no simple answer to that question, and what will be described here is merely a brief review of some of the drivers and boundary conditions often mentioned in the literature. At the end is a summary made linking drivers and boundary conditions to proposed agricultural functions.

Population increase. The current basin population of approx. 160 million is expected to double over the next 25 years, and in the year 2050 possibly approach 400 million or more. The rate of urban population increase will be even higher.

Economic development and associated dietary changes. Even if the rate of poverty will remain the same in many basin countries, the number of well-to do middle class people will increase in absolute numbers. This in turn is linked to a more affluent meat-based diet and increased consumption of goods and services, all closely linked to enhanced consumption of virtual water.

Access to green and blue water. Landscape changes like deforestation and land degradation have well-known impacts on the basin water balance: more water will rapidly leave upstream areas and concentrate in downstream locations. This is mirrored by a corresponding drying up of soil water. In addition, by neglecting upstream catchment functions an increase in silt and debris load in downstream runoff will appear, potentially decreasing the life span of large infrastructure investments (dams, irrigated areas). Climate change will also have an effect, most likely reducing the total amount of water available for food production.

Global changes. These include higher international energy and food prices, a rising demand for bio-fuels (reducing land and water resources available for food production), and more interests from other countries to grow food in the basin for their own populations.

Technological changes. New crop varieties, possibly genetically modified, are likely to increase drought and heat tolerance, flood resistance, and ability to withstand pests. New technology also implies the use of mobile phone and internet distributed information.

Increased urbanization. This has many common effects; e.g. smaller families, enhanced well-being, more water-use efficient jobs in industry and services, and shorter distance to public services like education and health care.

Some of the above issues probably have a negative overall impact on the basin. For example, the combined effect of climate change and land degradation – due to increasing population pressure and inappropriate land use practices – are probably not good for the basin. However, many of the other issues include positive feed-back mechanisms on development in general and on agriculture specifically. The biggest change of them all, urbanization, is sometimes described as something "bad", although that can be debated. Certainly, for those living in urban slum areas it is bad. However, urbanisation also drives economic growth, provides new opportunities due to the proximity to education, changing habits, global markets, communication and new types of employment opportunities. The latter are typically quite efficient in terms of converting water use into decent livelihoods, and should be seen as a way out of water scarcity and poverty – not the other way around. They also drive a move towards a more "modern" agriculture sector, more market oriented, responsive to opportunities and open for new farming practices. Finally, the urban sector is also the main generator of foreign currency, critically needed in order to pay for imported food, which in turn is needed to feed everybody in the region.

The implication of the above on the proposed agricultural functions is as follows.

1. **Export earnings in foreign hard currencies must have a priority right** to available green and (primarily) blue water resources – *given that they are water use-efficiently produced*. These earnings, together with other capital transfers, are today paying for about 20% of all food

consumed in the basin, and this rate will most likely increase in the near future. Thus, nothing should be allowed to limit such income generation to a country orthe region. In practice it implies that e.g. high value cash crops (flowers and expensive vegetables and fruits), the tourist sector and urban uses of water (industry and services) should have a priority right to water before it is allocated to other needs like large-scale irrigation for wheat and rice production. In addition, the urban areas will also become home to millions of new people that all need their household needs satisfied by blue water – again a priority need. The above reasoning follows very closely to what all the national workshops stated: we want to focus on food security rather than food self-sufficiency in the future.

2. **Maintain critical upstream catchment functions**. Probably 30-40% of the basin population lives in true "upstream positions", i.e. they live in areas feeding some 100 million downstream located people with water. For example, within their countries, both Kampala and Nairobi are located downstream. These people depend on the amount, distribution and quality of water coming down from above. If the access to water turns increasingly seasonal, total amounts are reduced, or the quality goes down (due to e.g. increasing contents of rubbish, silt, pesticides or salt) these people will suffer. Silted dams, damaged turbines, flooded city centres and undrinkable water – that is no good to anyone. We see it happen around the world today (e.g. in Thailand, Pakistan, Iraq). There is only one solution to avoid such a scenario: *to maintain upstream catchment functions*. And to do so, the upstream land managers have to be engaged. These are typically rural, subsistence rain-fed farmers, living far away from big cities and new lifestyles, but still producing some 60% of all the food in the Nile basin. It is within their potential to massively increase the basin's agricultural land and water productivity, protect the catchment functions to the benefit of downstream people, and drive the basin's economy forward. Thus, upstream rain-fed agriculture should if anything be given a priority over further expansion of irrigated agriculture.

3. **Promote dedicated, focused and state-of-the-art knowledge.** Both of the above issues depend heavily on *knowledge.* Issues such as how to handle the allocation of water between different needs, to improve land and water productivity, and new types of crops targeting dry, subsistence conditions on poor soils – they all need new knowledge, disseminated effectively and actually *applied*. This requires an organisation that is close to the ground, listening attentively, and able to convert what it learns into appropriate packages of "knowledge". The knowledge may either be old and well tested, or new state of the art, produced according to strict need assessments, tested in the region, and applicable by farmers also located far away from research stations. There is indeed a lot of knowledge produced around the world today on issues relevant to the Nile basin, but it all has to be converted into the specific context found in the basin, or it won't make any difference. There has to be a capacity in the region to develop context-specific knowledge, and in the case of land, water and agriculture, a listening organisation able to handle Terms of Reference, contracts and facilitated funding.

7.2 Function cost estimates

What the proposed agriculture functions will cost to "implement" is an important issue and part of this assignment. However, short of doing a thorough analysis, which would be a major assignment of its own, this is at the level of making an assessment, an estimate. The difficulties in doing this are obvious. Most proposed functions are based on an initial NBI/NRBC review or policy development phase, followed by a facilitated "implementation" phase. The implementation is typically undertaken by a contracted institution, according to Terms of Reference developed by NBI/NRBC. The difficulties are not linked to the first phase, some internal NBI/NRBC work, but to the second phase: How "much" implementation should be planned and what is the cost of "each" implemented activity? For example, there is no difficulty in defining a long list of needed research studies on water and food, but should they all be included in the cost of the Knowledge Management function? And should the cost of each study be that of developing a new GM crop – or doing a small review of IWRM curriculum being used in southern Africa?

We have chosen the following approach. For each sub-function, the cost at two levels of implementation is given. The first level is "to get the function going", something small but still noticeable. The second level will give functions a "direction and substance", albeit still modest in size and early in the process of making a difference in the basin (note: a sub-function can start by both Level 1 and 2 activities). Further activities will depend on prevailing conditions, priorities, and funding opportunities.

In the table below is a description of the two levels and their associated costs given against each sub-function. Four terms are often used: (i) Outline; "internal working document for further action"; (ii) guidelines, "being practical procedures to determine a course of action"; (iii) principles, "fundamental norms, rules, or values that represent what is desirable and positive"; and (iv) policy, "a concise set of formal statements or principles that determine decisions". An outline is the least compelling, policy the most. Do also note that additional activities may have to be taken under Function 1 Policy Development before the issue is ready for implementation in subsequent functions.

Table 4. The cost of two activities per function and sub-function

Sub-function	Level 1	Cost	Level 2	Cost
Policy Development				
1:1 Knowledge management	Develop guidelines for internal NBI/ NRBC knowledge management. Review data management in other RBOs / analyse current approach	2 person-months, 4 reg. travel. **Tot: USD 30,000** 4 person-months, 2 international travel **Tot: USD 50,000**	Write a NBI/NRBC outline on water and agriculture research. Write a NBI/NRBC outline on data management	4 person-months, 6 reg. travel. **Tot: USD 55,000** 4 person-months, 6 reg. travel. **Tot: USD 55,000**
1:2 Water and agriculture standards.	Review the use of standards to promote shared management concerns	4 person-months, 1 international travel **Tot: USD 45,000**	Write a NBI/NRBC outline on the use of standards in basin development.	4 person-months, 6 reg. travel. **Tot: USD 55,000**
1:3 Basin agricultural planning.	Review the issue; positions, current conditions, interests	6 person-months, 8 reg. travel. **Tot: USD 80,000**	Write a NBI/NRBC outline on the diversion and use of Nile water.	6 person-months, 8 reg. travel. **Tot: USD 80,000**
1:4 Foreign Investments in basin agriculture	Review scale and character of foreign investments in basin agriculture	6 person-months, 4 reg. travel. **Tot: USD 70,000**	Write a NBI/ NRBC outline on foreign investment in agriculture production.	6 person-months, 8 reg. travel. **Tot: USD 80,000**
1:5 Agricultural openness and conflict resolution	Write a NBI/NRBC outline on how to handle conflicts in the basin.	4 person-months, 6 reg. travel. **Tot: USD 55,000**	Write a NBI/NRBC policy on openness and dialogue.	4 person-months, 6 reg. travel. **Tot: USD 55,000**
1:6 Market development	Review basin agriculture issues linked to market development	6 person-months, 8 reg. travel. **Tot: USD 80,000**	Write a NBI/NRBC outline on market development in the Nile basin	4 person-months, 6 reg. travel. **Tot: USD 55,000**
Knowledge Management				

2:1 Develop and implement KM strategies & guidelines	Write a project proposal on strengthening KM within NBI/NRBC itself	1 person-month, 2 reg. travel. **Tot: USD 15,000**	Secure funding and implement project proposal.	1 person-month, plus project cost **Tot: USD 210,000**
2:2 Data collection, storage and sharing	Make an assessment of data available, currently collected, and new needs	6 person-months, 2 reg. travel. **Tot: USD 65,000**	Write project proposal on establishing a NBI/ NRBC data centre.	2 person-month, 2 reg. travel. **Tot: USD 15,000**
2:3 Develop, regulate and monitor standards/agree	Identify and describe 3 standards linked to agriculture.	6 person-months, 2 reg. travel. **Tot: USD 65,000**	Write project proposal on introducing 3 standards at sub-basin level.	2 person-month, 2 reg. travel. **Tot: USD 15,000**
2:4 Agricultural research and KM	In cooperation with partners, identify 3 ag. research areas to promote	6 person-months, 4 reg. travel. **Tot: USD 70,000**	Facilitate the funding of 3 research projects, arrange ToR, tender & contract	2 person-month, 2 reg. travel. **Tot: USD 15,000**
2:5 Applied training, incl. dissemination of knowledge	Review present training needs and select 3 such needs	3 person-months, 4 reg. travel. **Tot: USD 40,000**	Facilitate the funding of 3 training projects, arrange ToR, tender & contract	2 person-month, 2 reg. travel. **Tot: USD 15,000**
Basin planning				
3:1 Plan basin development	Write project proposal on using DSS model to analyse benefit sharing opp.	2 person/ month, 2 reg. travel. **Tot: USD 25,000**	Secure funding and Implement project proposal	1 person-month, plus project cost **Tot: USD 210,000**
3:2 Agricultural watershed management	Commission review report on rain-fed vs. irrigated agriculture & catch. funct.	2 person/ month, 2 reg. travel. **Tot: USD 25,000**	Write project proposal on studying up/ downstream agriculture linkages.	2 person-month, 2 reg. travel. **Tot: USD 15,000**
3:3 Facilitate project preparations	Facilitate the funding of a project proposal	2 person/ month, 2 reg. travel. **Tot: USD 25,000**	Facilitate the funding of a project proposal	2 person-month, 2 reg. travel. **Tot: USD 25,000**
3:4 Support project implementation/ management	Review the role of NBI/NRBC in project implementation/ management	6 person-months, 4 reg. travel. **Tot: USD 70,000**	Develop guidelines for NBI/NRBC to engage in project implementation	3 person-months, 4 reg. travel. **Tot: USD 30,000**
Market Development				

4:1 Marketing/ promotion agriculture trade	Commission DSS based research on the value of water in diff. sectors	4 person-months, 4 reg. travel. **Tot: USD 50,000**	RATP assignment to assess trade implications of alt water value in diff. sectors	3 person-months, 4 reg. travel. **Tot: USD 30,000**
4:2 Market information easily available	Review regional/ global experience of mobile phone shared information	4 person-months, 2international travel. **Tot: USD 50,000**	Facilitate the funding of 1 pilot project on mobile phone info sharing	1 person-month, 2 reg. travel. **Tot: USD 15,000**
TOTAL COST PER LEVEL		**USD 910,000**		**USD 1,030,000**

Some comments on the cost of initiating agricultural functions are as follows. Most of the outlined activities are of an introductory nature, like review the current status, outline a NBI/NRBC position, or facilitate the funding of a project proposal. More complex activities are not foreseen at this stage. In two cases are an active inclusion of NBI/NRBC staff in the implementation foreseen, whereas in all other cases the implementation is assigned to a contracted partner. The cost estimation is simple. One professional person, including the cost of an office, costs USD 10,000 per month (500 per day). Regional travel is USD 2,500 per tour, including accommodation etc. Finally, the totals may look large, but one should remember that these include one activity per every sub-function (two on KM), which is a lot and will never happen. A more likely implementation plan is outlined in the subsequent section.

7.3 Starting small, growing bigger

The purpose of this section is to share some thoughts on an “agricultural functions implementation plan” and some guiding principles on this.

In general, we propose that a few, maybe as little as 2-3, sub-functions are identified as having particular importance and likelihood to produce real, positive outcomes. As these start their implementation, another group of sub-functions can be selected for implementation and so forth. With augmented experience and results, securing funding should turn easier. In Table 8 below are 6 sub-functions presented as optional first choices for implementation.

Table 5. Proposed options for fist activities

Sub-function	Activities	Outcome	Arrangements
1.1 Policy development/ KM/ The use of in-house NBI/NRBC knowledge capacity/ Develop guidelines for internal NBI/ NRBC Level 1.	1. Review where information is located, what types, with whom 2. Review what the problem on not sharing is – culture, values, practical obstacles 3. Define the desired outcome 4. Write guidelines on internal NBI/NRBC KM	5. A hands-on set of guidelines on internal knowledge management with the goal of making information/data available, productive and accessible to all. 6. The guidelines should include a focus on specific groups, e.g. senior managers, technical staff, administrators. 7. Openness and accessibility should be key words.	8. This should preferably be a basin-wide (NBI) task to undertake, i.e. not separately by NELSAP/ENTRO. 9. Activities are for NBI/NRBC to write ToR for the assignment, tender and contract a specialist in KM and experienced in working with large organisations in Africa. 10. 2 man-months of work, some travel and a total of **Tot: USD 30,000.**
1.1 Policy development/ KM/ Water and agriculture research/ Write a NBI/NRBC outline on water and agriculture research. Level 2.	11. Define NBI/NRBC role in water & agriculture research 12. Identify criteria for selecting research issues to address 13. Identify dissemination avenues for research results 14. Arrange 4 national workshops/meetings on a NBI/ NRBC research agenda 15. Write an outline paper for internal discussions	16. A document called "A NBI/ NRBC Water and Agriculture Research Agenda" 17. The document shall be sufficient specific to initiate extensive internal / with partners discussions	18. This could either be a basin-wide or sub-basin focused task 19. Activities includes for NBI/ NRBC to write ToR for the assignment, tender and contract 1 or 2 specialist(s) in research and experienced in working with water and agriculture research in the region. 20. 4 person-months, 6 reg. travel. **Tot: USD 55,000**

Sub-function	Activities	Outcome	Arrangements
1.2. Policy development/ Stan-dards/Review the use of standards in agriculture Level 1	21. Review how and which standards that are being used in river basins to regulate water linked issues 22. Identify a list of 10 standards of different character and potentially for use in the Nile. 23. Visit and review one international river basin 24. Write a comprehensive report linking international experience with a regional context.	25. A good scientific report on standards, their use and applicability in the Nile. 26. How standards can be used in a trans-boundary river like the Nile to promote enhanced, water use-efficient agriculture.	27. This task wills most likely have a sub-basin focus; thus being arranged by NELSAP or ENTRO. 28. Activities includes for NELSAP/ENTRO to write ToR for the assignment, tender and contract a specialist on the issue and with experience of African rivers and agriculture 29. 4 person-months, 1 international travel, **Tot: USD 45,000**
2.1 Knowledge Management/ Develop and implement/Write project proposal on strengthening KM within NBI/NRBC Level 1	30. Review the issue; like the above developed guidelines, the current situation, the desired, future target 31. Develop a project proposal that will ensure new guidelines to be fully implemented. 32. Include both soft and hard issues (values, technical equipment etc)	33. A professionally written project proposal, including objectives, activities and outcomes, plus budget and suggested implementation arrangements.	34. This is a basin-wide project and should as such be handled by NBI. 35. Write ToR for the assignment, tender and contract a specialist experienced in KM and large organisations in Africa 36. 1 person-month, 2 reg. travel. **Tot: USD 15,000**
2.1 Knowledge Management/ Develop and implement/ Secure funding and implement project proposal Level 1	37. Build on the above developed project proposal 38. Write ToR for the assignment, tender and contract a consultant experienced in KM and large organisations in Africa 39. Monitor implementation	40. Following implementation, the new guidelines are implemented and used throughout NBI/NRBC.	41. Depending on the context, NBI or NELSAP/ENTRO takes leadership and facilitates the process. 42. 1 person-month, plus project cost. **Tot: USD 210,000**

Sub-function	Activities	Outcome	Arrangements
3:3 Basin Planning/ Facilitate project preparations/Facilitate the funding of a project proposal Level 1	43. Focus here could be any proposed Nile basin project in need of funding 44. Depending on need; negotiate with countries, organisations, funding agencies, 45. Find a mutually satisfactory solution, facilitate the funding and withdraw.	46. A new project in line with the NBI/ NRBC mandate has received regional acceptance and funding, and is ready or implementation.	47. Depending on the context, NBI or NELSAP/ENTRO takes leadership and facilitates the process. 48. 2 person/month, 2 reg. travel. **Tot: USD 25,000**

It can be argued that not even one of the above activities will lead through to real, field-based improvements. That is correct. It requires additional activities before the proposed agricultural functions are actually seen in the farmer's field or in a local market. Thus, what is described above are only the first steps in a sequence of specific activities, that depending on the need, context and NBI/NRBC's capacity, plus funding opportunities, can grow into important programmes.

8. SELECTED REFERENCES

Allen, T.,(2007). Regional case study: R3Sharing Nile waters: a closed fresh water resource, soil water potential, and political economy and Nile trans-boundary hydro politics. Foresight Project on Global Food and Farming Futures, (http: //www.bis.gov.uk/Foresight

Appelgren, B., Klohn, W., and Undala Alam, (2000). Water and Agriculture in the Nile Basin, Nile Basin Initiative Report to ICCON Background Paper prepared by FAO, FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS Land and Water Development Division ,Rome.

Kirby, M., J. Eastham, and M. Mainuddin (2010). Water-use accounts in CPWF basins: Simple water-use accounting of the Nile Basin. CPWF Working Paper: Basin Focal Project series, BFP03. Colombo, Sri Lanka: The CGIAR Challenge Program on Water and Food.29pp.

Sulser, T., Ringler, C., Zhu, Z., Msangi, S., Bryan, E., and M.Rosegrant, 2009. Green and Blue Water Accounting in the Limpopo andNile Basins Implications for Food and Agricultural Policy. The International Food Policy Research Institute (IFPRI).

Zeitoun, M., Allan, JA., and Y. Mohieldeen (2010). Virtual water 'flows' of the Nile Basin, 1998–2004: A first approximation and implications for water security. Global Environmental Change 20 (2010) 229–242.

9. Annexes

Annex 1 Bsin review: Murray-Darling River

Basin facts: Location, size and countries/states covered

Murray Darling River is located in Australia. It has a catchment area of 1 Million km^2 and passes through five states. These are Queensland, New South Wales, Victoria, South Australia and the Australian Capital Territory. Although the river falls in one country but the fact that it passes through several states implies that cooperation is necessary for effective and sustainable management of the river and its basin to ensure equitable benefit sharing.

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

The population in the catchment area is about two million who depend on it to meet the demands of their livelihood from the resources in the basin. Some of the natural resources in the basin include 30 000 wetlands which are also important for biodiversity conservation. Sixteen of these wetlands are of international significance and are recognized under the convention on wetlands.

The basin is home to the aborigines for the last 50 000 years and sustains the cultural, socio-economic and spiritual lives of the inhabitants. Still today, more than 30 major aboriginal nations maintain their traditional lands within the basin and its waters. Waterways and wetlands remain significant for socio-economic and cultural functions.

Livelihood conditions/socio-economic: Resource allocation/use, wealth, employment, society

Apart from the two million living in the basin, the basin also supports an additional one million people. Agriculture is a major water consumer in the basin with 65% of irrigated agricultural land falling within the basin. In total 39% of National income is contributed by agricultural production. The agricultural benefits generated from the basin include cereals constituting 53% of the country's cereal production. Other major agricultural products from the basin include fruits and particularly oranges and apples which constitute 95% and 54% respectively of the entire fruit production in Australia. In addition to these, the basin also supports 28% of the nation's herd, 45% sheep and 62% pigs. This is an indication on how significant the basin is in meeting livelihood demands in the country.

Water related problems

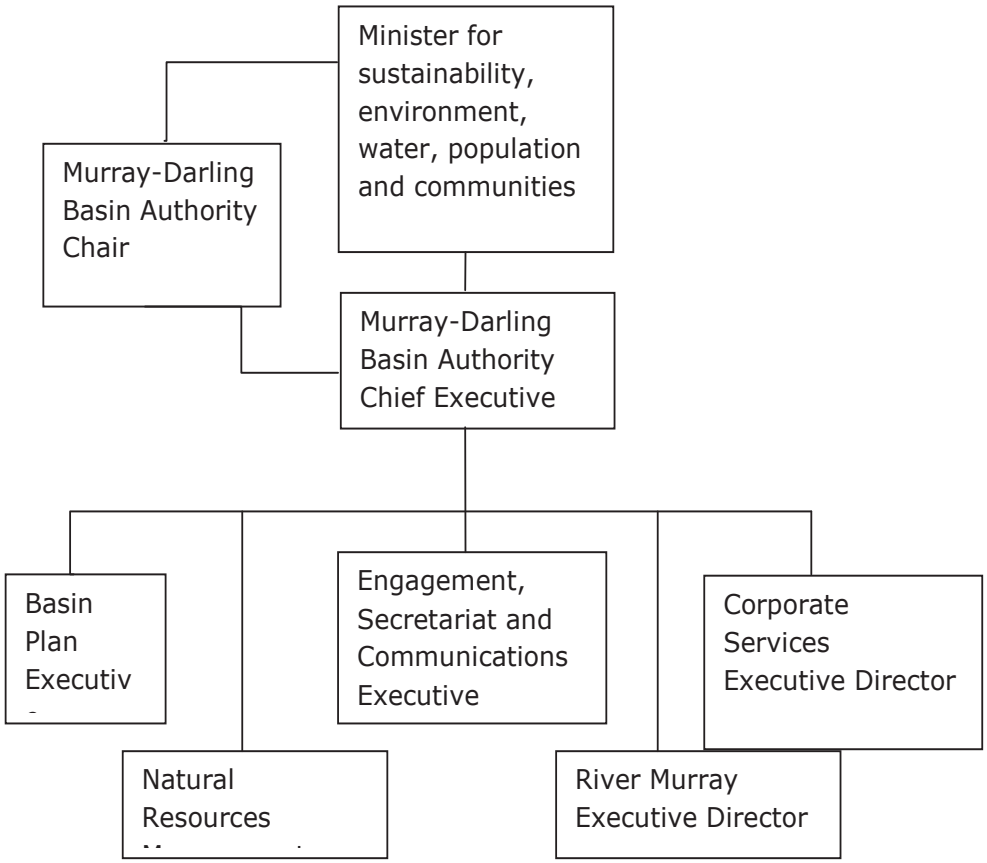
Water related issues in the basin are quite diverse. These range from natural processes including hydrology to social aspects related to water use. They include drought and climate change resulting in prolonged water scarcity. In addition to these, past water management decisions and over-allocation have resulted in inequitable water sharing. Other issues which relate more to water quality include water and land salinity, poor water quality, acid sulphate soils and land degradation which also results in reduction of soil storage and reservoir capacity due to siltation.

RBO: Established by who, when, why, how, and goals and milestones.

The Murray Darling River Basin Authority (MDBA) is the RBO established in the basin. It is an autonomous public institution with the responsibility of managing the basin's water resources in the national interest. The process of establishing the RBO started in 1915 with the creation of River Murray Waters Agreement (RMWA) to facilitate water sharing between the southern states. The RMWA was later transformed into Murray-Darling Basin (MDB) agreement in 1987 with all the six states signing the agreement by 1998. It was run by Murray-Darling Basin Commission until December 2008 when its functions were taken over by the Murray-Darling Basin Authority (MDBA). The goal of MBDA is to achieve sustainable management of water resources across Murray Darling River which is the largest River Basin in Australia. Legally MDBA is a statutory agency established by the Australian Government under the Water Act of 2007. Some of the milestones realized by MBDA are its operationalisation and development of the basin plan which outlines the operational roles of the various structures of the RBO

RBO: Institutional arrangements/structures, management, stakeholders

The functional structure of MBDA with the five major roles is as outlined in the diagram below.



Functional structure of MDBA

RBO: Overall functions – types, coordination, interactions, operationalization

The functions of the MDBA are executed through MDB Ministerial council, Murray-Darling Basin Officials Committee (BOC), the Basin Community Committee (BOC) and the Sub-Basin Committees to the BCC. These institutions provide platforms for stakeholder engagement in executing the roles and responsibilities of MBDA. Their functions are outlined below.

1. MDB Ministerial council: The council is composed of one Minister from each of the five states in the Basin. It is chaired by the commonwealth water Minister. The council is the top policy decision maker of the Authority

2. The Murray-Darling Basin Officials Committee (BOC): This committee is established under the Water Act and the Murray-Darling Basin Agreement. It facilitates cooperation and coordination between the commonwealth water minister, MDBA and the Basin states in funding works and merging the basin water and other natural resources. BOC provides advice to the Ministerial

Council, and implements policy and decisions of the Ministerial Council on matters relating to state water sharing and the funding as well as delivery of natural resource management programs. The BOC has high level decision making responsibilities for river operations, including setting objectives and outcomes to be achieved by MDBA in Murray River operations.

3. The Basin Community Committee (BCC): The BCC consists of 16 members including the chairperson. They are selected on the basis of their expertise or interest in community, irrigated agriculture, environmental water management, indigenous or local government matters. The BCC is the advisory committee that provides a formal platform for the views and interests of the community to be considered by MDBA. It advices MDBA about the performance of its functions including engaging the community in the preparation of each of the draft basin plans, community matters relating to basin water resources and matters referred to the committee by the Authority and the Murray-Darling Basin Ministerial Council.

4. The sub-committees to BCC: These are four in number and their membership is drawn from the BCC. They are supported in their functions by inputs from technical experts. The focal areas are irrigation, environmental water, indigenous water, urban industrial and recreational water sector issues.

Key agricultural functions – indirect

The key indirect agricultural functions include setting guidelines for water diversion limits, defining conditions under which diversions can be varied depending on flow variability and setting guidelines for the harvesting of flood water for irrigation

Key agricultural functions – direct

The key agricultural functions of MDBA which are directly related to agriculture include: Diversion of water from the river for irrigation and managing diversion structures. Catchment protection to ensure that a minimum level of sediment is delivered from farmlands to the river including the wetlands. Development of drought resistant crops through research, defining terms and conditions for supplementary irrigation taking into account the meteorological conditions and harmonizing standards for use and protection of riparian zones are also agriculture based functions of MDBA.

Lessons learned – success/failures

One of the lessons learned in the functioning of MDBA is good political will from the six member states that has created an enabling environment for the functioning of the RBO. The other lesson learned is the proper structuring of institutional arrangements that provide platforms for community participation.

Key messages for the Nile basin

The key messages drawn from MDBA for the Nile basin are agreement among member states which has created enabling environment for the functioning of the RBO, provision of adequate platforms for stakeholder participation and devolution of power and functions to lower level institutions.

Annex 2 Basin review: The Red River

Basin facts: Location, size and countries/states covered

The Red River is an International River passing through China and Vietnam in a total of 26 provinces before flowing into the East Sea.

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

The Red River has adequate water to meet the demands of its population which is about 28 Million. The scarcity experienced can be explained by spatial and temporal variability of its flow pattern.

Livelihood conditions/socio-economic: Resources allocation/use, wealth ,employment, society

The Red River supports an irrigation area of about 650 000 ha mainly around the delta area. Other water uses that generate income and employment are recreation and tourism. To diversify income in order to ensure food security, aquaculture and crop diversification have been considered as potential for income generation.

Water related problems

The major water related problems in the basin are scarcity of irrigation water supplies, flood damages and pollution. The problems persisted and consequently led to a change of policies in order to address them comprehensively. Policy change also brought institutional problems and in particular conflicts due to overlapping mandates especially between The Ministry of Agriculture and Rural development and that of Natural Resources and Environment. The implementation of IWRM was slow due to the weakness of the RRBO.

RBO: Established by who, when, why, how, and goals and milestones.

The Red River Basin Organisation (RRBO) was established in this basin under the Ministry of Agriculture and Rural Development (MARD). Three top priority issues of concern in the Red River for the RBOs are:

- Irrigated agriculture
- Water supply and sanitation together with pollution
- Flood control including reforestation and protection

Two other RBOs established in the sub-basins of the Red River are the Cau Sub-Basin Organisation (CSBO) and Day Sub-River Basin Organisation (DSBO) in the Cau River and Day-Nhue River respectively. The two RBOs operate under RRBO. The RBOs play a technical coordination and advisory role to MARD on assessing planning alternatives, basic investigation projects and inventory and assessment of water resources in the basin. Based on the assessments, the RBOs submit recommendations to MARD and other authorized state agencies for implementation.

The major milestones realized by the RBOs are

1. The establishment of integrated water resources management in Cau River sub-basin
2. Strategic flood management in the Red River delta
3. Integrated water resources management at sub-basin level in selected upland provinces
4. Integrated water resources management in the day-Nhue River Sub-basin with focus on water quality issues

RBO: Institutional arrangements/structures, management, stakeholders

The RRBO is legally under the MARD. Although the Ministry of Natural Resources and Environment (MoNRE) has the responsibility to manage water resources, implementation however was to be carried out at the basin level through RBO which is under MARD. Due to lack of clear distinction in functions between institutions, MoNRE became the custodian of water resources at National level while RBO managed water resources at basin level under MARD.

Structurally RRBO is chaired by the vice Minister of MARD assisted by the Director of Water Resources (DWR) and a departmental level leader from MoNRE. Members of RRBO include leaders of PPCs from the 26 provinces, leaders of DWR, IWARP, DWRM and other water related departments from other Ministries as well as their provincial affiliates.

RBO: Overall functions – types, coordination, interactions, operationalisation

The Red River Basin Organisation was established in 2001 with the roles of technical coordination and advisor to MARD. The functions of RRBO were to manage the planning of water resources management, facilitate improved stakeholder involvement and coordinate various agencies with water resource related functions. Given the big number of provinces in the basin, the RRBO was also charged with coordination of the 26 provinces in as far as water resources management is concerned and establish a water resources database for effective operations.

Key agricultural functions – indirect

The indirect agricultural functions undertaken by the three RBOs are as follows

1. Water quality monitoring in order to determine the pollution sources and develop strategies to address problems emanating from poor quality water for various uses
2. Flood control to reduce damage and loss of property and life which would result in low agricultural production
3. Conflict resolution among provinces in the same sub-basin while inter-basin issues are addressed by the RRBO
4. Inter-provincial coordination to enhance management of water resources and equitable water use

Key agricultural functions – direct

The direct agricultural functions undertaken in the basin by the three RBOs are as follows

1. Water allocation in accordance with the rules to ensure equity to the various uses including irrigated agriculture
2. Data management for projections and planning of water allocation based on trends of water availability
3. Storage enhancement to improve water availability for agriculture and other uses

Lessons learned – success/failures

The lessons learned as a result of policy change in the River Basin include the emergence of functional conflicts as a result of institutional development caused by overlapping mandates. Stakeholder participation in the RBOs is limited to representatives from government agencies at national and provincial levels. Consequently the views of target groups are not incorporated into the decision making process since they are not given forum to engage with policy makers and implementers.

The sub-basin organisations (CSBO and DSBO) are also very much controlled by RRBO and by extension government agencies thus making them extremely weak with no authority for decision making in executing their functions. The whole system is a top down approach, government controlled and therefore ineffective in implementing IWRM. This is part of the reasons why management of water resources in

the basin is characterized by in-fighting and power struggle. Consequently most programs have not been successful in the basin.

The fact that the sub-basin organisations are operating under RRBO is likely to annihilate any sense of ownership by the provinces they are serving due to subordination by the national institutions. At provincial level, the CSBO is dominated by Thai Nguyen Province. Since one of the functions of sub-basin organisation is to address inter-provincial issues, dominance by one province is a weakness in non-partisan decision making across all provinces served by the same sub-basin organisation.

Another lesson learned from the RBOs is that basin-wide participation is both difficult and unnecessary in all the 26 provinces in the Red River Basin. This is because the 28 million people living in the basin do not share common IWRM challenges.

Key messages for the Nile basin

The key message to the NileBasin as learned from the lessons above is that the functions of the institutions to be established should have clear functions without overlap in order to avoid institutional conflicts which can be counterproductive.

Strong involvement of government institutions in an RBO is likely to cause in-fighting and power struggle for control of the RBO. Consequently the utilization of resources is likely to be ineffective. Institutional arrangements should also provide forums for stakeholder participation in order to diversify decision making and encourage by-in of projects to be implemented by the RBO. Another message for the Nile is that there is need to identify common issues and challenges in order for IWRM to work in a basin.

Annex 3 Basin review: Mekong River

Basin facts: Location, size and countries/states covered

The Mekong River flows through six countries namely Cambodia, Lao PDR, Thailand, Viet Nam, China and Myanmar. It rises from the Tibet Mountains and flows for a distance of 4800 km before flowing into the Great lakes in Cambodia.

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

The Mekong River has a population of 60 Million in its lower reaches with about 100 different ethnic groups. This is an indication of diversity in culture which is likely to influence socio-economic practices in the basin. The River is navigable in most of its parts for 8 months a year. It flows into the Great Lakes in Cambodia during flood season. Flooding causes the area of the lake to increase from 3000 km^2 to 13000 km^2. During dry season water flows from the Great lakes to the Mekong River which constitute 16% of dry season flow.

Livelihood conditions/socio-economic: Resources allocation/use, wealth, employment, society

The living standards in the basin are quite low as indicated by high poverty levels. The majority of the population survive on less than 1 US$/day. The basin accounts for between 20% of GDP in NE Thailand and 52% of GDP in Lao PDR and it provides for more than 300 Million people. The basin provides livelihoods for around 75% of the lower Mekong basin (LAMB) population and is an important source of export income. Irrigation is a major water consumer in the basin and during wet seasons it is practiced in order to secure the rice crop. Irrigation in the dry season allows a second crop or even a third one. It also enables production of high value vegetables, fruits and industrial crops. Overall agriculture employs 85% of the people living in the basin with rice production being a major crop.

Water related problems

Sea water intrusion into the delta area during dry season reduces irrigation potential thereby resulting in loss of production. The sea water is not fit for domestic use and therefore the intrusion process into the delta affects shallow wells thereby causing scarcity of domestic water supply. During the wet season, water availability for irrigation exceeds the demand while during the dry season irrigation water supply is often short of the demand. This is so particularly in the Mum-Chi basin and in the delta, which is currently responsible for about 50% of Viet Nam's total food production. Other issues which are water related are loss of biodiversity and livelihoods, erosion and siltation of water bodies as well as loss of wildlife and eco-tourism. These are exacerbated by the impacts of high variability of flow between dry and wet seasons.

RBO: Established by who, when, why, how, and goals and milestones.

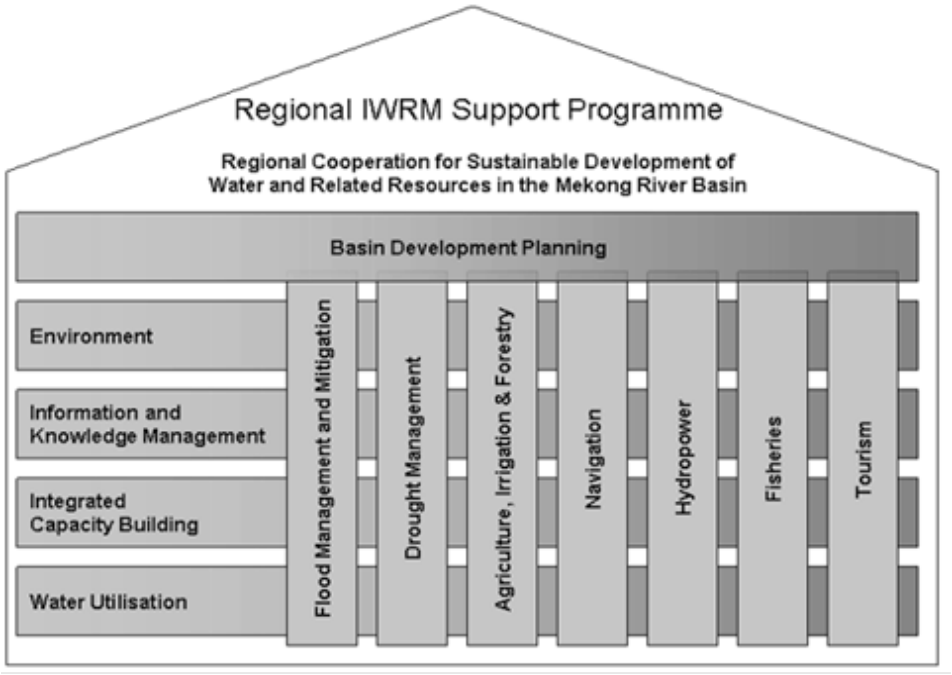
The basin is managed by the Mekong River Commission (MRC) established on 5/04/1995 through an agreement signed by the four riparian countries. The vision of the commission is to ensure the realization of economic prosperity, social justice and environmental soundness of the basin. The MRC incorporated China through an agreement signed on 1/04/2002. The goal of the commission is to achieve effective use of water and related resources, alleviate poverty and at the same time protect the environment. In addition to these, the commission also seeks to sustain economic growth and improve the welfare of the people.

Some of the milestones realized by MRC are development of Strategic Plan 2006-2010, which addresses development needs in Navigation, flood management, fisheries, irrigation, hydropower, environment management, watershed management, tourism, and capacity building. Areas prioritized by MRC in implementing the plan are the provision of hydrologic information especially on the Lancing/Mekong River

for flood forecasting and provision of information for planning the management of water resources. In addition to this, knowledge management, planning and environmental protection, and facilitation of both structural and non-structural investments and development of action plans are key to implementation of the plan.

RBO: Institutional arrangements/structures, management, stakeholders

The National Mekong Committee (NMC) which is responsible for implementing National programmes subscribes to MRC and embraces regional protocols. These include the Greater Mekong Sub-region Economic Cooperation Programme (GMS), ASEAN Mekong Development Cooperation and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). The NMC has adapted Integrated Water Resources Management (IWRM) at basin scale in implementing programmes. The IWRM functional structure is shown in the Figure below.



RBO: Overall functions – types, coordination, interactions, operationalisation

The focus of the MRC is on food production, drinking water, sanitation, hydropower, transportation and tourism. It executes these functions by facilitating, coordinating and balancing investments in the basin. The commission also supports countries at the level of strategic planning and program implementation. This ensures that the implementation approach of the programs is uniform at national level. The MRC also facilitates resource mobilization and research some of which are with the Japanese Ministry of Agriculture, Forestry and Fisheries (funds DMPF) for resource mobilization, and the Consultative Group on International Agricultural Research (GIAR) for research support on water and food programs.

Key agricultural functions – indirect

Agriculture and specifically irrigation is a major function of MRC. It is executed under the Agriculture, Irrigation and Forestry Program (AIFP). The goal of AIFP is to ensure sound watershed management, preservation of natural resource benefits for the future, development of improved irrigation and water use methods, engagement in research on the best methods for monitoring land-use changes, undertaking of important baseline studies on watershed management, forestry and land use planning. The major components of AIFP are Water use efficiency and watershed management. Under this program the

projects below have been supported

(i) Demonstration multi-functionality on Paddy fields

(ii) Improved irrigation efficiency on paddy fields

(iii) Challenge program on water and food

(iv) watershed management project

The programme also supports capacity building through dissemination workshops on best irrigation water use practices, development of publications to communicate improved irrigation water use methods, organisation of training programs for irrigation water users to adopt modern water saving technology.

Key agricultural functions – direct

The direct agricultural functions carried out under the AIFP program include development of land-use maps showing different types of agricultural activities, maintaining temporal and spatial variability of agricultural land, comparison of variability of irrigated and rain-fed agriculture, estimation of irrigation water use, environmental effects of agriculture such as surface runoff, soil erosion, water quality, groundwater recharge, microclimate, aquatic ecosystems, flood mitigation and re-use of irrigation water. Additional functions at project level are use of modern concepts to improve irrigation efficiency, enhancement of capacity of stakeholders in using up-to-date irrigation concepts, production of guidelines for improving irrigation efficiency based on actual water use conditions in the member countries and assessing the performance of irrigation schemes.

Lessons learned – success/failures

The lessons learned from the MRC approach include joint effort to alleviate poverty, increase economic welfare and regional integration. The program has also adapted a holistic approach, strong capacity development and generation of a knowledge base for enhanced agricultural production. Additional lessons learned include integrating agriculture with other related fields such as forestry, incorporating cross cutting programs using the IWRM approach and supporting resource mobilization for program implementation and research.

Key messages for the Nile basin

The MRC has demonstrated that cooperation is possible in a pragmatic way through joint identification and implementation of concrete projects in areas of mutual benefit. In addition to this, it has also shown that through proper planning, it is possible to have several growing seasons in a year to enhance income. Embracement of regional protocols is key to building synergies in executing common programs within the region. Providing support to countries at the level of strategic planning and project implementation is vital to ensure a common approach is adapted across the board. Coordination of capacity building programs is essential in enhancing the knowledge base for improved agricultural production.

Annex 4 Basin review: Volta

Basin facts: Location, size and countries/states covered.

The Volta Basin is located in West Africa and covers around 400.000 km² of the sub-humid and semi-arid savannah zone. The basin encompasses the majority of Ghana (70% of land area) and Burkina Faso (63%) and lesser proportions of Togo, Benin, Mali and Cote d'Ivoire, respectively. It is in general a low relief basin, with elevations ranging from sea level to 920 m, a mean elevation of 257 m and correspondingly low channel grades. The lower Volta is fed by three major tributaries. To the west, the Black Volta (147,000

km2) drains western Burkina Faso and small areas within Mali and Cote d'Ivoire; the White Volta (106,000 km2) drains much of northern and central Ghana and Burkina Faso, and to the east, the Oti (72,000 km²) drains the north western regions of Benin and Togo. In the other riparian countries of the basin, small and larger dams have been built by governments, NGOs and local people after the severe droughts that occurred in the 1970s and 1980s to secure food production. In the Nakambe sub-basin (Burkina Faso) alone more that 600 small dams have been built most of them during that period. More recently power generating dams have also been built in the Volta main tributaries Bagre and Kompienga

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

The geographic distribution of the population within the basin is highly variable with a density ranging from 8 to 104 persons/km2. In areas with high density population one can notice a real pressure on land and water resources (Ghana's Upper East regions: 104 persons/km2). In general, areas with low population density are either national parks (Comoe one of the largest West African national parks, in Cote d'Ivoire) or regions where onchocerciasis or river blindness is prevalent (valleys of the Black Volta). Three cities in the basin (Ouagadougou, Bobo Dioulasso and Tamale) can be described as large, each having a population of over one hundred thousand people.

The climate is influenced by the movement of the Inter-Tropical Convergence Zone (ITCZ). The average rainfall lies around 1000 mm/yr with a strong north-south gradient and regional and temporal variability. Unpredictable and unreliable precipitation makes rain-fed agriculture a risky undertaking throughout much of the basin. Mean annual temperatures are around 30°C and humidity varies between 90% in coastal areas to below 20% in the North during the harmattan and the dry season. By African standards, the basin is densely settled, with Ghana, at 90 inhabitants per km2, possessing roughly three times the mean population density of Sub-Saharan Africa (SSA). Basin inhabitants are overwhelmingly rural. Agriculture is the most important economic factor, followed by the service sector and mining (particularly in Ghana). Today 70 – 90% of the population in the Volta Basin depends on subsistence farming. Therefore the agricultural productivity is low in comparison to other regions in the world. In order to increase agricultural productivity, investments in irrigation are required, particularly in the drier regions of Northern Ghana and Burkina Faso. Small scale irrigation schemes, established by small and medium sized farmers, are also developing rapidly.

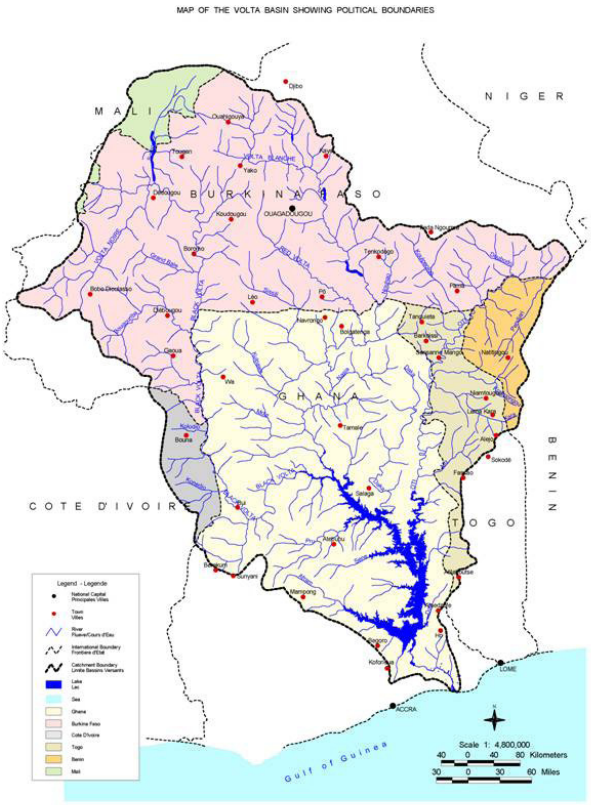
In terms of rainfall-runoff, it has been estimated that 340 km3 of rain must fall on the catchment before run-off occurs at significant levels. Once this threshold has been reached, approximately half of the precipitation becomes run-off. This indicates that only small changes in rainfall could have dramatic effects on run-off rates. Although rainfall decreased by only 5% from 1936 to 1998, run-off decreased by 14%.

Livelihood conditions/socio-economic: Resources allocation/use, wealth, employment, society

Per capita income in the Volta Basin countries tends to be lower than the SSA average, although Ghana, at $447, appears somewhat more prosperous when income is evaluated in Purchasing Power Parity (PPP) terms ($1,940). Much of Ghana's affluence is located in urbanized regions to the south, however, outside Volta basin boundaries. With respect to the demand for water resources, these attempts to expand agricultural productivity will paradoxically position the agricultural sector increasingly as a competitor to the power generation sector, arguably no less critical to overall economic developments. The mineral and natural resources industries (gold mining, wood processing) are concentrated in the south of Ghana, largely outside the Volta basin. The search for reliable energy sources to support the growing industrial and municipal sectors is a never ending enterprise. The dam at Akosombo, originally proposed in the 1920's, was constructed by an international consortium in 1961 largely to provide (highly subsidized) hydropower to the Volta Aluminum Company (Valco). The availability of inexpensive hydropower was, and remains an important engine of economic growth for Ghana, critical to the viability of the mining and industrial sectors, and for surrounding countries which purchase Volta Hydropower.

In the past, surface water was considered as a public good, and any individual or family was assumed to possess a right to it. Most importantly, a river's waters were considered holy and were therefore protected by various means. For instance, in Ghana, entire activities such as washing clothes, water abstraction, or

fishing were prohibited on certain days of the week. However, the British and the French colonial rule transformed the geographic and institutional landscape of the region. Under the British colonial system, land and water management were in fact based on two parallel systems, the state sponsored and the community regulated.



Significant transformations occurred in the late 1990's accompanying water sector reform processes in Ghana and Burkina Faso. As part of the adjustment programs of the World Bank, the reforms were intended to meet economic objectives, reduce poverty and alleviate the effects of increasing water stress. As a result all natural resources within the two countries were nationalized. In Ghana and Burkina Faso all water resources were taken to be the possession of the respective presidents. Within the framework of large scale decentralization, new water institutions were established in order to operate at different societal levels and sectors.

The agriculture sector contributes between 35-40 percent of the value added to GDP in all countries, except Côte d'Ivoire, where it contributed only 25 percent. Côte d'Ivoire, and Mali, also experienced a negative agricultural value added growth. Also, agriculture value added per worker varied considerably: lowest contribution in Burkina Faso ($185), followed by Mali ($265), Togo ($528), Ghana ($574), Benin ($627) and highest in Côte d'Ivoire ($1085). As the agriculture sector value added per worker is a measure of agriculture sector productivity/efficiency, it implies that with the minor exception of Côte d'Ivoire, the agriculture sector is least efficient, which points to capacity constraints, underemployment, low productivity, market distortions, and poor infrastructure in these countries.

Irrigated land as a percentage of cropland for 1995–97 for Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, and Togo are 0.8, 0.7, 1.0, 0.2, 2.1, and 0.3, respectively. Thus, crop production under irrigation is negligible in the sub-region as most arable farming is predominantly rain-fed. With current climate change, rainfall is believed to be becoming more variable and unreliable. Extensive crop farming coupled with variable and unreliable rainfall patterns in a region where poverty is predominant has far-reaching implications on the environment and food security.

Ghana and Burkina Faso have invested for the development of cash crops, as they benefit the farmers, as well as the nations' hard currency income. In Burkina Faso, a strong political will has accompanied the development of cotton production, with several incentives offered to farmers. The result has been a spectacular increase in cotton production, the country ranking as a main producer in Africa (and the first in 2006). This example shows that when the political will exists, important development can be attained in agricultural production. However, competitors on the world market often subsidize their own production (cereals in Europe, cereals and cotton in USA where support to national farmers largely exceeds development assistance to developing countries) so that the prices paid to the developing countries remain largely erratic and undervalued. As long as true trade liberalization has not been established, developing countries have little option but to protect their agriculture, and especially small producers of food crops.

Analysis of the national food market in Burkina Faso has shown that there is a strong possibility for development of national cereal markets, which would alleviate part of the cost of more than 200,000 tons per year of rice and wheat that are currently imported. At present, the total sales of food crops in Burkina

Faso are estimated between 160 and 220 billion CFA (US$ 320 to 440 million), that is two to three times the cotton exports. The import of cereals amounts to about 40 billion CFA (US $80 million).

Water related problems

As the basin population may increase by as much as 80% over the next 25 years, water resources are going to become even scarcer. Water scarcity arises as a result of diminishing precipitation, reduction in river flows, falling water tables, an increase in the amount of evapotranspiration (due to the construction of thousands of large and small reservoirs in the basin), and inefficient use of water resources. Over the past 20 years the basin has seen a reduction in the amount of precipitation and river flows. Furthermore, groundwater in the basin is overexploited with excessive pumping without due regard to the recharge characteristics of aquifers. Lowering of the water tables has also been observed in large parts of the basin, and can lead to saltwater intrusion in the southern parts of the basin near the Gulf of Guinea coast.

Since the six countries are very poor, they also lack the financial resources to build water infrastructure. As a result, sanitation, water and wastewater treatment and water supply facilities are inadequate in the basin. At the same time, since water is an important development resource, the six countries are trying to exploit the basin's water resources as much as possible to develop their economies. There are competing uses of water resources among different sectors within a country and between the upstream and downstream countries. Within each country, water has diverse uses: irrigation, fishery, domestic water supply and livestock watering. Internationally, conflict exists between Burkina Faso, who wants to expand its irrigation extracting more water from the river, and Ghana, who wants to generate more hydropower to fuel its economic development. The need to develop the region economically to improve the livelihoods of its people conflicts with the need to preserve and protect the ecosystem for future generations. These issues are essential to address in any plan of water management for the basin.

The riparian countries have very weak capacity to deal with environmental issues, such as loss of biodiversity, reduction of fisheries resources, groundwater resources depletion, and flooding and river pollution. These problems are water related and trans-boundary in nature. In the six countries, many institutions are charged with responsibilities for managing water, food, and soil resources. This results in overlapping of responsibilities and difficulties in coordination. Coordination of activities among institutions is weak, and in some cases exists only on an ad hoc basis for crisis situations. For the management of water and soil resources to be effective, it should be integrated at the local and national level, with emphasis on inter-sectoral coordination.

Furthermore, there has been little coordinated trans-boundary effort in the basin until recently, with the establishment of the Volta Basin Authority in 2006. Previously, each country acted independently in harnessing the river. Many of the causes and effects of the water issues are trans-boundary in nature. If no cooperation is achieved, potential for conflicts among riparian countries might increase with rising water withdrawals. Conflict prevention and resolution can be found in some countries in Africa at the local and national level, but nearly no functional provisions exist at the international level.

The inefficient use of water resources in the region has exacerbated the problem of scarcity. For example, flooding is the most common irrigation practice in the basin. This approach is very inefficient as it results in water losses through evaporation and deep seepage. More efficient types, such as sprinklers and drip irrigation, may have to be introduced to cut the water use.

Water supply systems for domestic and industrial uses have large transmission losses due to leakages, which could be as high as 50%. The expansion of water supply systems for domestic and industrial use does not always match the water demands. The limitation in expansion is due to unavailable financial resources.

While each of the countries forecasts increased demand for water over the next decades, the trends in water use pattern among some of the riparian countries are quite different. For example, there has

been a rapid expansion of irrigation in the last 15 years in Burkina Faso of about 934 %, while Ghana only experienced an expansion of 95m %. Ghana, on the other hand, plans to expand its hydropower generation by constructing the Bui Dam. Thus Burkina Faso, an upstream, agriculturally-oriented country hopes to develop the country's irrigation potential while Ghana, downstream, aims to develop use of hydropower. The trends in water use patterns can potentially generate conflict if the resources are not managed in an integrated fashion.

Discharge from untreated industrial effluents is not significantly present in the basin due to limited industrial activities, but some untreated sewage is discharged into the waters. Additionally, humans and animals defecating and bathing in rivers and water sources add to the degradation of water quality. Another significant cause of water quality degradation is the introduction of urban waste, particularly from run-off from inland port communities and urban settlements located near banks of the rivers and reservoirs.

RBO: Established by who, when, why, how, and goals and milestones.

In 1998, largely reduced water level in the Akosombo dam led to an energy crisis in Ghana. Ghana accused Burkina Faso of causing the problem by holding back too much water upstream. During this period, many research institutes and development agencies, such as GLOWA-Volta, Green Cross International, UNEP and the World Bank, observed the emerging conflicts in the basin. These institutes and agencies funded several projects and initiatives on sustainability and governance in the basin in an attempt to ameliorate the situation. They also organised conferences to engage stakeholders across the basin to develop commonly accepted principles on trans-boundary water governance. These projects were a very important driving force for the launching of the Volta Basin Technical Committee in November 2004 and a series of follow-up meetings among the six riparian countries. As a result of all these efforts, the six riparian signed an agreement to establish the Volta Basin Authority (VBA) in July 2006.

Since the beginning of the twentieth century, water development projects have been planned to make use of the water and other natural resources in the basin. Thus, the idea of damming the Volta River began in early 1900s with the conception of the Volta River Project (VRP) and ended with the creation of Volta River Authority (VRA) in charge of the creation and management of the Akosombo dam and later, the Kpong dam downstream.

RBO: Institutional arrangements/structures, management, stakeholders

The permanent administrative organs of the Volta Basin Authority are:

1. The Assembly of Heads of State and Government;
2. The Council of Ministers in charge of Water Resources;
3. The Forum of the Parties involved in the Volta basin development;
4. The Committee of Experts;
5. The Executive Directorate of the Authority.

RBO: Overall functions – types, coordination, interactions, operationalisation

The 1st Assembly of the Heads of State of the riparian countries of the Volta Basin, which was held on 19 January 2007 under the auspices of the Government of Burkina Faso in Ouagadougou, signed a Convention for the establishment of the Volta Basin Authority (VBA). The mandate of the VBA is to:

1. Promote permanent consultation tools among the parties for the development of the basin;
2. Promote the implementation of integrated water resources management and the equitable distribution of the benefits resulting from their various utilisations;

3. Authorize the development of infrastructure and projects planned by the stakeholders and which could have substantial impact on the water resources of the basin;
4. Develop joint projects and works;
5. Contribute to poverty alleviation, the sustainable development of the Parties in the Volta basin, and for better socioeconomic integration in the sub-region.

Key agricultural functions – direct/indirect

1. To organise and reinforce consultations among the riparian countries of the Volta and also between these countries and all the development partners interested in the development of natural resources of the Volta Basin;
2. To harmonise the national policies relating to the management of the water resources of the Volta basin, through the adoption and enforcement of Integrated Water Resources Management throughout the basin;
3. To mobilise the human, technical, and financial resources necessary for undertaking studies, research activities and works aimed at sustainable management of water resources for the socioeconomic development of the Volta Basin;
4. To coordinate studies, research activities and works initiated in the basin for the development of the water resources of the basin;
5. To create and or improve the tools and networks for the collection, processing, storage and dissemination of data and information necessary for the activities of scientific research, planning, development and management of the natural resources of the basin;
6. To promote cooperation between the Authority and other similar regional and international organs;
7. To authorise the development of infrastructure and projects planned by the States Parties which could have substantial impact on the water resources of the basin;
8. To develop joint projects and works.

Lessons learned – success/failures

This case study demonstrates the interdependency of policies across sectors, and point to a growing need for policy coordination and strengthened legal and regulatory arrangements in order to secure win-win outcomes for all riparian states and communities sharing the Volta Basin waters. Mechanisms for trans-boundary cooperation must be based on international agreements. Likewise, trans-boundary water resource allocations are also potentially contested at local level where principles of customary (non-statutory) law and indigenous practices determine the distribution of water. Where local or indigenous allocation and decision-making protocols prevail and where water management problems are largely related to cultural, economic and social issues, international policies and regulation will have a limited impact unless these frameworks are properly accommodated and reconciled. In particular, water bodies not registered or administered by national water authorities are objects of negotiation by strategic groups operating at local and regional level. Participatory approaches to cooperation developed locally have often turned out to be sound strategies for conflict prevention, as demonstrated at the Bagré Dam and in the Nakambé River Basin. A central question facing researchers and partners in Phase III of the GWP is how to promote effective joint management of shared water resources on the basis of integrative scientific research. An institutional framework which integrates the interests of diverse user groups, and reflects the legal-pluralistic governance context of the water sector, has yet to be developed for the Volta Basin.

Key messages for the Nile basin

Like many other basins, the Volta basin is affected by global, regional and national drivers of change. These include economic growth, population growth, technical change, land degradation, climate change, globalization, urban development, political change, and trade liberalization. In principle, these can profoundly influence future progress of increasing the resilience of the rural poor and of ecosystems at the river basin level in:

(1) Maintaining growth in irrigated and rain fed agricultural production;

(2) Reversing the ongoing degradation of watersheds, and water-related ecosystems;

(3) Increasing incomes and enhancing and safeguarding the rights to domestic and irrigation water supplies for the poor, women, and socially excluded groups, such as minorities and indigenous group and

(4) Managing conflicts over water use.

If the climate remains constant, the greater production of food required cannot be achieved only by an increase in the area of cultivation, but large increases in productivity will be necessary as well. Moreover, the nature of the production will also have to change according to the changes in urban diet and the demand for rice, maize and animal proteins. The identified risk is an increase in the population whose food needs would not be met by a sufficient increase in local food productivity. Overall, there is also a great uncertainty on the climatic trends, with no major change on total rainfall, but increased variability and unreliability are common features of the models. Increased water productivity, drought mitigation in rain-fed cultivation with proper soil and water management techniques, and the development of irrigation are clear requirements to confront climate change.

Annex 5 Basin review: Guardiana River

Basin facts: Location, size and countries/states covered

The Guadiana is one of the five river basins in the Iberian Peninsula shared by Portugal and Spain. It rises from the Sierra de Cazorla and flows through south-central Spain and South Eastern Portugal to the Gulf of Cadiz in the Atlantic Ocean. The flow length of the River is 778 Km and it has a catchment area of about 66 800 km2 in area. Hydrologically the basin consists of the Rivers Andarax, Nacimento, Ramblas of Tebernas and Gergal. 81.9% (55 513 km2) of the basin is in Spain while 17.1% (11 620 km2) is in Portugal.

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

The average annual precipitation in the basin is about 182250 hm3 with arid areas of Spain receiving about 200-300 mm of rain in a year. The rainfall is irregular with 70% falling mainly in autumn and winter. The average annual runoff is approximately 63100 m3. The population in the basin is about 4 Million. It has rich biodiversity in both flora and fauna. Three Ramsar sites are established in the basin to conserve these rich biodiversity.

Livelihood conditions/socio-economic: Resources allocation/use, wealth, employment, society

The River is used for Irrigation mainly in Spain with rice being one of the major crops grown in the basin. Other uses are hydropower generation and Navigation which is mainly in Portugal and is only possible for a distance of 68 km upstream. To improve water assurance, over 30 dams have been built in the basin with Alqueva dam being the largest. Apart from surface water, ground water is also used for irrigation for example 40 hm per year is abstracted from the aquifer system of the Andarax river for irrigation. The Andarax River basin corresponds to an alluvial valley of 250 km.

The area is marked by rapid economic growth starting from the late 1960s based on intensive agriculture while mining was a major economic activity in the early 1960s. Agriculture is increasing becoming prominent with growing fruits such as oranges and grape fruits. Tourism is another activity which is increasingly becoming one of the main economic activities in the basin. In Almeria province, more than 80% of water is used for irrigation with agriculture constituting more than 80% of employment with similar figures of the Brute Added Value (BAV).

In Andalusia province, 27% of irrigation uses ground water. When ground water is used for irrigation, water consumption is lower by about 20% while productivity is 3 times higher than when surface water is used for irrigation. Using ground water for Irrigation generates twice as much employment while at the same time it is less subsidized compared to irrigation using surface water.

Water related problems

The water related problems in the basin are mainly scarcity since the river flows through the low rainfall area of Toledo Mountains. Also the flow is highly variable due to high variability in rainfall. Other issues include extreme droughts and floods and mismatch between demand and temporal variability of water resources. Pollution is also another problem in the basin due to river bank erosion especially in the navigable section of the River and from agro-based industries as well as agricultural activities in the basin. One major pollution incident occurred in 1998 when toxic waste was spilled affecting both aquatic and terrestrial ecosystems. Water sharing is also an issue since the ICIR treaty covers l limited territorial area and sectors.

RBO: Established by who, when, why, how, and goals and milestones

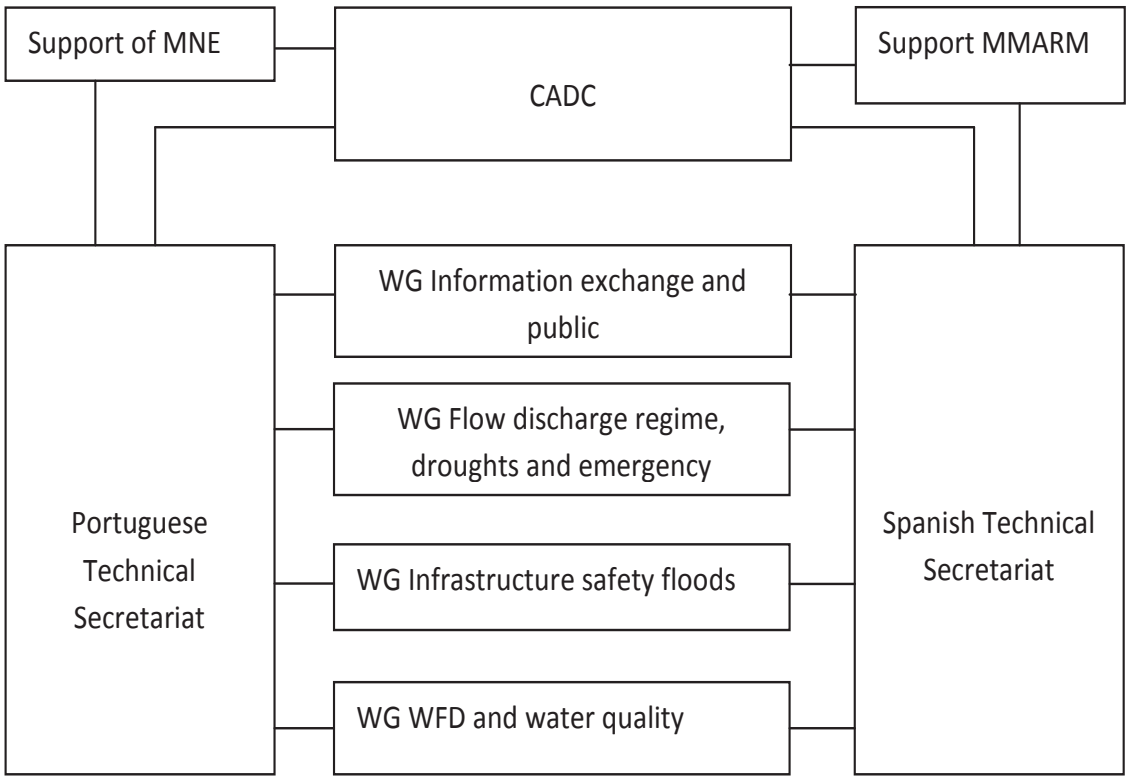
The use of waters in the Guadiana basin is guided fundamentally by the international treaty for the use of water of border rivers agreed upon in 1912. The treaty was a culmination of a process initiated in 1864

for sharing waters in Iberian Peninsula. The treaty included the shared rights which were finalized in 1968. The final agreement signed in 1998 (International Commission of International Rivers-ICIR) provides a framework for water sharing in the basin.

The formalisation of water sharing between Spain and Portugal was improved through the Albufeira Agreement in 1998. The agreement focuses on institutional regimes, exchange of information, trans-boundary impacts, quality and pollution, water uses, exceptional situations and flow regimes. This agreement aims at improving the cooperation between the two countries in order to encourage the sustainable use of shared water courses and, maintain as well as improve the ecological status of shared water bodies. To guarantee sustainable use of the shared waters, increase of storage through building of reservoirs to meet the demand for the different uses of water supply, irrigation and other uses is therefore a priority. Storage of flood water during wet seasons through reservoir regulation is promoted to ensure minimal retention during dry seasons.

RBO: Institutional arrangements/structures, management, stakeholders

The Albufeira Agreement provides a framework for information sharing between Spain and Portugal to promote sustainable management of water resources in Guadiana basin. The institutional arrangement of the agreement consists of the Conference of Parties with high political responsibility and the Commission for the Development and Application of the Agreement (CADC) with technical responsibility for developing and implementing the agreement. The functional institutional arrangement of CADC is shown below.



RBO: Overall functions – types, coordination, interactions, operationalisation

Management in the basin is executed through the Guadiana River basin council, the National Water Institute and the Regional Authorities of the individual countries coordinated by the Permanent Technical

Secretariat of the Commission through CADC. The commission alternates annual meetings in the two countries chaired by the Ministry of foreign affairs from the host country. Participants are water related sectors and private companies. The functions executed within the framework of the agreement include:

1. Sustenance of flow regimes, balance between surface and ground water use, water scarcity and response to emergency situations
2. Promoting information sharing and public participation
3. Ensuring security of infrastructure against floods
4. Ensuring compliance to Water Framework Directive (WFD) and water quality standards
5. Regulation of anthropological activities since they have direct impact on water quality and quantity

Key agricultural functions – indirect

The key indirect agricultural functions are:

1. Regulation reservoirs to guarantee irrigation during scarcity
2. Shared water rights for equitable water sharing
3. Specifications of river stretches, designs of hydraulic structures and conditions for water abstractions as specified in the agreement taking into account properties and rights in other countries
4. Coordination of reservoir operation minimised disasters downstream

Key agricultural functions – direct

The following are considered to be direct key agricultural functions

1. Setting up and ensuring maintenance of minimum flows under normal rainfall conditions
2. Specifying conditions for minimum flows
3. Technical assistance in Agriculture
4. Promoting access to markets in agriculture based industries on the basin for agricultural products

Lessons learned – success/failures

The lessons from the review are as follows:

1. Use of regulation reservoirs to store flood water for irrigation ensures that adequate storage is sustained without compromising low flows
2. Agreements undertaken with consideration of existing frameworks promotes effectiveness and sustainable water use as well as vertical and horizontal integration
3. Irrigation using groundwater has higher value per unit water use than that based on surface water
4. Pollution is a threat to terrestrial and aquatic ecosystems with agricultural development in a river basin if infrastructure is inadequate and inefficient
5. Allowing agreed minimum flows across the borders in a given time frame to downstream water users.

Key messages for the Nile basin

The key messages drawn from this review for the Niles basin are:

1. Knowledge sharing, trust, deep personal relations enhances mutual benefits
2. Mutual agreement is fundamental to sharing common resources
3. Explore possibility of encouraging use of groundwater for irrigation in the basin because of potential high value returns per unit water use

4. Promote stakeholder participation in agriculture including private sector involvement to share both benefits and risks
5. Promoting storage of flood water and allowing agreed flows across borders during droughts is a useful tool in sustaining the corporation
6. Regional frameworks are key to promoting bilateral corporation in sharing of common resources

Annex 6 Basin review: Garonne

Basin facts: Location, size and countries/states covered

Geographic location: South-West France: 115,000 km2 (20% of France) and 120,000 km of rivers. Basin located entirely in France. Adour-Garonne Water Agency employs 260 people.

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

Population: 6,000,000 (10% of the population of France). More than 2500 billion m3 are collected in rivers and aquifers for irrigation, industrial purposes and production of drinking water. In the Adour-Garonne Basin agricultural and rural development, irrigation accounts for an average of 80%.

Livelihood conditions/socio-economic: Resources allocation/use, wealth, employment, society

Its diversified agriculture (40% of irrigated) and livestock are the basis of a developed agriculture and food sectors. The density and diversity of the network of rivers, estuaries, ponds, generate a wealth of fish exploited by fisheries.

Water related problems

These include:

i) A water resource widely exploited, particularly for irrigation;

ii) Pressures (dams and other uses) modifying the morphology of the rivers and water regimes, altering and disturbing the biological balance,

iii) Risk of flooding to control,

iv) A poor water quality despite important improvement,

v) Aquatic ecosystems of outstanding ecological interest in preservation

vi) Pools of water for human consumption to protect.

RBO: Established by who, when, why, how, and goals and milestones

Created in 1978 with the founding missions initially:

i) Management and increase of water resources,

ii) Protecting people and property against flooding,

iii) Pollution control.

These missions have evolved over time to accommodate the Water Act 1992 the land use and water management Master Plan (SDAGE) for the Adour Garonne Basin, approved in 1996.

Objective: A public territorial pool working for a concerted and balanced water resource in the basin and for the protection of aquatic environments, thus meeting the requirements of the European Framework Directive on Water in 2000. The Water Agency Adour-Garonne wants a centre of encouraging dialogue and to conserve and better manage water resources in the basins of the Adour, Garonne, Dordogne and Charente.

The founding documents include (or reference)

1. Law n ° 2006-1772 on water and aquatic environments of 30 December 2006 (OJ of 31/12/2006): http://www.ecologie.gouv.fr/IMG/pdf/loi_eau_milieux_aquatiques_301206.pdf
2. The law of January 3, 1992: http://www.legifrance.gouv.fr
3. Law of 16 December 1964: text-loi64-1245.pdf,
4. Directive 2000/60/EC of the European Parliament and the Council of 23 October 2000 establishing a framework for Community action in the field of water.

RBO: Institutional arrangements/structures, management, stakeholders

The management structure of the Agency includes:

1. A board that controls the activities of the Agency: The composition of the board of directors, governed by decree, is as follows:
2. A president, appointed by decree of President of the Republic for a period of 3 years
3. 11 representatives of local authorities of the college elected by and from among the members of the Basin Committee
4. 11 representatives of users of the college elected by and from among the members of the Basin Committee
5. 11 representatives of the College of the State, are appointed as
6. 1 staff representative from the Agency (and one alternate) elected by the staff
7. The right to attend meetings for: the government commissioner, the financial controller, accounting officer, the director of the Agency. Invitees are: the Chairman of the pelvis and the regional prefect, Basin Coordinator
8. A director, who provides overall management of the institution, determines organisational needs and monitors its performance and its management.
9. The Board of Directors defines the intervention programme (charges, terms of aid, financial stability) and implements, mainly through its decisions to grant aid. The operation of the board of directors, its officers and its committees are subject to rules of procedure.
10. The Basin Committee defines the guidelines for action by the Water Agency and participates in the development of the financial decisions of the Agency .Every six years, it develops and updates the blueprint (master planning and water management) and monitors their application. In the course of a consultation it collects public comments on the draft SDAGE in order to edit it and seek advice from institutional (general and regional) councils, EPTB. It adopts the draft document which is then approved by the administrative authority. It delivers the approval of contracts for rivers or bays. It delivers the approval of contracts for rivers or bays.

The Basin Committee is consulted on a number of decisions or issues.

RBO: Overall functions – types, coordination, interactions, operationalisation

Orientation

1. Elaboration and update, every six years, of SDAGE and monitoring the implementation
2. Delineation of the scope of intervention of public territorial basin that could be formed to prevent flooding and ensure a balanced management of water resources,

3. Defining the multi-annual measures to help achieve the objectives and provisions of SDAGE
4. The territorial management and planning for water
5. Conduct and Develop Policy
6. Defining the actions of international cooperation in the fields of water and sanitation as the water agency can lead to a limit of 1% of its resources

Coordination:

1. Fight against pollution from industry, commerce and crafts
2. Promoting integrated management of the water resources;
3. Protection of the ecosystems

Operationalisation

1. Delineation of sensitive areas and in sensitive areas,
2. Definition of perimeter and SAGE projects (land use planning and water management)
3. Defining the EMP (low water management plans) provided in the blueprint,
4. Collection, transport, recovery or disposal of toxic waste

Key agricultural functions – indirect

Indirect agricultural functions

1. Determining the scope of intervention of public territorial basin
2. Delineation of sensitive areas and insensitive areas,
3. Definition of perimeter and SAGE projects (land use planning and water management)
4. Definition of PGE (low water management plans) provided in the blueprint,
5. Support for “Local Boards of water, “ to decline SDAGE priorities to SAGE at local level
6. Financial assistance by the payment of aid to owners and water stakeholders (communities, businesses, farmers, individuals etc)
7. Production and management of water data to ensure the necessary knowledge in the management and evaluation of policy.
8. Information and public awareness to support the conduct of water policies and develop “water democracy”.
9. Launch of prospective studies, preferably in partnership.
10. Fees collected under the pollution of the water samples, according to the principles of “polluter pays” and “user pays”
11. Allocation of financial assistance in ensuring the solidarity of purpose and territories across the pond.

Key agricultural functions – direct

Direct agricultural functions

1. Encourage associations or farmers' union s for irrigation and more generally for water use
2. Creating organisations that manage water for agriculture around the basin or sub basin
3. Create a warning system for agricultural irrigation to inform farmers on the need to irrigate or not.

Lessons learned – success/failures

The Water Agencies in France, including the Adour Garonne are known for their efficiency through financial mobilization and management of fees and funds, which are actually very high and a key to their financial autonomy.

The Adour-Garonne Agency is also part of the implementation of the Framework Directive and its blueprint is in line with this objective. Similarly, the Constitutional Charter of the environment, water law and aquatic environments of 2006 are taken into account.

The definition of the SAGE helps to bring the level of sub basins and local permits to apply the principle of subsidiary with local water committees.

The principles of efficiency and solidarity are present in the fees that take into account the impact of water usage on the aquatic environment and contribute to changing user behaviour. Furthermore, the Agency seeks fair treatment and efficient management of grants by comparing the cost of implementation and financial efficiency.

Key messages for the Nile basin

Taken from the French experience of basin agencies it should be noted that the pillars of good water management include:

1. The knowledge of the available water resources and the issues
2. Identification and coordination of actors, responsible for water management
3. The establishment of consultative bodies
4. Promotion of a "water democracy" through public awareness and dissemination of reliable information
5. The establishment of a river basin culture, conscious of solidarity in facing the water resource and financial solidarity built on the principle of "user-polluter-pays"
6. Political commitment at the highest state level and subsidiarity with the organs in place.

Annex 7 Basin review: Niger

Basin facts: Location, size and countries/states covered

The Niger is the third longest river in Africa (4 200 km) and the fourteenth longest in the world, 2 170 500 km2 (active watershed covering 1 500 000 km2). Nine countries in West and Central Africa: Guinea (6%) ; Côte d'Ivoire (1%) ; Mali (26%) ; Niger (23%); Burkina Faso (4%) ; Benin (2%) ; Cameroun (4%) ; Chad (1.0%) ; Nigeria (33%)

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

Population: more than 110 Million (44% are under 15 years of age), 2.5 million ha of arable land in the Niger Basin, of which only 20% are exploited.

It accommodates 27 large dams and over 5000 small dams. Climatic zones vary from hyper-arid (in the northern part) to sub-equatorial with annual rainfall fluctuating from over 4000 to 400 mm.

Livelihood conditions/socio-economic: Resources allocation/use, wealth, employment, society

Agriculture represents a large part of the Niger Basin GDP, with crops making up 25–35%, livestock 10–15%, and fishery 1–4%. Major crops are yams, cassava, rice, groundnuts, millet, sorghum, plantains, cocoa beans, maize, sugarcane and cotton. The countries are engaged in political reforms including Democracy principles; decentralization and openness.

Water related problems

They include land degradation and water (erosion, siltation, pollution of various origins, etc.), proliferation of aquatic weeds, and loss of biodiversity, water scarcity, drought and desertification.

RBO: Established by who, when, why, how, and goals and milestones

Established in 1964 as the Niger Basin Commission by the Head of States and Government to minimise the risks of conflict, the Commission, through a new convention in1980, became the Niger Basin Authority (NBA), an inter-governmental organisation in West and central Africa aiming to foster co-operation in managing and developing the resources. NBA objectives:

i) Harmonise and coordinate the national exploitation policies of the basin resources;

ii) Plan the development of the basin by designing and implementing a «Sustainable Basin Development Plan» iii) Design, build, exploit and maintain common works and projects.

The milestones include:

i) The creation of the Niger River Commission in 1964,

ii) The establishment of the Niger Basin Authority,

iii) The Paris Conference on the Niger Basin development and

iv) The implementation of the decisions based on the shared vision:

The shared Vision expresses the commitment of States to a common action programme. The shared Vision statement: "the Niger Basin, a common space of sustainable development through an integrated management of water resources and associated ecosystems, for the improvement of the living conditions

and prosperity of the population by 2025".

It defines the long term objectives (by 2025), and provides the strategic guidance so that the mechanisms and specific tools designed allow achieving the above objective:

The strategic objectives are:

i) To ensure economic, social and environmental security in the basin;

ii) Establish a global and integrated water resource management and an optimal and sustainable use of all the basin resources;

iii) Strengthen the cooperation and joint actions between the riparian countries of the basin to make benefits profitable to all ;

iv) Reduce poverty and promote economic growth in the basin;

v) Strengthen the cooperation between the Niger Basin Authority and the international community of development partners.

The operational Objectives are:

i) To develop a participatory and consensual basis and implement an action plan for a sustainable development of the basin for a sharing of the benefits;

ii) Enhance the legal and institutional framework conducive to dialogue and consultation for cooperative action between the member countries of the Niger Basin Authority;

iii) Develop the water resources of the basin in a sustainable and equitable way so as to promote prosperity, security, and peace between the populations living there;

iv) Follow a participatory and consensual approach in the conduct of the development process of the shared vision.

RBO: Institutional arrangements/structures, management, stakeholders

Governance structure/policymaking:

i) Conference of the Heads of State of the Niger Basin Authority and Partners

ii) The Council of Ministers,

iii) The Technical committee of Experts and

iv) The Executive Secretariat .

Other organs are:

i) The Niger Basin Observatory for the Environment;

ii) The Permanent Technical Committee;

iii) The Regional Steering Committee of the projects;

iv) The Regional Advisory Group;

v) The National focal structures, and

vi) National and regional forums of water users.

Key tools for NBA are:

i) The Niger Basin Water charter,

ii) The Sustainable Development Action Plan (SDAP) and

iii) The Investment Programme (IP) is the baseline of the SDAP. The IP is a programme in 3 main domains of actions to be taken in the next 20 years, divided into five-year plans.

Those three domains are :

i) Socio-economic infrastructure development;

ii) Resources and ecosystems protection ;

iii) Capacity building and GIRE stakeholders' participation.

RBO: Overall functions – types, coordination, interactions, operationalisation

Facilitation:

1. Promoting and facilitating dialogue and consultation between the Member States in the design and execution of programmes, projects and all other development activities affecting or which could affect the Basin water resources;
2. Promoting research and technological development, information exchange, capacity building, in particular as regards the IWRM and the use of adequate technologies for the management of the Niger Basin catchment area;

Orientation

1. Defining the procedures for examination and approval of new projects which use water or which could affect the quality of water;
2. Defining the principles and rules for the prevention and settlement of disputes regarding the use of the Niger Basin water resources;
3. Determining the rules related to the protection and preservation of the environment in accordance with the sustainable development objectives;
4. Defining the procedures for the participation of water users in decision-making processes regarding Basin water resources management;

Coordination:

1. Promoting integrated management of the Niger Basin water resources;
2. Promoting the harmonization and monitoring of national policies for the preservation and protection of the Niger Basin catchment area;
3. Providing a framework to the principles and procedures of the allocation of water resources among the various user sectors and the associated benefits;
4. Assisting countries to identify investment resources to protect the Basin and its watershed,
5. Identifying areas, as part of the SAP, where the institution will have a comparative advantage over well-established national and local agencies that are also charged with working on these matters (The principle of subsidiary)

Operationalisation

1. Protection of the ecosystems
2. Data collection management and sharing (Observatory)
3. Arrange political support for large infrastructure projects
4. Training & research in IWRM
5. Monitoring water quality (laboratories)
6. Financing and building water infrastructure
7. Providing a platform for advocacy and promotion of the NBA Programs
8. Information/knowledge capitalization and Exchange: The Observatory
9. Planning and financing common facilities and facilities of common interest, as well as the conditions for participation in the funding, the management and the sharing of the benefits resulting from the construction or the use of these facilities
10. Water allocation
11. Planning of projects for the development of water resources;

Key agricultural functions – indirect

Indirect agricultural functions

1. Promoting and facilitating dialogue and consultation between the Member States in the design and execution of programmes
2. Promoting research and technological development
3. Defining the procedures for examination and approval of new projects which use water or which could affect the quality of water;
4. Defining the procedures for the participation of water users in decision-making
5. Defining the principles and rules for the prevention and settlement of disputes
6. Strategic planning
7. Training & research in IWRM
8. Planning and financing common facilities or facilities of common interest.

Key agricultural functions – direct

Direct agricultural functions

1. Promote regional agricultural exchange (COWES mandate as well)´
2. Arrange regional database on basin food production, demand & trade
3. Water allocation
4. Promoting research and technological development

Lessons learned – success/failures

The Case of Niger Basin is a very good example to learn from. The RBO setting-up is crucial when the stakes and challenges are huge and political commitment high. But one should:

1. Define clearly, Mandate, Role and Mission
2. Develop a shared Vision for the development of the basin around a strong political commitment;
3. Develop a SAP and the Investment Plan so as to tackle concrete development issues
4. Develop a Charter for the basin
5. Fit with the regional context in terms of Existing policies, strategies, plans and organisations to build synergies and coherences
6. Make sure the Principle of Subsidiary is a key and an RBO and the member states should have clear roles.

The shared vision process that included the building of national and regional forums of Water users is a good approach for participation. The Assessment of the coherence/synergy of the SAP with the national and regional policies and initiatives was a very good point.

Key messages for the Nile basin

Some good factors can help the Nile Basin including:

The international conventions to refer to: Convention on wetlands adopted in Ramsar (Iran) on 2 February 1971, the African Convention on the conservation of nature and natural resources amended in Maputo (Mozambique) on 11 July 2003; the 17th March, 1992 Helsinki Convention on the protection and use of trans-boundary water streams and international lakes and to the Convention on the law of non-navigational uses of international water courses, adopted in New York on 21 May 97. The existence of African Regional and sub regional Organisations and their Action programmes and policies.

The development of a shared vision, a SDAP, and a water charter, and then the Assessment of its coherence with Regional and National initiatives were very good points for the NBA. Also, the regional and national forums of actors are a very good tool for the development of the Basin!

Other key elements for success include

1. Continued strong political leadership and commitment
2. Going through a major reform process, to strengthen the institution and make it relevant and legitimate, with a strong national constituency when necessary.
3. A dynamic and enabled staff to empower the Executive Secretariat
4. Have a financially viable institution with the need for countries to ensure that their financial commitments are kept. It is very important to remain financially sustainable and autonomous, to attract highly skilled staff, and to continue to work on its core mandate of river basin management and development.
5. Moving beyond unilateral planning: commitments to the cooperative agenda, it is important that each of the countries review its national water resources management plans to assess whether viable alternatives might exist if development is now viewed through the lens of the broader, regional river basin.
6. Ability to assess and compare optimum investments in the Basin, which will yield the greatest number of benefits to the largest number of members, in a context of social and environmental stewardship, for real and tangible development benefits to be realized for the people of the Basin.
7. Development partners committed to their side of the contract.

Annex 8 Basin review: Central Valley, California

Basin facts: Location, size and countries/states covered

The **Central Valley** is a large, flat valley that dominates the central portion of the U.S. state of California[4]. It is home to California's most productive agricultural efforts. The valley stretches approximately 450 miles (720 km) from northwest to southeast inland and parallel to the Pacific Ocean coast. Its northern half is referred to as the Sacramento Valley, and its southern half as the San Joaquin Valley. The Sacramento valley receives about 500 mm of rain annually, but the San Joaquin is very dry, often semi-arid desert in many places.

The two halves meet at the huge Sacramento-San Joaquin River Delta of the Sacramento and San Joaquin Rivers, which along with their tributaries drain the majority of the valley. The Delta is a large expanse of interconnected canals, streambeds, sloughs, marshes and peat islands. The Central Valley covers an area of approximately 58,000 km^2. Stanislaus County, located in the heartland of the Central Valley, consistently ranks among the top ten agricultural counties in the state. The county also plays a major role in agriculture at the national level, based on market value of agricultural product sold. The county is here presented as a case of local government support to the agriculture sector.

Runoff from the Sierra Nevada and the resulting rivers that flow into San Francisco Bay provide some of the largest water resources of California. The Sacramento River is the second largest river to empty into the Pacific from the Continental United States, behind only the Columbia River and greater than the Colorado River (http://enwikipedia.org/wiki/Central_Valley_(California) - cite_note-12). Combined with the fertile and expansive area of the Central Valley's floor, the Central Valley is ideal for agriculture.

Human and natural resources: Population, climate, water, land and vegetation/biodiversity

About 6.5 million people live in the Central Valley today, and it is the fastest growing region in California. There are 10 Metropolitan Statistical Areas in the Central Valley. The largest city is Fresno, followed by the state capital Sacramento.

The northern Central Valley has a hot Mediterranean climate; the more southerly parts in rain shadow zones are dry enough to be Mediterranean steppe or even low-latitude desert. It is hot and dry during the summer and cool and damp in winter, when frequent ground fog known regionally as "tule fog" can obscure vision. Summer daytime temperatures reach 32 °C, and occasional heat waves might bring temperatures exceeding 46 °C. Mid Autumn to mid spring comprises the rainy season — although during the late summer, south easterly winds aloft can bring thunderstorms of tropical origin, mainly in the southern half of the San Joaquin Valley but occasionally to the Sacramento Valley. The northern half of the Central Valley receives greater precipitation than the semi desert southern half. Frost occurs at times in the winter months, but snow is extremely rare. http://enwikipedia.org/wiki/Central_Valley_(California) - cite_note-6)

Environnement

The 'Central Valley Grassland' was once a diverse grassland containing areas of desert grassland (at the southern end), prairie, savannah, riverside woodland, marsh, several types of seasonal vernal pool, large lakes such as now-dry Tulare Lake, the largest lake in the United States west of the Mississippi. However, much of the Central Valley environment has been removed or altered by human activity including the introduction of exotic plants, especially grasses. The wetlands have been the target of rescue operations to restore areas nearly destroyed by agriculture.

Today, the Central Valley is one of the most productive farming regions of the United States, but water control was desperately needed to prevent rivers from overflowing during the spring and summer while drying to a trickle in the autumn and winter. http://enwikipedia.org/wiki/Central_Valley_(California) - cite_note-CVPhist-14)

As a result, many large dams were constructed on rivers entering the Central Valley, many of which are

[4] This text is an edited version of material reviewed on the Wikipedia (Central Valley, Agriculture in California); A Briefing on California Water Issues, Susan Lauer, 2009; and Agricultural Element, 2006, Stanislaus County.

part of the Central Valley Project. These dams have had a profound impact on the physical and ecological state of Central Valley Rivers.

Rapid development and growth of California's two major urban areas, the San Francisco Bay Area and the Los Angeles/San Diego metropolitan areas, meant that an enormous new demand was placed on local water resources that were not enough to support the population alone. The Central Valley was looked to as a water source, leading to the creation of the California State Water Project which was contrived to transport water to parched, thirsty Southern California.

Major public works projects beginning in the 1930s sought to reduce the amount of snowmelt flooding by the building of large dams. In 2003 it was determined that Sacramento had both the least protection against and nearly the highest risk of flooding. Congress then granted a $220 million loan for upgrades in Sacramento County.

Nearly 75 percent of the available water originates in the northern third of the state (north of Sacramento), while 80 percent of the demand occurs in the southern two-thirds of the state and the coastal areas. The demand for water is highest during the dry summer months when there is little natural precipitation or snowmelt. California's capricious climate also leads to extended periods of drought and major floods

Livelihood conditions/socio-economic: Resources allocation/use, wealth, employment, society

Agriculture is the primary industry in most of the Central Valley. A notable exception to the predominance of agriculture has been the Sacramento area, where the large and stable workforce of government employees helped steer the economy away from agriculture. Despite state hiring cutbacks and the closure of several military bases, Sacramento's economy has continued to expand and diversify and now more closely resembles that of the nearby San Francisco Bay Area. Primary sources of population growth are people migrating from the San Francisco Bay Area seeking lower housing costs, as well as immigration from Asia, Central America, Mexico, Ukraine and the rest of the former Soviet Union.

The Central Valley is one of the world's most productive agricultural regions. On less than 1 percent of the total farmland in the United States, the Central Valley produces 8 percent of the nation's agricultural output by value: 17 billion USD in 2002. Its agricultural productivity relies on irrigation from both surface water diversions and groundwater pumping from wells. About one-sixth of the irrigated land in the U.S. is in the Central Valley.

Water related problems

Nearly 75 percent of the available water originates in the northern third of the state (north of Sacramento), while 80 percent of the demand occurs in the southern two-thirds of the state and the coastal areas. The demand for water is highest during the dry summer months when there is little natural precipitation or snowmelt. California's capricious climate also leads to extended periods of drought and major floods.

These basic problems have been remedied, in large part, by building one of the most complex and sophisticated flood control, water storage and transport systems in the world. An integrated system of federal, state and locally owned dams, reservoirs, pumping plants and aqueducts transports large portions of the state's surface water hundreds of miles to the Central Valley, Bay Area and Southern California.

California's population reached 38 million in January 2008 and is projected to hit 59.5 million by 2050. Water demand in urban areas is expected to increase in average water years from its current 8.8 million acre-feet annually to 11.4 million acre-feet by 2020. A buzz word emanating from state and federal levels is so-called "smart growth" or, the idea of allowing growth while protecting and ensuring resources

Historic floodplains in the West have been heavily developed for agricultural, commercial and residential use. In California's Central Valley, a growing population has pushed subdivisions into flood plains previously left off for agricultural use, often without recognising the inadequate level of protection provided by the existing flood management infrastructure. The relative risk of flooding is a remote concern for many people living in floodplains, though their houses are more likely to incur damage from a flood than a fire.

Many urban water managers worry about California's water supply reliability during an extended drought. For this arid region of the United States, it is not a matter of if a drought will occur, but when. Keeping water in the state's elaborate network of canals, reservoirs and aquifers is of the highest importance for a state so dependent on water for its economic stability.

In addition to rising water demand, urban water agencies face water quality issues. Surface water and groundwater supplies have been contaminated by both manmade and natural substances. The most significant threat to water quality is nonpoint source pollution, which includes runoff from city streets, construction sites and agricultural fields, leaking underground storage tanks, accidental spills and abandoned mines. Controlling nonpoint pollution is very difficult because it does not come from a single source.

Water marketing – the sale, exchange or lease of water from one user to another – has the potential to become a key tool for meeting rising water demand. Water transfers, however, can raise a host of issues because of the unique nature of water, the interdependence of many users and the traditional use of the resource. One of the major concerns over water marketing is the potential for farmers to sell their surface water and pump groundwater in its place, depleting the underground resource. There also are risks of third-party impacts to rural communities and agriculture-related industries if farmers sell their water and quit farming.

For more than a century, groundwater has supplied a major part of California's water needs -- about one-third of the water supply in normal years and up to 40 percent during drought years. More than 9 million Californians – nearly one in three – rely solely on groundwater to meet their needs, including the major cities of Fresno and Bakersfield. Along California's central coast, 90 percent of the drinking water comes from groundwater. Although groundwater and surface water are treated as separate resources, they are intimately connected. The use, transfer or contamination of one can directly affect the other. The long-term decline in groundwater storage can result in lowered water tables and increased energy costs for pumping. In some basins, overdraft leads to land subsidence and can cause sea water and other contaminants to invade the aquifer.

With climate change already changing conditions throughout the state, and as difficult as it is for California's diverse water interests to agree on anything, most appear to realize that California will resolve its water problems only through compromise and innovative thinking

Confronted with unprecedented population growth, diminishing agricultural resources, and increased production costs, it can no longer be assumed local agriculture will always be a major supplier to the nation with fresh fruits and vegetables and remain the mainstay of our economy. The challenge of solving the problems confronting agriculture in Stanislaus County requires the coordinated efforts of both government and private citizens. The goals to sustain a healthy agricultural economy, conserve our agricultural land, and protect our natural resources are goals for which our community as a whole can strive, from which our community as a whole will benefit.

RBO: Established by who, when, why, how, and goals and milestones.

A large number of public or private institutions support the agricultural sector in the Central Valley of California. Public institutions include local, state and federal governments, river basin commissions, the California Water Commission and the Central Valley Regional Water Quality Control Board, whereas public research and education institutions include e.g. University of California in Davis and Berkeley. Private interests are abundant, e.g. companies providing seeds, fertilisers and farm machinery.

Key agricultural functions

Strengthen the agricultural sector of the economy. This include ways to improve marketing and promotion, provide education and technical assistance, minimise conflicts between farm and non-farm residents, provide adequate housing for farm workers, and ensure food safety.

1. *Enhance the marketing and promotion of agriculture.* The ability to market and promote agriculture on both a county-wide and farm level is essential to the success of agriculture in the central valley. Direct marketing is one method farmers can use to gain market control, but for many crops a local infrastructure for marketing and promotion is needed for success. This local infrastructure is comprised of land, services, and the workforce needed for support industries such as food-processors, manufacturers, distributers, suppliers, and retailers. A key factor to attracting and retaining the necessary infrastructure includes a strong local focus on economic development. This focus includes:

    1. Efforts to promote the location of new agriculture-related business and industry in the county shall be supported*;*
    2. The marketing and promotion of local agricultural products shall be encouraged
    3. Efforts to expand markets for the export of local agricultural products shall be encouraged

2. *Support the development of agriculture-related uses. A*griculture involves a variety of commercial and industrial activities and requires a range of supplies and services. Roadside stands, processing services, maintenance and repair of farm machinery and equipment, custom farming services and similar agriculture-related uses are all important for the success of agriculture.

    1. Processing facilities and storage facilities for agricultural products either grown or processed on the site shall be permissible in agricultural areas;
    2. Concentrations of commercial and industrial uses, even if related to surrounding agricultural activities, are detrimental to the primary use of the land for agriculture and shall not be allowed;
    3. In order to encourage vertical integration of agriculture, the county shall allow research, production, processing, distribution, marketing, and wholesale and limited retail sales of agricultural products in agricultural areas, provided such uses do not interfere with surrounding agricultural operations

3. *Minimising Agricultural Conflicts.* Urbanization and the proliferation of rural residences throughout the county have led to increased conflicts over agricultural operations. Homeowners complain about noise, odours, flies, chemical spraying and similar impacts of commercial agricultural practices; farmers complain about vandalism, theft and trespassing on farm properties. To minimise these conflicts, the county can implement a variety of tools designed to minimise the interaction between people and agriculture which results in the conflict. These tools include continuing to implement its right-to-farm ordinance, requiring buffers between non-agricultural development and adjacent agricultural operations, and establishing setbacks from agricultural zones.

    1. The county shall continue to protect agricultural resources by limiting the circumstances under which agricultural operations may be deemed to constitute a nuisance;
    2. The county shall protect agricultural operations from conflicts with non-agricultural uses by requiring buffers between proposed non-agricultural uses and adjacent agricultural operations
    3. The county shall support state regulations requiring landowners to manage noxious weeds and pests on fallow or abandoned lands.

4. *Provide Housing for Farm workers.* Efficient farm management requires a stable work force to provide labour when needed. To ensure the availability of labour, adequate numbers of employees must be

housed on both a temporary and a permanent basis. Farm worker housing issues involve the location, amount and type of housing for seasonal and year-round farm workers.

1. The county shall continue to facilitate efforts of individuals, private organisations and public agencies to provide safe and adequate housing for farm workers;
2. Temporary housing for full-time farm employees in connection with any agricultural work or place where agricultural work is being performed shall be supported;
3. Permanent, new housing for seasonal farm workers preferably shall be located in areas supplied with public sewer and water services;
4. Housing for year-round, full-time farm employees shall be permissible in addition to the number of dwellings normally allowed by the density standard.

5. *Support Education and Technical Assistance***.** Farmers and ranchers often lack the means to undertake the wide range of activities necessary to pursue new agricultural market opportunities and develop new products. Public educational institutions, including the University of California, California State University Stanislaus, and Modesto Junior College all provide some form of technical assistance to agriculture. However, these public institutions can be better utilised to help agricultural groups and individuals conduct market analyses, identify direct marketing opportunities, promote exports, and coordinate other economic development activities in support of local agriculture.

    1. Public education institutions shall be encouraged to provide more technical assistance related to agricultural economic development in Stanislaus County;
    2. The County shall continue to encourage vocational agriculture programs in local high schools and at Modesto Junior College;
    3. Public agencies providing agricultural services shall be encouraged to continue agricultural research and education;
    4. The county shall continue to encourage 4-H and FFA programs for local youth.

6. *Protect Food Safety***.** The lack of consumer confidence in food can be costly to the agricultural community. The use of chemicals in growing and storing crops, the use of antibiotics and hormones in raising poultry and livestock, and the use of radiation to prolong the shelf-life of our food are types of agricultural practices that worry consumers who are concerned about food safety and its long-term impacts on their health. The public is also concerned about the impact of agricultural chemicals on the environment. Air, soil and water quality problems can result from the unsafe application and disposal of agricultural chemicals. A viable agricultural industry requires a sustainable regulatory framework promoting economic viability and environmental safety.

    1. The County shall continue to work with local, state and federal agencies to ensure the safety of food produced in Stanislaus County and to maintain a local regulatory framework promoting environmental safety while ensuring the economic viability of agriculture.

7. **Encourage Regional Coordination in the Central Valley.** The Central Valley has long been one of the premier agricultural regions in the world. Yet the Central Valley's population is growing rapidly, resulting in far-reaching demographic, social and economic changes. Some of the most obvious changes include crowded highways, polluted air, and homes and shopping centres sprouting from what used to be farmland. These types of regional impacts will likely have cumulative effects on agriculture, exerting a powerful influence over its future viability in the Central Valley.

    1. The County shall encourage regional coordination of planning and development activities for the entire Central Valley.

Conserve agricultural lands for agricultural uses. Agricultural land is a finite, irreplaceable resource. Once agricultural land has been taken out of production and paved over to provide streets for residential subdivisions and parking lots for shopping centres, it is not likely to be farmed again. The urbanization of productive agricultural land means the permanent loss of an irreplaceable resource.

1. **Continued Participation in the Williamson Act.** The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, is a tax relief measure for owners of farmland.

    1. The County shall continue to provide property tax relief to agricultural landowners by participating in the Williamson Act.

    2. The County shall ensure all lands enrolled in the Williamson Act are devoted to agricultural and compatible uses supportive of the long-term conservation of agricultural land

2. **Discourage urbanisation and the conversion of agricultural land in unincorporated areas of the County. U**rbanisation and farmland conversion are like two sides of the same coin. As urban areas expand to accommodate a growing population, surrounding farmland is converted to residential subdivisions, shopping centres and industrial parks.

    1. To reduce development pressures on agricultural lands, higher density development and in-filling shall be encouraged;

    2. To the greatest extent possible, development shall be directed away from the County's most productive agricultural areas;

    3. Agricultural lands restricted to agricultural use shall not be assessed to pay for infrastructure needed to accommodate urban development.

3. **Assessing and mitigating Impacts of farmland conversion.** The conversion of agricultural land to non-agricultural uses has far-reaching impacts on the land, water and air resources that support our biggest industry. For example, taking out an almond orchard to accommodate urban development may involve paving over groundwater recharge areas, which will have a long-term effect on groundwater resources. Similarly, new roads providing access to the development may increase traffic congestion, resulting in a cumulative impact on air quality.

    1. When the County determines that the proposed conversion of agricultural land to non-agricultural uses could have a significant effect on the environment, the County shall fully evaluate on a project specific basis the direct and indirect effects, as well as the cumulative effects of the conversion;

    2. In order to mitigate the conversion of agricultural land resulting from a discretionary project requiring a General Plan or Community Plan amendment from 'Agriculture' to a residential land use designation, the County shall require the replacement of agricultural land at a 1:1 ratio with agricultural land of equal quality located in Stanislaus County.

    3. The County shall work cooperatively with the nine cities within the County and to encourage them to adopt agricultural conservation policies or ordinances

Protect the natural resources that sustain our agricultural industry. Agriculture depends directly on the land, air, water and soil resources to sustain its productivity. The success of agriculture in Stanislaus County can be largely attributed to the availability of these resources for the production of a wide variety of products. The continued availability of soil, high quality water and clean air cannot be taken for granted. In the process of urbanisation to accommodate a booming population, Stanislaus County is losing farmlands to urban development by cities. At the same time, there is increasing competition between agriculture and urban uses for limited water resources. Ultimately these problems threaten the County's agricultural economy and our ability to help feed the nation.

1. **Air Quality.** The County shall continue to coordinate with the San Joaquin Valley Air Pollution Control District.

    a) The County shall encourage the development and use of improved agricultural practices that improve air quality and are economically feasible.

2. **Water Resources.** Water is the lifeblood of agriculture in Stanislaus County. To supplement an average rainfall of just 12 inches per year, local agriculture relies on a network of irrigation water

delivery systems to sustain its broad diversity of valuable crops.

a) The County shall encourage the conservation of water for both agricultural and urban uses;

b) The County will continue to protect the quality of water necessary for crop production and marketing.

3. **Soil Resources.** The county shall encourage the conservation of soil resources.

Lessons learned – success/failures

Agriculture in California is a multi-billion business. It is highly efficient, research supported and in many respects very successful. The central valley is the bread-basket of the US, and possibly even of the world. And this has happened despite very dry conditions in the valley, rainfall is less than 500 mm per year in Davis, for example. There are many reasons why this dry stretch of land has developed in such an unprecedented way. They include the following:

1. The land is inherently very fertile, and thus able to generate large crops of food year after year;
2. The probably biggest infrastructure network found anywhere in the world brings water to the valley from as far away as the Colorado River;
3. The federal and state governments have subsidized farming in California (as well as elsewhere in the United States) enormously for many years. Farmers receive for example almost free water, export subsidies, import tariffs (reducing foreign competition), market support, extension services, and assistance to address soil erosion and salt accumulation;
4. A strong emphasis on agricultural research in nearby valley-based universities. UC Davis is one of the most renowned agriculture research and education centres in the world, and steadily generates state of the art knowledge on improved farming practices, salt tolerant crops, and irrigation technology, to mention just a few areas.

Key messages for the Nile basin

California is located far away from the Nile Basin and the two areas are very different. It is not apparent what the key messages say. Still, a few issues can be defined, possibly of general applicability to any basin (or agriculture region) of the world. The messages are as follows:

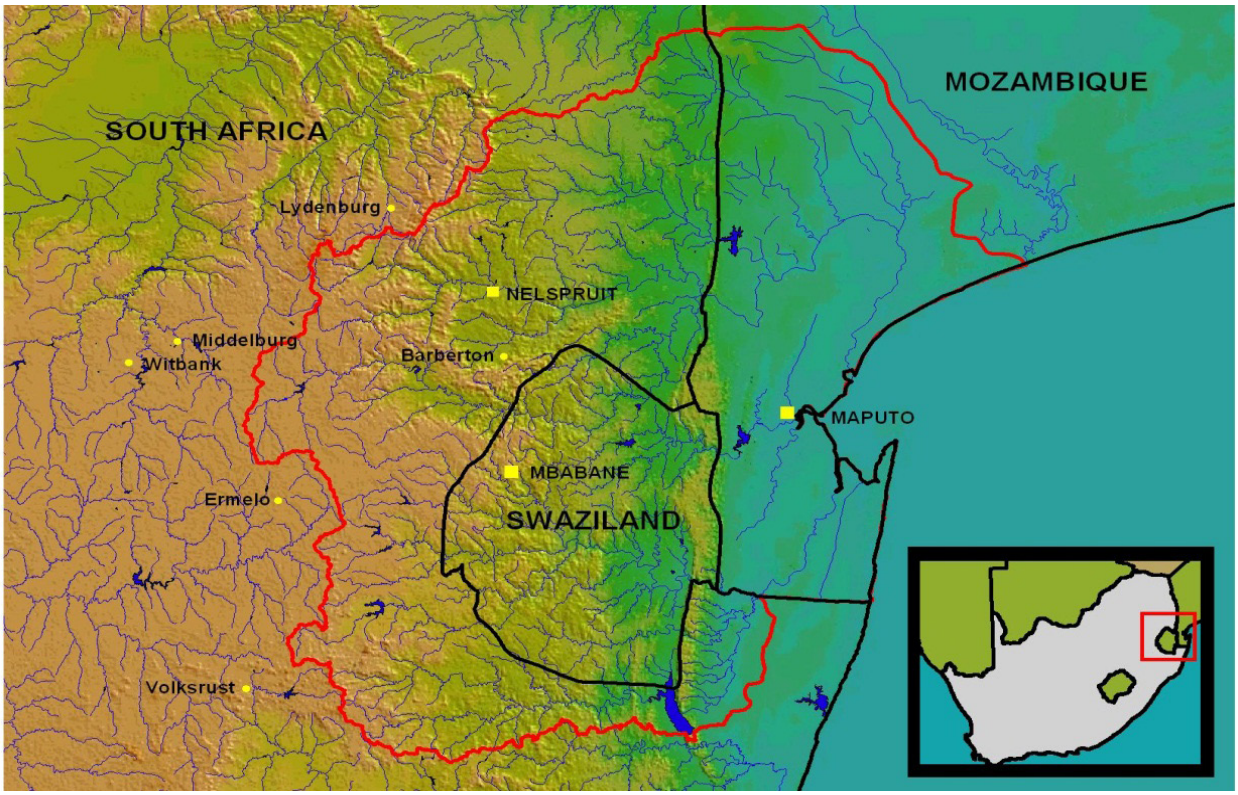
1. Fine, productive land should not be wasted, neither by urban expansion, industrial pollutions or land-use induced soil erosion and salinisation. Cities can be located on hard rock, industries regulated, and land use practices improved.
2. Farming typically implies hard work. Farm workers must have liveable conditions for themselves and their families, otherwise efficient, productive and innovative farming difficult.
3. Research and capacity building is key to agriculture development. The central valley and its enormous production of food and value-chain products would not have happened without the support of dedicated scientists of many types – not only agriculture.
4. Consumers are important. If they trust the food produced, regard it as safe to consume, and ecologically friendly, they are not only willing to pay more, but also to support – or at least turn a blind eye – towards governments that use scarce financial resources to subsidise farmers rather than paying for nurses or school teachers.

Annex 9 In- depth review: Komati River

Basin Facts

The Komati River is a trans-boundary river traversing three countries, namely South Africa, Swaziland and Mozambique. It has a catchment area of 46 700 km^2 out of which 2500 km^2 (6%) is in Swaziland, 15600 km^2 (31%) is in Mozambique and 28 600 km^2 (63%) is in South Africa. The River Rises from Drankensberg Mountains at an altitude of 2000 m and drops down steeply to the low veld and the plains of Mozambique. The three tributaries of Komati River are Komati, Crocodile and Sebie Rivers. The Komati River which flows from South Africa into Swaziland and back into South Africa has one tributary, the Lomati River and has a catchment area of 11209 km^2, which includes 1 493 km^2 of Lomati River. The river is approximately 450 km long up to the confluence with Crocodile River in Mozambuque. The Komati River is the main water course in Swaziland with about 2560 km^2 of its area in Swaziland and 8431 km^2 is in South Africa.

Figure 1: The Komati River Basin



Human conditions

The Komati Basin has a population of 460 000 according to 1992 records but projections show that currently it is over half million. The main economic activity in the basin is the sugar industry which employed about 30 000 people by 2003 and generates income to levels of about US$50-100 Million/year. To diversify income, horticultural crops, dairy farming and fruit trees are also grown. Tree nurseries are coming up for medicinal plants and preserve indigenous trees. Other sources of income include tourism as a result of the growing hotel industry some of which have come up after the completion of the dams. In addition to these, mining, construction, furniture and paper industries also provide additional income to the people in the basin.

The diversification of income was enhanced by resettlement as a result of the displacement brought about by the construction of the two dams. It is worth noting that the resettlement of the displaced persons

was done jointly through coordination by KOBWA after individual separate initiatives by South Africa and Swaziland did not succeed.

Natural Resources

Climate

The climate in Komati Basin is characterized by cool temperatures in the High veld with mean annual rainfall of 1200 mm. Towards the low veld it changes to hot and dry with mean rainfall of 600 mm a year. Rainfall occurs in summer in the months of November to April. Evaporation rates are quite high in comparison to rainfall reaching levels of 1900mm per annum. Runoff levels are as high as 1420 Mm^3 annually while consumptive water use is about 990 Mm^3 per annum which is about 70% of total runoff.

Biodiversity

This comprises wildlife of varied species some of which are endangered. The Komati basin has two conservation areas including Krueger national Park in South Africa. The conservation areas provide environmental services in terms of water, biodiversity conservation and are a preserver for indigenous species.

Agriculture

Agriculture is a major economic activity in the basin. Both subsistence and commercial farming are practiced. Sugarcane is the main commercial crop in the Komati River basin grown through irrigation. It is undertaken by both the private and Public sector. The public sector one is located at Komati Downstream Development Project (KIDD). Apart from sugarcane, horticultural crops are also grown which therefore diversifies agricultural income.

The suitability of sugarcane as a commercial crop in Komati Basin was determined through soil survey and suitability carried out by the Ministry of Agriculture. The Ministry of Agriculture implements its functions through Swaziland Agricultural and Development Enterprise (SWADE). This is a government parastatal under the same Ministry established by the company's act to facilitate agricultural development and in particular Irrigation schemes. Some of the functions carried out to promote agriculture include assisting farmers to access credit through capacity building and information sharing as well as developing guidelines for effective utilisation of resources and control of land degradation. Through SWADE farmers are provided with extension services to enhance production. With the support of SWADE, 20 farmers associations have been assisted to develop commercial irrigation of sugarcane on communal land. SWADE also promotes commercial farming among small scale farmers to enhance their income in addition to providing training to farmers on modern farming methods. It also ensures sound human resource and financial management so as to increase returns per resource input.

The land tenure system in Swaziland comprises three categories namely the Swazi National Land system which is about 60%, the title deed land tenure system comprising 12% and concession land which is about 15%. Most of the agricultural land is under the Swazi National land System which is communal land held in trust by the King of Swaziland. It is administered through the chiefs who lease it out to farmers on behalf of the King.

In Swaziland Irrigation agriculture constitutes 40 000 ha consuming about 870 MCM of water per annum. Out of this sugarcane alone consumes 67% of total irrigation water hence constituting a major economic income in the basin. In South Africa, irrigation in Komati Basin uses 60% of water supply, domestic 30% and Kruger National Park 10%. In South Africa, the ICMA coordinates agricultural functions in the catchment in as far as irrigation water use is concerned to ensure equitable sharing for optimal agricultural production.

Infrastructure

The major infrastructure in the basin that relates to agricultural development is the construction of storage dams. Between 1962 and 1968 three dams were already constructed in South Africa namely VygeNRBCon (78Mm3) and Nooitgedacht (78 Mm3) on the upstream of Swaziland for industrial purposes

mainly for cooling thermal power stations and two in Swaziland. Dams and reservoirs control sediment and freshwater flow in to the estuary ecosystem at the confluence with Komati which has effects on the estuary and supports a 5000 ha mangrove forest and sustains the marine habitat.

Farmers also maintain their irrigation infrastructure to ensure efficient conveyance and distribution of water in the scheme. To facilitate this and other activities Farmers are organized into 19 groups in the Komati Downstream Development project. The KDDP has a potential irrigation area of 6000 ha. So far 4290 ha has been developed out of which 3990 is under cane. The project has been able to realize this with the support of SWADE.

The Komati River Basin

Establishment of RBO and other water governance institutions

The Komati River Basin has one River basin Organisation called Komati Basin Water Authority (KOBWA). The RBO was established under the 1992 treaty between South Africa and Swaziland for the development and utilization of Komati River Basin. Through this treaty, KOBWA was established in 1993. KOBWA is project based for implementation of specific projects. In particular it was intended to construct, operate and maintain Driekoppies dam on the Komati River in South Africa and Muguga dam on Komati River in Swaziland. The genesis of KOBWA originated from the potential conflict over water use between South Africa and Swaziland. These were mainly Storage of water for industrial use in South Africa upstream of Swaziland on Komati and over abstraction of water for irrigation in Swaziland on the same river which affected farmers in South Africa who were irrigating downstream of Swaziland .

The Water availability in Komati is 2270 MCM per annum with assurerity of 1:10 years (90%) while demand is 1710 MCM with assurerity of 1:10 (90%). This implies that adequate water is available to meet the demand. Some of the major water related issues in the basin that prompted the development of the dams include water scarcity, water sharing and temporal and spatial variability of water resources. Other issues include monitoring of abstractions, water quality and environmental and wildlife water needs.

Institutional Framework for management of Komati Basin

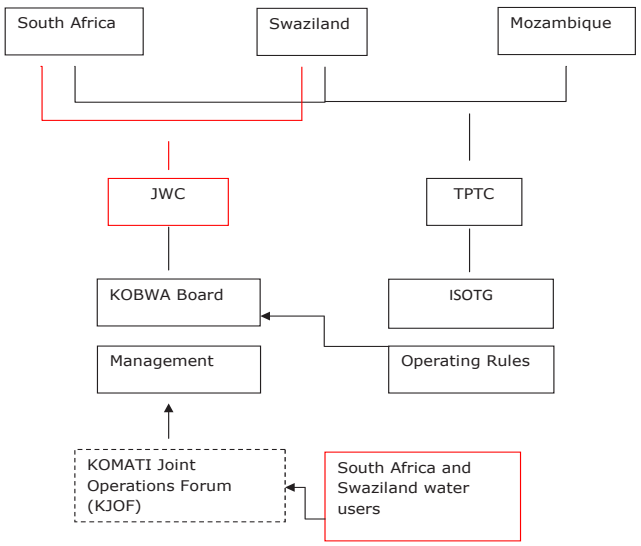


Figure 2: Institutional framework for management of Komati Basin(Source: Dams and Development: The KOBWA-Experience. JWC: Joint Water Commission; TPTC: Tripartite Permanent Technical Committee; ISOTG: Komati Systems Operational Task Group)

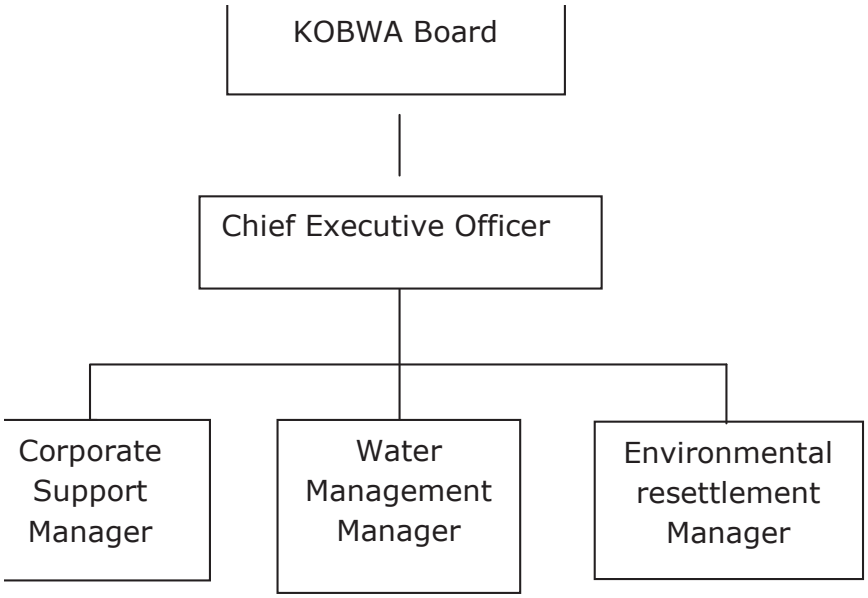


Figure 3: KOBWA Structure (Source: Dams and Development: The KOBWA-Experience)

The JWC is the top policy decision making body of KOBWA with the implementation of the three functions overseen by KOBWA board. Each of the two institutions has six members with equal representation from South Africa and Swaziland. KOBWA executes its functions with the involvement of stakeholders through Komati Joint Operations Forum (KJOF). The KJOF meets once a year and agrees on water sharing modalities. Thereafter meetings are held every month to monitor operations and compliance.

Functions of KOBWA

KOBWA is a project based RBO established in 1993 with the specific function of implementing Phase I of Komati River Basin Development project. This phase of the project comprised of construction, operation and maintenance of Driekoppies Dam on Komati river in South Africa and Muguga Dam on Komati River in Swaziland. The construction of the two dams was completed in 1997 and 2002 respectively. Following their completion, Driekoppies Dam with storage capacity of 251 Mm3 started operating in 2000 while Muguga Dam having storage capacity of 332 Mm3 operated for the first time in 2006. With the completion of these dams and resettlement of displaced persons, KOBWA's main function currently therefore is the management of the water from the two Dams. In particular, it is mainly concerned with water allocation between the two countries. Policy issues regarding the functions of KOBWA are referred to the Joint Water Commission for deliberations.

In allocating water, KOBWA is guided by the demands from individual countries, water availability in the storage dams, priorities of water use, assurance of the various uses and provision of flow to Mozambique. Four priorities are recognised in the three countries namely water supplies, irrigation, afforestation and runoff reduction in descending order. Assurance level on the other hand are determined for water supplies and irrigation with the figures of 1 in 100 (99%) and 1 in 10 (10%) respectively. The water is allocated to South Africa and Swaziland annually at the beginning of the growing season. The available water in storage is determined with the help of stochastic models in the DSS. The information is then relayed to the water users and in particular to the farmers with details on available water and entitlement to enable them plan realistically the extent of their investments in irrigation farming. This information dissemination is executed through the stakeholder forum, KJOF. In as much as KOBWA allocates water based on the country requests, the management of country allocations is the responsibility of each country. The requests are made on a weekly basis to KOBWA and subsequently water is released according to agreed schedule. Apart from sharing water, countries also share losses in water resources which are estimated at 40 Mm^3 / year. These are mainly systems losses, evaporation and transmission losses.

A summary of the functions of KOBWA is given here below:

1. River flow regulation and monitoring to provide adequate and reliable hydrological data as well as amount of water in storage and its temporal variability
2. Monitoring of abstractions of water use to ensure compliance to agreed regulations
3. Review and approval of water use and reconciliation of statements regarding demands and availability of water resources
4. Efficient supply of water to the parties (through developing and implementing operating procedures, water accounting systems and a maintenance programme for water infrastructure
5. Providing information and guidance to the parties on efficient water use
6. Providing information and guidance to the parties on actions required to minimise the impacts to aquatic environment
7. Ensuring efficient communication procedures with all stakeholders in place
8. Recognition that Mozambique be supplied with a minimum of $2m^3/s$ of water over a period of three days. Currently they are negotiating for 2.6 m^3/s under IIMA which is being implemented through PRIMA project.
9. Monitor flows at strategic positions on every 15 seconds and data is uploaded to systems every 5 minutes
10. Monitor flow releases based on feedback from the strategic monitoring stations
11. Monitor quality using South African standards in line with SADS agreement. The parameters which are monitored are PH, EC, N, P, TSS and TDS from which feedback is given to individual countries for appropriate action.
12. Facilitating studies on efficient water use demand management and enhancement of water resources mainly through increase of storage.

In executing its functions, KOBWA has remained non-partisan from which it has gained trust from the two countries and Mozambique. This has contributed significantly to equitable sharing and timely arrival of water at the point of application and effective use of water for agricultural production.

RBO Agricultural Functions

Agriculture is a major water user in the basin in both South Africa and Swaziland. In South Africa, 60% of the water from the Komati basin is used in irrigated agriculture while domestic and Kruger National Park use 30% and 10% respectively. In Swaziland irrigated agriculture constitutes 40 000 ha consuming 870 Mm^3 of water per annum with sugarcane consuming about 67% of total irrigation water while the rest is used to irrigate citrus fruits and vegetables. KOBWA has no direct agricultural functions but indirectly promotes irrigated agriculture through creation of storage for irrigation and implementing operational rules for allocating irrigation water.

Best Practices and Lessons learned (Positive and negative)

Best practices

The following best practices have been derived from the study of Komati Basin with focus on the functions of KOBWA as a river basin organisation

1. Equitable sharing of water is upheld taking into consideration the level of development of a country
2. Land use planning is upheld for better utilisation of the lend and economic returns
3. Common understanding of functions and practices between the countries in the basin

4. Use of stakeholder platforms to ensure transparency in water sharing
5. Common understanding of the functions and practices
6. Timely information dissemination to the stakeholders at the beginning of the growing season and monthly regular updates and especially in as far as water situation is anticipated to be.
7. Being non partisan in executing functions assigned to the organisation
8. Embracing of regional protocols and in particular SADC in the management of River Basins
9. Classification of water use into assurance classes incorporates fundamental principles of IWRM for effective use of water as an economic as well as social good.

Lessons learned

The lessons from the review of the Komati Basin with focus on KOBWA can be summarised as follows:

1. Consensus building among riparian states to undertake development in the basin and share both benefits and risks
2. Corporation among riparian states in the implementation of the treaties enhanced the success of the projects
3. Participation of communities in decision making process through stakeholder forums
4. Diversification of income generation and promotion of micro-entrepreneurship
5. Genuine corporation, transparency and shared vision among the three countries attracted development partners to provide financial support to KOBWA to execute its functions
6. Good will among stakeholders demonstrated by the treaties, agreements and protocols facilitated water use
7. Prioritising social and environmental effects in project development enhances the success and benefit generation
8. Genuine political will offered by the top policy makers from the three countries through the treaties made a positive impact on the success of the project.
9. Sharing of both benefits and losses ensures low negative impacts on individual countries
10. The three riparian countries constituting Komati basin have confidence in KOBWA in executing its functions

Analysis and proposed Agricultural Functions for the Nile

The proposed Agricultural functions derived for the Nile Basin from In-depth study of Komati Basin are summarised below:

1. Common management of change and displacement as a result of storage development mitigates preferential treatment of those affected
2. To Develop limits and guidelines for irrigation-water use for each country in the basin taking into account the country's contribution of water resources and irrigation water demands and rain fed agriculture
3. Supporting studies that can lead to water saving agricultural practices and enhancement as well as diversification of Agriculture
4. To promote access to markets by farmers through regional economic blocks
5. Harmonisation of water allocation requests for agriculture from individual countries

6. Promoting the establishment of institutions which facilitate agricultural development in individual countries
7. Promoting value addition in agricultural produce

Some of the agricultural functions derived for the Nile may be carried out directly but are coordinated by the organisation since implementation is more or less based on policies from individual countries. Since KOBWA is mainly concerned with water allocation, it provides limited options for developing agricultural functions for the Nile apart from those based on individual country agricultural functions.

Conclusions

The in-depth study for Komati basin presented in this report revealed a success story of the functioning of KOBWA which is a project based River Basin Organisation established following high level political support provided by heads of state from the three riparian countries of South Africa, Swaziland and Mozambique. The fact that the agreements and commissioning of projects among other major political activities are presided over by the concerned heads of states is an indication of genuine commitment to the success of the RBO.

In executing its functions, KOBWA has demonstrated neutrality and in the process built confidence among the stakeholders. Consequently they have been entrusted with very delicate assignments such as resettlement of displaced persons caused by development of the two dams. KOBWA has also ensured that through KJOF, stakeholders are given appropriate opportunity to participate in the management of the water resources. This has made operations to be executed amicably. Lack of adequate consultation and subsequent buy in lead to conflict like in the case where a chief in Swaziland had converted a grazing land of about 50 ha into sugarcane plantation and developed it at 30000/- Rends / ha without consulting the community. This resulted in confrontation and consequently the field was burned to create land for grazing. This is a show case demonstrating the need for genuine stakeholder participation and is a key message to the Nile Basin.

Appendixes

Appendix 1: Bibliography

Dams and Development: The KOBWA – Experience

IIMA Agreement. Tripartite Permanent Technical Committee (TPTC). Mozambique, South Africa and Swaziland

KOBWA, Development of an ecological water management policy and water management plan for the Komati River Basin

The Kingdom of Swaziland. The Water Act 2003

Republic of South Africa. National Water Act 1998

Komati Downstream Development Project (KDDP). Educating poverty and creating wealth. Information brochure, SWADE

SWADE annual report 2009

LUSIP Futurist. Water and Agriculture Partnerships for Sustainable Development. WADE publication. Nov.-Dec. 2010

Swaziland Review 2009. An overview of the Kingdom of Swaziland's Economy

Appendix 2: List of Interviewees

Table A1: Characteristics of Interviewees

	Institution	Relevance	Country	Contact person Appointment
1	Department of Water Affairs: Planning and operations division	Coordinating implementation of policies and strategies at National level	SA	Celine Ntuli
2	Department of Water Affairs: Directorate National Water Resources Planning and Trans-boundary water management	Developing policies and strategies at National level and coordination of TPTC	SA	Niel Van Wyk
3	Komati Catchment Management Agency	Implementing regulations and IWRM at catchment level	SA	Brian Jackson
4.	KOBWA	Manager – Environment and settlement	SA/SWA	Ian van Zydam
5	KOBWA	Water Quality Monitoring	SA/SWA	KenzieMavimba
6	KOBWA	Community Development Officer	SA/SWA	Nicholas Mkhashwa Nicholas.mkhatshwa@kobwa.co.za
7	KOBWA	Environmental Officer Social Development	SA/SWA	Sibanangaye Mkhatshwa Sibanangaye.mkhatshwa@kobwa.co.za
8	KOBWA	Environmental Officer	SA/SWA	Nonceba Naqayi Nonceba.Naqayi@kobwa.co.za
9	SWADE	Chief Executive Officer	SWA	Doctor M. Lukhele lukheledmp@swade.co.sz
10	SWADE	Director Komati Downstream Development Project	SWA	.....@swade.co.sz
11	Ministry of Agriculture	Director of Agriculture	SWA	DumisaniMngomezulu mngomezulud@gov.sz
12	Department of Water Affairs	Water Resources Engineer	SWA	Trevor Shongwet_shongwe@.....

Annex 10 In depth review: Moulouya River

Basin facts

The Moulouya river basin extends between latitudes 32°18 'and 35° 8' North and longitude 1° 11 'and 5° 37' West. The Moulouya river begins at Alemsid, at the junction of High and Middle Atlas; the main river is more than 500 km long.

The area of intervention of the Moulouya River Basin Agency is about 70,910 km^{2}including the following sub basins: Moulouya (55,500 km^2),Kert, Isly, Kiss, ChottTigri, and part of the zone-FiguigBouarfa , draining the waters from the eastern Rif and Middle Atlas mountains, and also from the High Atlas in the south.

The trans-boundary part of the Moulouya basin is called Bounaîm-Tafna sub basin (Isly and Kiss rivers) shared with Algeria. However the Moulouya River Basin Agency is a national body, set up by Morocco. The staff of the Agency is about 50 people.

Human conditions

The basin has a population of about 2.17 million inhabitants; that represent 7% of Moroccan population. In the Moulouya basin there is a very active civil society: about 671 associations and 462 cooperatives (419 agricultural and 43 artisanal). There was not a massive rural exodus, during the recent past, but it is foreseen that this will be an issue in the coming years in view of the changes that the Moroccan agriculture is likely to face, under the combined effects of drought and liberalization of trade of agricultural products. A strong link is well established by the "Green Morocco Plan", between the ambitions of the prospective rural development and the actual economic growth. The demographic concentration is 23 inhabitants/ Km^2 (47inhab./km^2 at national level). The population is young with 50% under 25 years old. The rate of unemployment is 26% against 119% at national level; therefore it is clear that employment constitutes one of the major priorities for the decision-makers. The Moulouya Basin remains an area of agricultural and pastoral activities, and some fishing activities are also noted.

At national level in Morocco, indicators include: HDI = 0.624 (114e Rank), infant mortality rate = 36 per 1000, GNP/person = 4638$US in 2008and the average poverty index is 17,9.

Natural resources

From the literature review and discussions with relevant persons it appears that the climate of the Moulouya River basin is highly variable. The average annual rainfall can exceed 600 mm / year in highest altitude areas but less than 350 mm / year in the plains, which are characteristics of arid areas. The inter annual river flow observed at the dam "Mohamed V" controlling an area of 52,000km^2 is27m^3/s, with an average annual water flowing at the mouth of Moulouya of 1150 million m3/year(period 1945-2002). For groundwater resources, the Moulouya Basin contains more than thirty aquifers (confined and unconfined). The total volume of renewable groundwater is around 520 million m^3/year. Generally the water quality of the unconfined aquifers, where agriculture is intensive, is characterized by high concentration of nitrate, salinity (coast aquifers) and probably pesticides. However, for the confined aquifers the pollution is almost nonexistent.

Except for the agricultural area (North and Western part), the Moulouya basin is constituted by the steppes (alfa alfa,). The plant cover is precarious because of the arid ecological conditions and human action that damage by grazing and overexploit. An important ecosystem is the Moulouya wetland that is protected by Ramsar.

Agriculture

In the Moulouya basin private farms cover only 45% of the area; the medium and large farms (more than 5 ha) dominate. The fruit trees (citrus, olive and vine) are the main agricultural production. Agriculture is the source of 15% of the national wealth produced each year and the sector employs 46% of the country's assets. The income of farmers in irrigated areas, which is intensified and diversified agricultural production with developed export crops, is high. The irrigated agriculture shows a value added of around 45% in a year with sufficient rainfall, and this increases to nearly 75% in dry years, thus irrigation is playing an effective role in food security in the country.

Agriculture is the main user of the natural resources, including water which is the key resource for development. At national level, the Green Morocco Plan (Plan Maroc Vert, PMV), is developed, with the creation of the "Agricultural Development Agency" (ADA) that is operating as an intermediary between farmers, investors and the administration. In the frame of the implementation of the PMV, a number of practices are encouraged, to increase the stability and efficiency of water resources, including replacing existing irrigation systems with micro-irrigation, expand drip irrigation from 150,000 ha to 670,000 ha by 2020, and 1 million ha of land dedicated to water-intensive cereal crops to be converted to less-intensive fruit and vegetable production.

Catchment management

The major concern in terms of degradation is the water quality that is being affected by domestic, industrial and agricultural pollution. However, the problems associated with industrial pollution are not yet alarming. Furthermore a monitoring system for water quality is in place with a network composed of 21 stations for surface water, 60 groundwater stations and 3 stations at dams level.

Marketing

In Morocco, the agricultural sector's development remains thwarted by lack of water, but also by constraints linked to outdated technology, land tenure, the smallness of the vast majority of farms and old practices. The private sector is constrained by the phenomena of difficult access to credit, high interest rates, land issues, administrative delays and legal uncertainties. Also some gaps in managerial, technical and operational skills are mentioned. The state has long been heavy, overly intrusive, impeding the free market and competition. Serious deficiencies still affect the products and services, in terms of compliance with quality standards and adopting effective marketing strategies. This results in a low external competitiveness and excessive vulnerability of the economy to the international situation. The competitiveness of the economy also remained below expectations, mainly because of low productivity. Moreover, the domestic market remains small. The situation of Moulouya relates to this overall national context.

Infrastructure

In the Moulouya basin, the quantity and quality of water resources are relatively well known, protected and exploited for different sectors.

For agriculture: The volume of water used within the basin amounts to 1210 million m3 divided as follows:

i) 840million m3 of surface water used (96% for irrigation and 4% for Potable water supply) and ii) 370 million m3 of underground water (75% for irrigation and 25% for potable water supply).

For industry: Hydroelectric plants associated with the Mohamed V dam and canal Bouareg (downstream Homadi) have an installed capacity of 29MW producing 53 GWh per year. Upstream of the Moulouya basin are other small hydroelectric units over water.

Household water: In 2004, the volume of water used for supplying drinking and industrial water was 70million m3 of which 50 million m3 (70%) was groundwater and 20 million m3 (30%) was surface water. In rural areas, the rate of access to safe drinking water rose from14% in 1994 to 62% in 2004 thanks to the achievements undertaken by the Programme for Grouped Supply of Drinking Water for Rural Populations (PAGER).

Water infrastructure: The Moulouya basin has 5 large dams (Mohamed V Dam, OuedZa Dam, HassanII Dam, MechraHomadi Dam, Enjil Dam). The current overall capacity of storage of these dams is close to 1000 million m3. Forty (40) small dams and small lakes have been made in the Moulouya basin with an overall total storage capacity of 22 million m3 that are intended primarily for watering livestock, the protection against flooding (Oujda) or the rescue for drinking water supply (dam Arabat Nador). Several Dams are silted or require maintenance.

The Moulouya river basin

In 1995, Law No 10/95 on water was adopted in Morocco. Taking into account the constraints that complicate the management of water resources, the designers of Law No 10/95 made sure to give the country the necessary tools for a sound, collaborative and decentralized water management system. The fore front of operational activities, the basin agencies fully reflect the interests of efficiency and close management of water resources of the country. The basin agencies are one of the greatest innovations of the Water Act. From the law, Water Agencies are public institutions with legal personality and financial autonomy. The basin agencies manage all water resources in a pool or group of watersheds, involving all stakeholders at a Basin level and ensuring coherence in the development and management activities. The management structure of the Moulouya Basin Agency includes a Board of Directors. The headquarters of the Agency is located at Oujda.

Article 3 of the Decree No. 2-00-475 of 17 Shaban 1421 (November 14, 2000) on the Moulouya Hydraulic Basin Agency stipulates that the board of directors of the Agency is chaired by the Minister for Infrastructure and includes representatives of all the pertinent ministries, and all the key stakeholders (see the decree). The strength of the board is also reflected in the high level of representation of its members. For instance, the representatives of ministers must have at least the level of director of central administration. Those of offices should also have the level of Director. The agency's director attends meetings of the board in an advisory capacity. Any qualified person may be called by the president to serve on the board in an advisory position.

Key Partner Organisations defined for the collaboration/management are involved in the implementation process. A very comprehensive list of these organisations shows the very broad participatory approach and clear subsidiarity in the basins' management system.

All studies (impact studies, feasibility studies, water resources study ...) are confided to the private's structures. The agency plays only a role of coordination and control.

To implement some projects, the agency collaborates with other agencies from France or Spain.

Some of the key functions assigned to the Moulouya River Basin include mainly planning, coordinating and monitoring actions such as:

1. Development of master plan for integrated management of water resources within its area of action
2. Monitoring and regulating water quality and quantity
3. Organizing and implementing the water allocation system
4. Collecting, processing and sharing data on water (including Website)
5. Providing Capacity Building services(Training & Research) in IWRM

6. Organizing resource mobilisation and undertaking the realisation of water infrastructure
7. Promoting regional trade in agricultural products
8. Ensuring the functioning of a platform for advocacy and promotion of activities in the basin
9. Organizing political support for major infrastructure projects

RBO Agricultural functions

In terms of agricultural functions, the Moulouya Basin Agency is expected to take into account the National regulations, standards, Plans (such as Green Morocco Plan) and the decentralised bodies in charge of sectoral issues. The principle of subsidiarity with decentralised organs and delegation of roles are clearly noted. Some functions are indirectly addressing general management, planning and monitoring issues such as:

1. Elaborating the leading plan for water resources and ensure its implementation
2. Providing Capacity Building (Training & Research) in IWRM
3. Ensuring the functioning of a platform for advocacy and promotion of the basin's activities
4. Delivering authorizations and concessions of use of the public hydraulic domain
5. Managing and controlling the use of mobilized water resources
6. Organizing political support for major infrastructure projects
7. Holding a register of recognized water rights, of concessions and authorizations of water withdrawal granted.

Some very direct functions are undertaken by the Agency and linked to Agriculture, but at planning, coordination and monitoring and facilitation levels mainly, not directly at implementation level. The functions of the Agency includes:

1. Keeping vigil for application of the leading plan on Agriculture
2. Developing pilot projects for irrigation in collaboration with the "Regional Office for Agricultural Development of Moulouya" (ORMVAM)
3. Promoting regional trade in agricultural products
4. Promoting and encouraging efficient use of water
5. Encouraging the treatment and reuse of waste water in agriculture

The Basin Agency in this case has a very strong role also in funding issues, including taxes and incentives management.

Consolidated commentary on factors for success and factors which have inhibited success.

The Moulouya River Basin Agency is set up with a very comprehensive assignment, in close collaboration and involving the key actors. The Agency is however a National body in Morocco that operates, taking into account the regional context and opportunities (eg proximity with Europe, the world's market) in their prioritisation process as follows:

1. The principles of participatory approach and subsidiarity are applied with all the offices and local authorities involved (mainly the ORMVAM).
2. The institutional, organisational and legislative instruments are in place, with a lot of information.

3. The Web Site in development process design a framework for a comprehensive information and tools on the basins' characteristics, data and activities
4. The Master Plan for Integrated Development of the Moulouya Basin Water Resources is a key tool to consider, but the current one needs to be updated.
5. The governance of the Agency is strengthened by a solid National legislative framework, and very high level representatives in the Board of Directors

However, one can note some difficulties such as:

i) Weak recourses to the use of products that can improve the agricultural outputs, particularly improved seeds for cereals;

ii) Weak rate of use of fertilizers in spite of the State's incentives to this effect (subsidy of 50%);

iii) Parasitism's development on cultures in irrigated zone;

iv) Weak level of mechanization for some agricultural operations; and

v) The limited amount of renewable available water resources

Overall analysis of basin characteristics

The Moulouya river Basin Agency is designed to manage a relatively small basin, in a single country with national regulation in force. From the experience acquired, and taking into account the advices from the people met in Oujda, we would propose the following for the Nile:

a. First of all the River Basin Organisations to be set up they should be built on a strong political commitment for regional cooperation;

b. The governance mechanism should have a broad stakeholder forum that can help achieve consensus within and among the countries.

c. Taking into account the size of the Nile basin, a better focus should be on coordination, facilitation and orientation functions, and not so much at the execution level. It is advisable to leave the actual implementation actions to specialised bodies at national level or at sub-basins levels.

d. The principle of subsidiary should apply so that actions will be taken at appropriate levels by appropriate bodies.

e. A better knowledge of water resources in the basin (sharing data, modelling, Observatory etc…) is critical with well documented decision support tools.

It is also essential to work on:

1. Identification and involvement of water and agriculture actors in the basin
2. Creation and strengthening, when required, structures for water and agriculture management in the basin
3. Promotion of water economy technologies (drip irrigation systems, treated waste water use...) and water allowance while leaning on the principle of benefit sharing
4. Efficient implication of member countries in the subsidies system for farmers
5. Liberalization of the agricultural market in member countries may be an option for food security.

Conclusions:

The literature review on the Moulouya river basin Agency and the field trip to Oujda (Morocco) which allowed us to meet key resource persons, have given the opportunity to better understand the dynamics

and functioning of the Agency. It is important to mention that this is an example of a set of sub-basins put under the authority of a national water Agency. Even if this is not the organisation for an international basin, lessons learned are very pertinent regarding IWRM values and principles.

The lessons learned are, among others, that water is a resource so important (strategic and limited) that it is worth to put in place consensual mechanisms to manage it. The commitment of decision makers but also the institutional and legislative framework must be flawless.

Similarly, the perfect knowledge of the resources available, its renewal dynamics, monitoring and protection and also the development of decision support tools are important regardless of the size of the basin considered.

The principles of subsidiarity, benefit sharing, transparency, participation of all stakeholders are cardinal virtues to be applied even in the biggest rivers such as the Nile.

In both cases, the regional context, good knowledge of the players already present and their inclusion in the management scheme to avoid frustration,/ duplications and other conflicts is very important. Similarly, International conventions contain all relevant directives that trans-boundary basins' management frameworks must apply. For the Nile, a relevant scale to use the service sub-basins and regional management bodies is put in place.

Appendixes

1. Appendix 1: Bibliography

2. Water International Vol. 35, No. 5, September 2010, 594–622? Colombo : IWMI, 2009.

3. Les bassins hydrauliques du Maroc

4. Erosion hydrique dans le bassin versant de la Moulouya (Maroc Oriental). Recherche des zones sources d'envasement de la retenue du barrage Mohamed V. Thèse soutenue le 29 novembre 1996 par M. Jamal AHAMROUNI.

5. The Moulouya River Basin Agency web Site:www.abhm.ma. L'eau en montagne : gestion intégrée des Hauts Bassins Versants " 5 et 6 septembre 2002, Megève l'extension de l'espace hydraulique du haouz central Incompatibilité entre grande hydraulique et développement des territoires de montagne, Olivier ALEXANDRE, doctorant, TEO-CERMOSEM, UMR 5038 CNRS, Université Joseph Fourier, Grenoble I. publié dans "Actes du colloque L'eau en Montagne : gestion intégrée des Hauts Bassins Versants, Colloque Megève 2002, France (2002)"

6. 50 Years of Human Development & Perspectives to 2025 Summary of the General Report. HDR50-Summary, January 2006

7. Promotion de l'irrigation localisée dans le périmètre irrigué de la basse Moulouya au Maroc (Projet INCO-WADEMED Actes du Séminaire Modernisation de l'Agriculture Irriguée.Rabat, du 19 au 23 avril 2004 C. Tizaoui ORMVA de la Moulouya, Berkane, Maroc

8. Présentation des travauxd'intersession l'ABH Moulouya, Salé, le 29-30 mars 2010

9. Prospective Maroc : Quel avenir pour le Maroc, En collaboration avec le Conseil général du développement agricole (CGDA)

10. Appui au Programme National d'Économied'Eaud'Irrigation –

11. (PAPNEEI) : Plan de Gestion Environnemental et Social Novembre 2009 Ministère de l'Agriculture et de la Pêche Maritime, Maroc

12. Morocco Economic Performance Assessment, (USAID May 2008)

13. Green Morocco Plan (2008)

14. Gestion du domaine public hydraulique; Recueil de la loi n° 10-95 sur l'eau et de ses textes

d'application Applicables dans la zone d'action de l'Agence du bassin hydraulique de la Moulouya, Agence du basin hydraulique de la Moulouya. Mai 2010

15. The status and distribution of freshwater biodiversity in northern Africa, N. García, A. Cuttelod and D. Abdul Malak, IUCN.
16. Croissance économique et développement humain Eléments pour une planification stratégique 2007-2015 - Royaume du Maroc, haut commissariat au plan
17. Dossier les nouveaux défis alimentaires – Royaume du Maroc, Ministère de l'Agriculture et de la pêche Maritime- 2006
18. Le Maroc en chiffres (2009)
19. Mémorandumd'information, Maroc et oriental – Placement des zonesd'activité de la région de l'Oriental
20. Mémorandumd'informationparcagro-industriel de boughriba- placement des zonesd'activités de la région de l'oriental
21. Monographie de la RégionOrientale : Chambre de Commerce d'Industrie et de Services d'Oujda, 2007
22. Decret n° 2-00-475 du 17 14 novembre 2000 relatif a l'agence du bassin hydraulique de la moulouya ,Bulletin officiel du 7 décembre 2000
23. Mesures de Politique agricole et de développement rural – 2006
24. Rapport national 2004 sur les ressources en eau au Maroc – Mokhtar Bzioui
25. The possibilities of water resources reallocation between the Moroccan hydrological basins - Université Mohammed Premier, Faculté des Sciences -
26. Web Sites visited
27. http://www.ada.gov.ma/Plan_Maroc_Vert/plan-m,aroc-vert.php
28. http://www.abhm.ma/spip.php?article4
29. www.shdr.undp.org

Appendix 2: List of Interviewees

Table A1: Characteristics of Interviewees

	Institution	Relevance	Country	Contact person
1	University Mohamed I, Department of Sciences Laboratoire " GïtesMineraux, Hydrogéologie&Environnement"	One of the most important stakeholder for Research and Capacity building in the basin	Morocco	**Pr.Yassine ZARHLOULE**
2	Director of the Moulouya river Basin Agency	The key person in the development and implementation of the Agency's programme	Morocco	**Mr. Abdelillah OUARDI**
3	Director of the Regional office for the Agriculture development of the Moulouya (ORMVAM)	Implementing regulations and IWRM at catchment level	Morocco	**Mr Abderrahmane Naili**

Annex 11 In- depth review: Cauvery River

Basin facts

Physical setting

Cauvery is an easterly flowing river of the Peninsular India that runs across three of the southern Indian states i.e. Karnataka, Tamil Nadu, Kerala and a Union Territory of Pondicherry. The fourth largest river of southern region, begins its 800 km long journey from the Western Ghats; traverses through Mysore plateau and finally forms a delta on the eastern coastline of the subcontinent before falling into the Bay of Bengal. The point of origin of Cauvery, Talakaveri is in the Brahmagiri ranges of the Western Ghats at an elevation of 1341m. The total land area of the Cauvery basin is 43867 sq km2, with average rainfall being 930 mm/yr.

Human conditions

Average population density is around 192 persons per sq km. which is far less than the national average, but demographic changes expected in near future and also in recent years may lead to higher population density in the catchment, especially in some of the urban centres. In the Tamil Nadu part of the Cauvery basin, around 73.7% of the population lives in rural areas. In Karnataka, rural population comprises 60.47% whereas in Kerala the population is completely rural. Total number of villages in the entire basin is around 17356.

Furthermore, according to the 1981 census, 31.2% of the total population lived in urban areas in the basin, which has further increased in the last two decades. Amongst the urban centres population density of Bangalore is the highest. From around 882 persons/sq.km.in1981, it has reached around 3000 persons/sq.km. with a ten-year growth rate of over 35%. Other major urban centres are Mysore in Katnataka and Tirucharipalli, Thanjavuretc in Tamil Nadu. Bangalore, Mettur and Coimbatore have a high concentration of industries followed by Mysore, Mandya, Periyar and Salem. The demographic shift towards urban areas is expected to increase the demand for water in future.

Livelihood conditions

India today is a country in transition as well as partitioning. A growing middle class is enjoying all the pleasures of an affluent, consumption-based lifestyle; spending money on capital goods, pleasure travel and modern housing, and having access to quality education and health care. This group is usually estimated of being approximately 250 million people and growing. It is well educated and engaged in services and industry. Most welfare indicators of this group is comparable with those of industrialized countries in Europe or the US.

However, there is also a large group of poor people in India, primarily located in the countryside, but also in urban slums or poor neighbourhoods. It represents the majority of people in India, although in transition towards better conditions. It is not only the middle class and above that has gained from recent year's economic growth in India; a part of the new opportunities has also trickled – or even more than that – down to lower strata in society. Still, poor people do not enjoy the opportunities now being available in education, health care or professional careers.

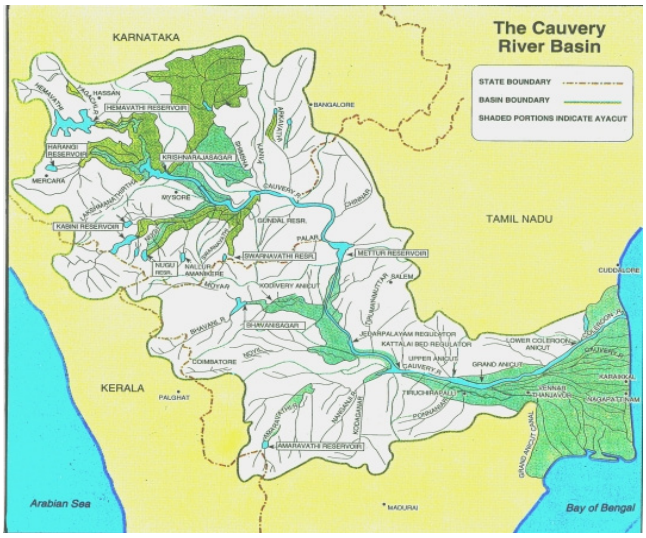
But India is not only in transition towards better livelihood conditions, it is also a country of partitioning, i.e. the two groups – poor people and the new middle class – are separating from each other. The gap is widening, and various strategies are being put in place due to that, some beneficial and some detrimental to societies at large. One is a general welfare system. In Tamil Nadu are all poor people provided with free rice every month, and similar general welfare systems are found throughout India. State politics is often quite populist and linked to offering free goods in times of elections. Also, which will be discussed further down, the agricultural sector in India is massively subsidized since many years back, and this could be seen as a general support to the rural (poor) farmers. On the other hand, the main political purpose of such subsidies is not to support people in rural areas; it is most likely much more affiliated with an overall goal of national food self-sufficiency. Finally, a more questionable trend linked to the widening gap between poor and middle class is the latter's attempts to address effects and not root causes. It is evident from e.g. the present trend of rapidly expanding gated communities (safe, peaceful and orderly areas where residents only are allowed in), an increase in the consumption of medicines (treating the outcome, not the

reason for a spread of diseases), and increasing number of private schools and health care centres (leaving those unable to pay behind and dependent for government services).

Natural resources

Climate

The climate of the command area, through which the link traverses, is basically tropical in nature. The mean daily maximum temperature in the command area ranges from 29.3C to 37.5C. During the hottest month, i.e., May, the temperature varies from 37.1C to 37.5C. Mean daily minimum temperature varies from 20.6C to 26.5C. During the coolest month, i.e., January, the temperature varies from 20.6C to 20.9C. The annual rainfall in the command area varies from 635 to 1019 mm. The summer season starts by about March and continues till May. Thereafter, the south-west monsoon season follows and lasts up to September. North-east monsoon sets in by mid-October and ends during mid-December. During the north-east monsoon period, the coastal belt of Tamil Nadu receives more rainfall. The cold weather period from mid-December to February is a season of generally fine weather.



Water resources

An average annual surface water potential of 21.4 km3 has been assessed in this basin. Out of this, 19.0 km3 is utilizable water. Cultivable area in the basin is about 5.8 Million ha, which is 3.0% of the total cultivable area of the country. Present use of surface water in the basin is 18.0 km3. The hydropower potential of the basin has been assessed as 1359 MW at 60% load factor. The Cauvery basin is estimated to be 72,000 km^2 with many tributaries including the Shimsha, the Hemavati River, and the Arkavathy River. The river is the source for an extensive irrigation system and for hydroelectric power. The river has supported irrigated agriculture for centuries and served as the lifeblood of the ancient kingdoms and modern cities of South India

The Cauvery basin is the most important surface water source in Tamil Nadu. In the 2nd century ad the Grand weir was constructed across the Cauvery River. It serves 350,000 ha in the delta and was the first major, and is still the largest, command area in the basin. During the 20th century, development of irrigation infrastructure in the Cauvery basin increased the (gross) total irrigated area from about600, 000 ha to 1.9 million ha and brought the entire basin to closure. The Bhavani basin was essentially brought to closure in the middle of the 1950s, and since then only a fraction of the natural outflow reaches the Cauvery River.

The water situation today is one characterized by scarcity, increasing pollution and lack of regulation and enforcement of laws and standards. As already mentioned, all blue water resources in the basin are fully utilised, implying that the basin is in fact “closed”, i.e. no water drains into the BengalSea. This in turns implies that an increased upstream use equals an equal amount of water not available downstream, something which requires good cooperation and agreements. Otherwise are conflicts likely to develop (which are the case).

There is massive dependency on groundwater today in India, including in the two states of Tamil Nadu and Karnataka. In both states is groundwater supporting at least 50—60% of all irrigated land, implying a huge dependency of food production on groundwater. But groundwater levels are falling rapidly across India. In Tamil Nadu, where groundwater levels were often close to surface some 30-40 years ago, making the water available also for small-holder farmers using simple pumping devices (or traditional large-circular

Indian open water holes). However, today the groundwater is often found at more than 100 m below surface, and falling with one or several meters per year. The out pumping of water is clearly much larger than the annual recharge. To pump water from such depths require professional equipment, including electrical engines that drive pumps. Electrical energy for irrigation purposes is free resource in most Indian states - with the direct implication that groundwater is being pumped out at a rapid rate.

Groundwater is also being used for urban and industrial uses. More than 50% of the urban water needs in Tamil Nadu and Karnataka is provided by groundwater, and to a large degree from groundwater found in the shallow, open aquifers formed along the Cauvery.

Water quality is also a major issue in India, including in Tamil Nadu and Karnataka. There are major upstream industries severely polluting the river. The city of Tirrupur in Tamil Nadu, for example, is a global centre for producing cotton garment. The amounts of dyes being used are massive and the salt content in the effluents below the city, eventually draining into the Cauvery, is at the level of the open sea. As a consequence, people and environment suffer badly in downstream areas. Land is left unused due to polluted irrigation waters, drinking water causes cancer and infertility, and, in the best of cases, only a long distance to carry water home from a safe source. In Tamil Nadu there is also a widespread sugar industry, also severely polluting nearby water sources.

All the industries, together with all urban areas, discharge their polluted effluents completely untreated into the nearest river. Ultimately, it is raw sewage mixed with a chemical potpourri that enters the Cauvery, and subsequently recharge the sandy-gravelly aquifers located in the river's bed.

There are laws regulating the emission of effluent, measurements are being taken, and everybody are aware that urban and industrial pollution constitute a major danger to the sustainability of the entire river system. Still, the laws are not being implemented. There is a break in the chain of roles and responsibilities that needs to be addressed. The element of enforcement is missing. There are no institutional arrangements to identify and remedy the sources that pollute the river.

Sector use of water

The sector use of water in southern India mirrors that of India at large. This implies that some 80-85% of all blue water resources are used within the agricultural sector, with another 10 % allocated to industry and services, and the remaining few per cent used for household consumption. There is very little, if any, blue water left unused for environmental needs. There is no, for example, environmental flows maintained in the river. It is closed.

The value of the water in terms of the products generated from its use is heavily skewed towards urban uses, i.e. industry and services. The value of industrial and service outputs per volume of water used is in the scale of 50-100 times higher than that of the agricultural sector.

State of the environment

The state of the environment in India is scary. What we learn through media only focus on the success stories of modern India, i.e. of millions of people leaving poverty and entering middle class life, of a rapidly growing economy, and of a new class of highly competent scientists. All of that is good and fine, but it also has a back side – the environment. The environment in India today suffers badly. Forests are cut down, soil erosion is massive, groundwater sources are – as mentioned above – rapidly being depleted, untreated effluents from people and industries alike enter common water resources, ecosystem services are not being recognised, and the population pressure is steadily increasing. Plans are in place, together with laws and regulatory frameworks, but they are not adequately implemented.

Agriculture

For many reasons, India occupies a centre stage in global food and water supply and demand projections.

First, with a population of over a billion, India is the second most populous country in the world. By the middle of this century it needs to feed an extra population of 500 million. Second, India has had a huge economy and a remarkable economic growth in the last decade. With the booming economy, people's expenditure patterns are changing; so do their lifestyles. Rapid urbanization is also adding fuel to these changes. As a result, food consumption patterns are changing—changes a traditional country like India would not have imagined a few decades ago. The changing food consumption patterns are so significant that they have a considerable impact on the needs of future food and water demand. Third, and perhaps the most critical, is that India has significant spatial mismatches of the population and water resources. Less water is available in places where more people live and much of the food is grown. Some river basins are already experiencing physical water scarcities, e.g. closing (see further info on this regarding the Cauvery River below). A few others face problems of unsustainable groundwater use. Thus, how India will meet its increasing food and water demand is a major focus of many food and water demand projections at the global scale.

India is presently close of being food-self sufficient, the food being exported more or less balance the food being imported. Still, some forecast clearly indicate that there will be a growing demand to import food in the near future. As the population increase and water resources turn increasingly strained, sometimes even drying up, as the case is in some groundwater dependent areas, the demand for food will increase while the capacity to grow more within the country may be constrained. The green revolution was by most standards a massive success in India; the increased production linked to this "revolution" today serves the needs of several hundreds of millions of people. That is an impressive outcome, although it also has a different face. That is linked to e.g. groundwater reserves being depleted, a huge dependency on multi-national agriculture business supplying everything from seeds to pesticides to fertilizers, and an ever increasing marginalization of farmers versus the forces of the market, globalisation and money-lenders. The outcome of that is in recent years rapidly rising numbers of farmers committing suicide.

More than 60% of the total population in the basin lives in rural areas and their major occupation is agriculture. The land under cultivation in the basin is 48%. Around 24% of the cultivable area has some means of irrigation or other. The crops grown in the area vary from region to region, however major crops are paddy, sugarcane, ragi and jowar. Apart from these, some other crops such as coffee, pepper, banana, betel vine, gingili, onion, cotton, black gram are also grown. The irrigated areas in the Cauvery basin have increased considerably since the 1924 agreement. Tamil Nadu has increased the irrigated areas (including a second crop) from about 620,000 ha to 850,000 ha, about a 60% increase. Karnataka has about doubled the area, from 430,000 to 850,000 ha. The water demand has increased proportionately.

Infrastructure

Infrastructure development in India since independence has been large, at least in absolute numbers. However, compared to the needs it is possibly not as impressive. There is clearly an urgent need today for action. Compared to other semi-arid countries, India can store relatively small quantities of its fickle rainfall. Whereas India's dams can store only 200 cu.m.of water per person and year, other middle-income countries like China, South Africa, and Mexico can store about 1000 cu.m. of water per person and year. Compared to rich countries these numbers are all very small.

Sewage and waste water from rapidly growing cities and effluents from industries have turned many rivers, including major ones like the Cauvery, Krishna and Ganges, into fetid sewers. Massive investments are needed in sewers and wastewater treatment plants to protect people's health and improve the environment.

New infrastructure needs to be built especially in underserved areas such as the water-rich northeast of the country where investments can transform water from a curse to a blessing. Furthermore India, desperately short of power in peak periods, has utilised only about 20 per cent of its economically viable hydropower potential, as compared to 80 per cent in developed countries. The country needs to invest in water infrastructure at all levels – from large multipurpose water projects to small community watershed management and rainwater harvesting projects.

Conflicts – cooperation

As already mentioned, the sharing of waters along the river Cauvery has been the reason of a serious conflict between the Indian states of Karnataka and Tamil Nadu. The genesis of this disparity, itself, lies in two controversial agreements, one signed in 1892 and another in 1924, between the Madras Presidency and the Princely State of Mysore.

The state of Karnataka feels that it has not got its due share of water utilization vis-à-vis Tamil Nadu. Karnataka claims that these agreements were skewed heavily in favour of the Madras-residency, and has since demanded a renegotiated settlement based on "equitable sharing of the waters". Tamil Nadu, on the other hand, pleads that it has already developed almost 12,000 km^2 of land and as a result has come to depend very heavily on the existing pattern of usage. Any change in this pattern, it says, will adversely affect the livelihood of millions of farmers in the state.

Following decades of negotiations between the parties without any results, the Government of India then constituted a tribunal in 1990 to look into the matter. After hearing arguments of all the parties involved for the last 16 years, the tribunal delivered its final verdict on 5 February 2007. In its verdict, the tribunal allocated 12 km^3 of water annually to Tamil Nadu and 7.6 km^3 to Karnataka; 0.8 km^3 of Cauvery river water to Kerala and 0.2 km^3 Pondicherry. The dispute, however, continued, as all four states deciding to file review petitions seeking clarifications and possible renegotiation of the order. There is more information on this dispute in the Study Tour Concept Note and in the Study Tour Report.

The Cauvery Basin and its water management.

To start, there are no river basin organisations in existence anywhere in India. This approach has not been favoured in the national water policy and thus there are no institutional arrangements to handle issues linked to common water resources at the basin unit. As mentioned above, there are a few cases of *water tribunals* established, but these are merely legal decision making institutions that assist when a crisis has developed and there is a need for a top-down decision making body. Otherwise, rivers shared between two or more states have to be managed through – in the best of worlds – negotiated bilateral agreements and a spirit of good faith. In reality is this difficult to achieve and thus all the conflicts now coming up around the country.

In the case of the Cauvery, as mentioned, no river basin organisation exists. Whatever agricultural functions being performed, they are not carried out and delivered by such an organisation.

Agricultural functions in the Cauvery

But the above paragraph does not imply that agricultural functions are not being carried out and delivered to the farming sector along the Cauvery River. On the contrary, a multitude of such functions exist, having a massive impact on everyday farming in the basin, and thus being extremely costly to the various governments paying their bill.

Below are the various functions arranged along the common structure proposed for the Nile Basin. An extra column indicates who the provider of the function is.

Agricultural Functions: Cauvery River	Provider
1: Collect, Store and Share Data	
1:1 In the upstream State of Karnataka there is an impressive system of real-time data collection (climatic data), analysis, and subsequent distribution of appropriate information for the agriculture sector by mobile phone in place. An interesting feature of the system is the dense network of recording devices. The reason for this is the huge variability that exists in semi-arid India in terms of e.g. rainfall: In order to catch the small-scale variation, much needed in agriculture, such a network is needed. The scientist presenting the system mentioned that the cost-benefit ratio of the system (the cost of establishing and operating the system vs. the increased farm-output) was in the scale of hundreds, i.e. it was a hugely profitable undertaking.	A research institute in Bangalore.
2: Research and Capacity Building	
2:1 Agricultural research takes place in many institutions in India. Three examples are IWMI and ICRISAT in Hyderabad, the Water Technology Centre in Coimbatore, and MIDS in Chennai.	Research institutes and universities.
2.2 Capacity building is provided at many levels. There is an extensive system of TV and Radio broadcasted programs on agriculture that millions of farmers watch regularly, and apparently also take to heart and apply on their own farms. The extension system is also well developed and having strong impacts. During the Study tour, the NBI participants met a very engaged rice development extension officer. He clearly saw an important role for himself in the area.	State governments, universities, NGOs
3. Monitoring and Regulation of Standards and Agreements	
3.1 This is hardly applied. Some monitoring may take place, although probably not in a structured way along the Cauvery, and regulation and enforcement does not exist.	
4. Knowledge Management in Agriculture	
This function is linked to research and extension services. The institutions providing such services also collect the data they need, analyse it according to their plans and priorities, and share the knowledge being produced. There is no particular focus on the river itself, probably a more general approach to water, agriculture and development in India.	The same as the research and capacity building function.
5. Strategic Basin Planning	
This function does not exist in the Cauvery Basin. There is no comprehensive basin-wide planning process ongoing. What may exist – although that is questionable as well – is state-based planning, with the river included as a source of water and food. However, a more comprehensive planning effort, identifying benefit sharing, up vs. downstream advantages and disadvantages in water use, and long-term sustainable use of the river, is not being carried out.	At state level not much. No cross-border institution is engaged in such planning.

Agricultural Functions: Cauvery River	Provider
6. Sector Services	
Sector services, i.e. functions directly supporting the agriculture sector abound in India and in the two states down south. It includes:	
6:1 Direct subsidies on many types of farm inputs, like energy (for pumping groundwater), water (delivered at no cost), and seeds, fertilizers and farm machinery. These subsidies are massive and completely off-set any type of market-based pricing of farm products – bad or good.	State government primarily.
6:2 Farmers (whether small-scale or big plantations) are exempted from government income taxes.	State and/or national government
6:3 Extension services and capacity building via public systems like TV or Radio is very efficient and cost-effective system of communication and learning.	State government and/ or research and capacity building institutions.
6:4 Farmers are insured against poor crops.	
7. Market Development	
7:1 There are different type of government managed Market Boards, but what their impact is is unknown. Farmers associations also engage in this sector, supporting their members.	State government
7:2 Local middle-men, facilitating the move of farm products between producers and consumers, provide packages of farm inputs. These may include seedlings, credits, labour and more, and of course against a price – what they are willing to pay.	Private companies
8. Facilitate Basin Development	
8:1 Local, State and Central governments are very much engaged in basin infrastructure development, although not in a coordinated up/downstream way. Infrastructure is being built, maintained and operated. Dams and water weirs are managed, the road network expanded in the basin, and electricity is available in all cities and most villages.	National and State governments
8:2 Some of the industrial expansion found today in the basin is the outcome of coordinated public and private interest. The private interests are given priority to water before agriculture, they are "allowed" to severely pollute the resource downstream, and are supported by international trade policies.	State government
9. Conflict Management	
9:1 As mentioned above, conflict management is not provided by the state governments in southern India. Instead, it is provided by a civil society initiative called the "Cauvery Family". The "family" is engaged in the up/ downstream dispute between Karnataka and Tamil Nadu since about 20 years back. It was created out of necessity; a basin conflict existed, no process existed that was likely to succeed in resolving the problems, and the costs of the conflict were immense. The "family" is an effort to allow people (farmers primarily) from the two states to meet and work out their differences. Once that is achieved (and they are close today), their proposal will be turned into state law and a many decade old conflict will hopefully belong to the past.	Civil society NGO
10. Facilitate Decision and Policy Making	
10:1 State or national policy provisioning exist, obviously, but it is not aimed specifically at the basin and its particular needs.	State or national governments.

Good practices and lessons learned

Good practices

A number of impressive agricultural support practices exist in the Cauvery Basin. While poverty and hunger does exist – in the midst of new wealth and rapid growth – it is not excessive and most people apparently do get enough to eat. They either farm the land themselves, or they earn a living in cities by waged work and buy the food at local markets. Food security exists for most. And for those unable to feed themselves, state government managed welfare systems provide a basic supply of rice.

As outlined above, the agricultural system in India is subsidized from start to end. Water and electrical energy is free, taxes are non-existent, and most farm inputs like seeds, fertilizers and machinery are massively reduced in price for the farmer. While many would argue that this is not very good, as it provides all kind of disparate incentives, some pointing in the "right" direction and some in the "wrong", considering natural resources management and environmental guardianship, it has still moved India from recurrent hungers in the 1950's and 60's to a situation today where enough food is produced in the country to feed everybody. That is impressive and can probably be attributed to the green revolution and its linked government support to farmers. Another criticism of very broad-based subsidies is that they probably give much support to those not in need for such support; i.e. big, wealthy farmers. A case could be the free electrical energy; it requires a rather large – and thus expensive – investment in pumping equipment before the subsidy can be enjoyed. Small-scale, poor farmers depending on scarce surface water or groundwater within hand-pumping depth will never benefit from this subsidy.

The system of data collection and information sharing developed in Karnataka is also interesting. It highlights two issues:

(i) That spatial data has to be collected in an adequately dense system in order to provide correct information, and

(ii) The huge benefits vs. costs derived from such a system.

Another good "practice" is the engagement of civil society. Due to India's open and democratic system of rule, civil society can take on a role in complex issues often referred to governments to resolve. The Cauvery Family is such a case. When a long list of state and national governments failed to resolve the dispute between Karnataka and Tamil Nadu, the family stepped in and started a process which is now close to final success. Without democratic rule, the Cauvery case, and many other cases like that around the world, would still be a festering cause for bitterness, non cooperation and massive costs in terms of non-development.

A final issue of interest is *the lack* of linkages shown between water and prosperity. During the study tour which a group of NBI officials participated in, an area in central southern India was visited. Water was very scarce, groundwater running dry, and farming no good anymore. A normal consequence would be people to leave for cities and taking on waged work. However, in this case a different development took place. Due to good leaders with a sense of entrepreneurship and vision, the area is today prospering. While farming is down, two new areas have grown rapidly. They are:

(i) Huge, industrial-scale chicken production (this tiny area today exports chicken to the Gulf and all across India) and

(ii) Building chassis for buses and trucks. Actually, the production of chassis in this area is the biggest in India. For these two areas of employment and prosperity there is enough water. The well-being produced is very water efficient.

Not-so-good practices

There are also some clearly not-so-good practices. Three issues are being brought up here. First, the use of groundwater is completely un-regulated. Groundwater is today being depleted all across India, and despite the existence of a central Groundwater Board in Delhi, monitoring and regulation does not occur. Considering the fact that approximately 50% of all water use in India is derived from underground sources and that this need is continuously rising, it is a frightening situation. While good people are aware of what is happening, little is apparently being done to try to take control of the situation. The combination of powerful agriculture interests and a growing industrial economy is probably not an easy task to challenge.

Second, the uncontrolled discharge of pollution is an equally frightening situation. It has many similarities with groundwater being overused. Knowledge exists and there are central government institutional arrangements in place to handle the issue. But enforcement is lacking, and without that is little happening. The waters of India are being polluted to the extent that it reduces the amount of freshwater available for productive use.

Third, the many positive issues linked to river basin cooperation are not being addressed – there are no river basin organisations existing in India. This is an opportunity lost, in terms of better managed water resources, enhanced ecosystem services, and planning for a sustainable future. With RBO's in place, many of the issues brought up above could be addressed and hopefully resolved.

Lessons learned

Lessons learned are as follows:

1. Mismanaging the environment is possible as long as the impact is not "too" big. However, when it is being done at a massive scale, polluting whole water systems, the consequence are dire and will most likely have negative effects on people and development.
2. Agricultural subsidies are possibly alright, at least as long as they do not promote unsustainable practices or waste scarce financial resources on rich people.
3. An open and democratic society is much more likely to resolve its fundamental development issues than a closed, non-transparent and undemocratic society.
4. While the growing urban areas in India certainly consume much water, they probably produce people's well-being much more water efficient than in rural areas. In other words, development is about food security, not food-self sufficiency.

Analysis and proposed agricultural functions for the Nile basin

India is indeed very different compared to the Nile basin. It is one country only, the population is several times larger, and there is on-going economic growth that few other countries can match. All this provides opportunities on how to feed its people, although the challenge to do is also very large. This implies that some of the agricultural functions found in India are not possible to transfer to the Nile countries. The massive agriculture subsidies, for example, are unlikely to ever appear in East or North Africa, simply because they are too expensive and probably not needed. The functions that could be transferred include the following:

1. Very precise, service-minded distribution of agricultural information to farmers. It represents a marginal cost to society at large, but has a huge positive impact on farmers and food production.
2. A few, very focused subsidies; subsidies that have a specific, well-defined purpose, only target people in need, and generating incentives that favour sustainable farm practices. Such subsidies could include an insurance system, making farmers a bit more risk-positive, and an active extension system, opening for new market-based products.
3. The very dedicated and active support for infrastructure development. From the Nehru years of dams being seen as "the modern temples of India" to today, infrastructure development has

been a corner piece in India's development process. It has caused many environmentally negative effects, but it has also contributed to feeding well above a billion people today.

Conclusions

The Cauvery basin is not equipped with a river basin organisation with an agricultural agenda. Still, many agricultural functions are being performed in the basin. Not by the river basin organisation, but by a mix of government, civil society and private interests. These do provide some very successful and impressive services to farmers. The very fact that roughly twice as many people today as compared to 30-40 years ago are being feed by home-grown food is a strong indicator of that. On the other hand, some of these services – "functions" – are very expensive, possibly detrimental to long-term food production and the environment at large, and lack overall coordination.

During the study tour to the Cauvery basin, all participants were probably taken aback by the massive scale of environmental degradation now occurring. It was scary to witness. Groundwater was severely overused, industrial as well as urban effluents entered the Cauvery untreated, and there was no public institutional arrangement to manage the situation.

Some of the lessons learned in the Cauvery basin include the importance of an open, democratic society where civil society can take action and where mismanagement is voted away; that successful environmental management requires a strong chain of linked roles and responsibilities; and that urban growth is needed in order to pay for rural services.

Annex 12: Stakeholder dialogue

In **Burundi,** policy development to enhance agricultural production is currently being emphasised at top policy level, whereas in **Kenya** agriculture is being promoted at top policy level through development of irrigation policy with emphasis on use of efficient technologies and strengthening of institutions to promote irrigated agriculture.

Agriculture has over time mainly been focusing on foods self sufficiency with conventional practices focusing on subsistence agriculture. However, with increasing challenges of climate change, water scarcity, unreliability of rainfall agricultural practices focusing on commercial agriculture at local levels as well need to be promoted. This has been emphasized by stakeholders from **Tanzania** as a means to ensure food security. Producing for the markets enhances food accessibility and at the same time diversifies food consumption. To ensure coordination of approaches, a common institution to promote this across the nine countries in the basin is inevitable.

It was further articulated by the stakeholders from **Uganda** that the potential for agriculture is quite high with can be exploited with availability of water and subsequently make Uganda a bread basket for the Nile basin region. This is positive thinking which can be promoted by the RBO to enhance food accessibility to other Nile basin countries as well and hence ensure food security in the basin and beyond.

It emerged from the views of stakeholders in **DRC** that the country imports substantial food products despite their potential. The RBO can facilitate the exploitation of this potential but at the same time can promote accessibility of such products within the Nile basin countries.

Concerns among stakeholders from **Ethiopia** emphasised the need for land use planning and classification of agro-climatic zones to ensure agriculture is practiced in areas suitable for specific agricultural activities to ensure maximum returns per unit resource input. This will ensure effective use of resources. It also emerged that agricultural functions should not end at production level but consideration should also be given to coordination of agri-business and agro-based industries. These will promote accessibility to goods and services as well as add value to agricultural products which will subsequently enhance food security in the basin. Promotion of accessibility will also enhance marketing of produce within the basin countries. Although market promotion is handled by COMESA, however building synergies with COMESA to ensure timely availability of goods in the markets will reduce potential saturation at production level hence promoting production. Essentially this view is trying to emphasise linkage between production and marketing as a possible area where the RBO can find a possible role to play that is linked to Agriculture.

Benefit sharing and water sharing were found to be closely linked according to the views of the stakeholders. However, there was a lot of vested interest in these forms of sharing resources by stakeholders from **Ethiopia**. Emphasis on the former was viewed as giving due advantage over water sharing to the downstream water users. Consequently the development of agricultural functions should look at the two scenarios objectively to the benefit of the Nile basin stakeholders equitably. Development initiatives to enhance agriculture should be confined to coordination as basin development functions are more or less undertaken by individual countries. Most agricultural functions are development oriented and this made most stakeholders wonder whether the future Nile basin organisation should engage in agriculture at all. However, because agriculture is the highest contributor to GDP in all the Nile Basin countries and offering about 80% of employment as well as being the major water user, most stakeholders are after deliberations for the view that there need to be some engagement because any improvement would bring benefits across the board.

Compliance to standards is an area which is often abused as implementation is subject to regulations of the individual countries. Issues raised by the stakeholders and more so in relation to agriculture relate to non-point source pollution, riparian zones for buffering the watercourse as well as soil erosion and sedimentation. The latter is an issue mainly in as far as siltation of infrastructure is concerned. In order to coordinate compliance and provide a platform for monitoring and engagement, the future RBO can play a role to ensure that agricultural activities do not have negative impact on water resources in the basin.

Stakeholders interviewed and their views on potential agricultural functions

	Stakeholder	Country/ Region	Views on potential agricultural functions
1	Ministry of Agriculture	Burundi	8. Play supportive role with less involvement in implementation of agricultural development projects 9. Support harmonisation of policies on agriculture that would promote marketing and free movement of agricultural products across borders within the Nile basin Countries 10. Coordinates realisation of common vision on food security
2	Directorate of water resources	Kenya	11. Support mobilisation of resources for multi-purpose water storage projects with major irrigation component to enhance production to increase food self sufficiency 12. Provide support for the development of guidelines for agricultural development projects that involve major use of water resources within the basin taking into account existing 13. Promote efficient water use for irrigated agriculture and encourage structured use of appropriate irrigation systems
3	Tran-sboundary water management	Kenya	14. Promote stakeholder participation in supporting agricultural development projects across borders to ensure harmonious use of trans-boundary waters.
4	Nile Basin Discourse	Burundi	15. Create awareness and sensitize stakeholders and beneficiaries to own agricultural developments projects that have major impacts across borders 16. Develop mechanisms to ensure that benefits from cross border agricultural development projects reach the people on the ground 17. Develop mechanisms to mitigate the environmental impacts of such agricultural development projects on the ground 18. Support information dissemination and flow to ensure that the people and the ground get maximum benefits and that they are least affected by the development projects
5	NELSAP	Rwanda/ Tanzania	19. Promote the benefits of agricultural projects through supporting the implementation of bilateral projects 20. Support the identification of agricultural projects that can be implemented on pilot basis within the basin 21. Promote ground level participation in agriculture by both stakeholders and beneficiaries 22. Strengthen ground level based institutions to promote upstream and downstream coordination for equitable benefit and risk sharing 23. Support resource mobilisation for long term development projects in agriculture and act as a platform for engagement in project formulation

	Stakeholder	Country/ Region	Views on potential agricultural functions
6	Private Sector	Ethiopia	24. Promote cross border Private Sector participation in agriculture in order to enhance benefit sharing 25. Develop mechanisms to enhance value chain of agricultural produce in the agricultural sector in the basin 26. Support mobility of agricultural goods within the basin so as to ensure adequate access to markets within the basin 27. Promote Agri-business and Agro-based industries. 28. Expand and strengthen markets through building synergies with regional economic blocks such as COMESA
7	Ministry of Environment and Natural Resources	Ethiopia	29. The NBI/NBO to focus on coordination and harmonisation of policies in agriculture without involvement on development projects 30. Develop mechanisms for equitable benefit transfer between agricultural development projects and benefits accruing from other sectors within the basin without compromising water sharing for such purposes. 31. Support land use planning programmes to ensure agriculture is practiced in suitable areas for maximum returns per resource input
8	Directorate of water resources	Tanzania	32. Promote rainwater harvesting to enhance agricultural development in the basin 33. Promote the adoption of efficient water use technologies in agriculture in cross border projects 34. Focus on commercial Agriculture at local level in order to improve accessibility and enhance food security
9		Uganda	35. Promote diversification and up scaling of agriculture taking into account related sectors such as livestock and fish farming 36. Promote preferential agricultural production by enhancing production from countries with high potential to adequate reserves for the entire basin
10		DRC	37. Promote agricultural production from unexploited potential as well as accessibility of products in the Nile basin countries

Annex 13: Assessment of national/international organisation's agricultural programmes

The African Union (AU)

The African Union has 53 member states. Basically all African states except for Morocco who left the OAU in 1984 when the majority of the member states supported Sahrawi Arab Democratic Republic (Western Sahara) are members of this regional organisation. AU was established on 9th June 2002 as successor of Organisation of African Unity (OAU) that was founded in 25th May 1963 for a collective voice on the African continent and eradication of all forms of colonialism. The member-states of the AU include most countries in Africa.

AU in the agriculture and water sector

Africa's agriculture sector accounts for approximately 60 per cent of total employment, 20 per cent of total exports and 15 per cent of GDP. Between 1993 and 2003 Africa's rate of population growth was higher than the rate of food production. The AU is involved in various actions and initiatives to address the continent's food security:

1. In 2001 the AU adopted the New Partnership for Africa's Development (NEPAD) programme. NEPAD is an implementing agency of the AU and is responsible for driving economic integration in Africa. NEPAD aims to pursue new priorities and approaches to the political and socio-economic transformation of Africa. Its objective is to enhance Africa's growth, development and participation in the global economy. (www.nepad.org)

2. The agricultural programme of the NEPAD is the Comprehensive Africa Agriculture Development Programme (CAADP), established by the AU assembly in 2003. CAADP provides a common framework for fostering broad-based agriculture-led economic growth in African countries. CAADP focuses on improving food security, nutrition, and increasing incomes in Africa's largely farming based economies. It aims to do this by raising agricultural productivity by at least 6% per year and increasing public investment in agriculture to 10% of national budgets per year. The CAADP focuses of four key areas in accordance with its four pillars: 'Sustainable Land and Water Management'; 'Market Access'; 'Food Supply and Hunger'; and 'Agricultural Research" (www.nepad.caadp.net)

3. The AU Commission has established the Department of Rural Economy and Agriculture (DREA). DREA is divided into three divisions; Agriculture and food security, Environment and Natural Resources and Rural Economy. AUC DREA also has specialised regional technical agencies located in various regions of Africa. The mandate of AUC-DREA is to work with member states, RECs, African Institutions, Civil Society and development partners to strengthen the agricultural sector, rural economies and the environment in order to improve the livelihoods of the African people and ensure food security and sound environmental management. (www.au.int)

4. All the Nile Basin countries are member states of the African Union. Through the Nile Basin Initiative, the Nile riparian countries have an opportunity to benefit from NEPAD (the agricultural branch of the AU) that aims to accelerate economic integration among African countries

5. The AU Commission has been involved in federating river and Lake Basin authorities under the aegis of the African Network of Basin Organisations (ANRBC). It has developed policy and institutional framework guidelines with regard to cooperation for sustainable management of trans-boundary water basins. The Guidelines for the Establishment of Cooperative Framework Agreement for the Integrated Management of Trans-boundary Basins have been developed and disseminated to member states of the AU (UNEP report 2010: Stock taking of Adaptation activities in the Nile River Basin on www.unep.org).

Arab Maghreb Union (AMU/UMA)

The first conference of Maghreb Economic Ministers in 1964 established the *Counsil Permanent Consultative du Maghreb* (CPCM) between Algeria, Morocco, Tunisia and Libya to harmonise trade relations with the

EU. However, the plans failed to be a reality (due to ideological, territorial, political rivalries, but mostly because of the Western Sahara dispute). In 1988 the first Maghreb Summit of the five Heads of State was held, which resulted in a decision to create the Maghreb High Commission and various specialised commissions. It wasn't until 1989 that the Heads of States of five countries (Algeria, Morocco, Tunisia, Libya, Mauritania) signed the Treaty establishing the AMU. The AMU treaty has an objective to strengthen all forms of ties among member state, but its main purpose is a more economic integration among the Arab states. The dispute over the status of Western Sahara has profoundly limited the actual decision-making in the AMU, as Heads of States have been meeting only on rare occasion. This organisation seems rather dormant.

AMU in agriculture and water sector

The AMU Treaty highlights three broad economic strategies:

(1)The development of agriculture, industry, commerce, food security,

(2) The setting up of joint projects and general economic cooperation programs and

(3) The possibility for other Arab and African countries to join the Union at a later stage. (Institute for Security Studies, www.iss.co.za/AF/RegOrg/unit_to_union/amuprof.htm)

At UNCCD, 2004, Statement by Mr. Mustafa Tlili, Advisor to Secretary-General, Arab Maghreb Union: "Each country of the Union (AMU) has its own experience in this field, and its own way of dealing with desertification problems. Libya, for instance, is famous for its special efforts to resist wind erosion and to protect oases. The large-scale use of stone was initiated in Algeria and then became used all over the world. Tunisia has a leading experience in the fields of water and soil conservation, improvement of pastures and combating advancing sands. Morocco, for its part has successful experience in the planting of eucalyptus and reforestation of mountainous regions. These countries also share a common climate, relief and vegetation. Overall, dams, irrigations, and terrace cultivation of the soil are among the most important means used to resist desertification."

AMU has identified the Maghreb Renewable Energy Program among its priorities, and six renewable energy projects are priorities in the Horn of Africa countries, including geothermal, wind, solar and biogas projects. These projects would harness Africa's large untapped renewable energy potential, especially in areas where other alternatives are costly (AU/NEPAD AFRICAN ACTION PLAN 2010-2015). With the help of renewable energy, AMU aims to address its water scarcity issues. On 26 June 2001 the General Secretariat of the Arab Maghreb Union (AMU) and the International Centre for Agricultural Research in the Dry Areas (ICARDA) sign a Memorandum of Understanding (http://www.icarda.cgiar.org/agreements.html)

None of the Nile Basin countries are the member-states of the UMA at present. However, UMA aims to unite all the Arab countries in the region and if that becomes successful, Egypt and Sudan may become its members.

Community of Sahel-Saharan States (CEN-SAD)

CEN-SAD was established on 4th February 1998 as the outcome of a Conference of Leaders and Heads of States held in Tripoli (Great Jamahiriya) and aimed for the establishment of a global economic union with focus on agricultural, industrial, energy, social and cultural field (www.uneca.org/cen-sad/index.html). It has 29 member-states: Benin, Burkina Faso, Cape Verde, Central African Republic, Comoros, Côte d'Ivoire, Djibouti, Egypt, Eritrea, Gambia, Ghana, Guinea-Bissau, Guinea, Kenya, Liberia, Libya, Mali, Morocco, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Somalia, Sudan, Chad, Togo and Tunisia

CEN-SAD in agriculture and water sector

In 2005, the CEN-SAD Secretary General pleaded for the creation of high authorities on agriculture and water to promote sustainable and harmonious development in sub regional zone. In 2007, leaders and heads of states adopted the rural development and natural resources management strategy. In 2008, the Executive Council noted that positive progress was made and recommended the implementation of

the budget action program, consisting of: Mapping of the agricultural potentials; Regional Food Security Program (RFSP/CEN-SAD); Monograph of the water resources in CEN-SAD region; Green wall program: plan of action for 2008 – 2010.

CEN-SAD strives to reinforce knowledge on water resources, with a view to optimizing planning and management to foster an integrated development in the sub region. It works toward establishing a geographical information system that can help develop an adapted thematic mapping; a better orientation of sub regional projects to be implemented in the area of water resource development; and creating water resource monitoring tools and indicators (African Union Report 2009, Status of integration in Africa). CEN-SAD receives support from the African Water Facility and UNESCO (International Hydraulic Program) for its projects on water resources.

CEN-SAD has taken the initiative to create the conditions for regional cooperation to address water management issues. It has organized technical meetings dedicated to the water sector in November 2006 in Bamako and in October 2007 in Tripoli. This initiative has raised the level of analysis and planning for the two types of water resources (surface and aquifer) and identified perspectives for the exploitation of additional opportunities, including the possibility of physical and virtual transfer of the water at regional level (Workshop Report, 2009 Climate change and trans-boundary water resource conflicts in Africa).

CEN-SAD also tries to strengthen cooperation with all the regional actors (RECs and basin organisations) by offering them space for exchange and cooperation and an opportunity to combine their data, information and tools in order to create a unified, shared vision of integrated management of the water resources, particularly trans-boundary, across the region (Workshop Report, 2009 Climate change and trans-boundary water resource conflicts in Africa)

Common Market for Eastern and Southern Africa (COMESA)

In mid-60s, UN Economic Community for Africa (ECA) convened the newly independent nations in Africa for establishment of a sub-regional economic integration initiative that marked the beginning of Economic Community of Eastern and Central African States. In 1981 Preferential Trade Area (PTA) was established to take advantage of a larger market size, to share the region's common heritage and destiny and to allow greater social and economic co-operation, with the ultimate objective being to create an economic community. The PTA Treaty envisaged its transformation into a Common Market and, in conformity with this, the Treaty establishing the Common Market for Eastern and Southern Africa, COMESA, was signed on 5th November 1993 in Kampala, Uganda and was ratified a year later in Lilongwe, Malawi on 8th December 1994. CO Mesa's main focus is on the formation of a large economic and trading unit that is capable of overcoming some of the barriers that are faced by individual states. At present 19 countries are member states of the COMESA: Burundi, Comoros, D.R. Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia, and Zimbabwe.

COMESA in agriculture and water sector

In the Agriculture sector, COMESA is implementing several programs with the view to increasing agricultural productivity of the region. COMESA is a key player in the implementation of Comprehensive Africa Agriculture Development Program (CAADP) and that it is implementing various projects under CAADP to address trade in agricultural products, sanitary and phytosanitary (SPS) issues, improving the livelihood of pastoralists etc. (African Union Report 2009, Status of Integration in Africa). COMESA has developed a comprehensive approach and program initiative to address climate change issues" (UNEP report October 2010). The objectives of the COMESA Treaty and the COMESA Agricultural Policy (CAP) are in line with the broader Comprehensive African Agricultural Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD) under the African Union (AU). The CAADP has been endorsed by African Heads of State and Governments as a framework for the restoration of agricultural growth, food security and rural development in Africa within an integrated and coordinated approach. CAADP defines four Pillars for improving Africa's agriculture:

1. Extending the area under sustainable land management and reliable water control systems;
2. Improving rural infrastructure and trade related capacities for market access;
3. Increasing food supply, reducing hunger and improving responses to food emergency crises; and
4. Improving agricultural research, technology dissemination and adoption.

East African Community (EAC)

The regional integration in East Africa dates back to the early 1900s as it is credited to be one of the oldest regional integration institutions. However, the Treaty for the Establishment of the EAC was signed in Arusha on 30 November 1999 and entered into force on 7 July 2000. Its five member states are: Burundi, Kenya, Rwanda, Tanzania and Uganda. In 2010, the EAC launched a common market for goods for its member states, and is aiming for a common currency by 2012 and full political federation in 2015.

EAC and agriculture and water sector

The Agriculture and Rural Development Strategy of the EAC outlines the strategic interventions for accelerating the agricultural sector development, consisting Improving Food Security and Accelerating Irrigation Development (www.eac.int)

The establishment of a common market will be beneficial for food producers and consumers for the member states as the new tariff structure creates marginally better conditions for world-market exporters, by reducing input costs and by reducing upward pressures on the exchange rate. It is also expected to have substantial impact by a new generation of investments in world-market production based on the region's comparative advantages in natural resources (especially mining and agriculture) (Booth, briefing 2007http://www.odi.org.uk/resources/download/100.pdf).

The treaty establishing the EAC obliges the three Nile riparian countries (Kenya, Tanzania and Uganda) to coordinate and harmonise their policies on sustainable use of the water resources of the Lake Victoria Basin and to negotiate as a bloc on issues relating to the basin. The treaty also commits the states to increase investment in the field of energy, transport, communication, forestry, tourism, agriculture, fisheries, livestock, mining and other areas of social economic development to stimulate development and eradicate poverty in the basin. Achieving these objectives requires a massive use of the waters of the Lake and its rivers, which will have the direct implications for the whole Nile basin. The policy position is further elaborated by the 'Protocol for Sustainable Development of the Lake Victoria Basin' of 29 November 2003, recognized Lake Victoria Basin as 'an economic growth zone', which is connected to the larger Nile River Basin. 'In view of the relationship between the Lake Victoria Basin and the Nile River Basin,' the Protocol stipulates, 'the partner (EAC) states shall cooperate with other interested parties, regional or international bodies and programmes and in so doing, partner states shall negotiate as a bloc''(UNEP report 2010: Stock taking of Adaptation activities in the Nile River Basin on www.unep.org).

Inter- Governmental Authority on Development (IGAD)

The Intergovernmental Authority on Development (IGAD) in Eastern Africa was established in 1996 to supersede the Intergovernmental Authority on Drought and Development (IGADD), which was founded in 1986. The severe droughts between 1974 and 1984 caused widespread famine, ecological degradation and economic hardship in the Eastern Africa region. Individual countries made substantial efforts to cope with the situation and received support from the international community, but the magnitude and extent of the problem asked for a regional approach (www.igad.int). IGAD has 7 member states at present: Djibouti, Ethiopia, Eritrea, Kenya, Somalia, Sudan and Uganda.

IGAD and agriculture and water

In July 2008, IGAD Secretariat joined COMESA, EAC, SADC and IOC and drew up a joint regional program to increase food production in face of the cut-back in food exports by the major food producers and the escalating food prices (African Union Report 2009, Status of integration in Africa)

In shared water resources, a number of projects and programmes are being formulated. IGAD is implementing the water-harvesting project in Kenya, Uganda and Sudan where the water could be used during the dry spell periods to boost food security. Programmes are currently being developed for improving food storage facilities. (African Union Report 2009, Status of integration in Africa)

The Nile system is one of five water catchments areas found within the IGAD region. Directorate of Agriculture and Environment in the IGAD Secretariat handles a significant portion of water and environment matters. Other broad programmatic areas of the Secretariat are economic cooperation and social development, and peace and security. In April 2007, IGAD developed an Environment and Natural Resources Strategy. The primary objective of the IGAD Environment and Natural Resources Strategy is to enhance the integration of environmental and natural resources concerns into development frameworks for environmentally sustainable economic development in the region (UNEP report 2010: Stock taking of Adaptation activities in the Nile River Basin on www.unep.org). In the trans-boundary water issues, IGAD works towards building and enhancement of the capacity of its member states to implement integrated trans-boundary water resources development and management.

The Economic Community of the Great Lakes Countries (CEPGL).....

CEPGL was created in 1976 by an agreement between the three member states that aimed to promote regional economic cooperation and integration. Its member states are: Burundi, Democratic Republic of Congo, Rwanda.

CEPGL and Agriculture and water sector

On 3rd February 2010, CEPGL signed a memorandum of understanding with IFDC (International Fertilizer Development Cooperation, a public international organisation addressing critical issues such as food security, poverty etc) to formalise the mutual goals of both organisations, i.e. the transformation of subsidence farming into market-based agriculture by creating a socio-economic climate conductive to growth and adaptation

(http://nelsap.nilebasin.org/index.php?option=com_content&view=article&id=128:cepgl-and-nile-basin-initiative-sign-memorandum-of-understanding&catid=1:latest-news&Itemid=128)

CEPGL and the Nile Basin Initiative signed a memorandum of understanding on 7th September 2010 and thereby supporting the NBI's shared vision of "achieving sustainable socioeconomic development through the equitable utilization of, and benefit from the common Nile Basin water resources". Moreover, the two organisations synchronized their positions regarding participation in international programmes and initiatives for efficient management and sustainable development in the CEPGL region. In doing so, they will exchange data and information on conservation and sustainable management of natural resources of the CEPGL region

(http://nelsap.nilebasin.org/index.php?option=com_content&view=article&id=128:cepgl-and-nile-basin-initiative-sign-memorandum-of-understanding&catid=1:latest-news&Itemid=128).

Lake Victoria Basin Commission (LVBC)

The LVBC has five member states: Burundi, Kenya, Rwanda, Tanzania and Uganda. The LVBC serves as an overall institution for the management of issues related to the Lake Victoria Basin. The East African Community (EAC) established the Victoria Development Program in 2001 (which was taken over by the LVBC), as a mechanism for coordinating the various interventions on the Lake and its Basin; and serving

as a centre for promotion of investments and information sharing among the various stakeholders. The program is the driving force for turning the Lake Victoria Basin into a real economic growth zone. (www.lvbcom.org)

LVBC agriculture and water sector

LVBC is focusing on harmonising of politics and laws on the management of the environment in the lake and the area around it, including economic activities in the development of fishing, industry, agriculture and tourism (UNEP 2010). AS LVBC (www.lvbcom.gov) argues: "The Lake Victoria Basin is endowed with fertile soils ideal for a wide range of crops. It also falls within a good agro-climatic zone. The basin also enjoys surplus labour, both skilled and unskilled, and is strategically connected through all modes of transport to outside market. In terms of policy and legal framework, the Partner States have each reviewed their regulations in favour of private sector investment, including the tax regime. The East African Community is also in the process of harmonising the policy/legal instruments to be conducive to the investors. These factors provide an appropriate environment for private investment in such potential areas as:

1. Intensification of crop and livestock production through improved technologies and inputs;
2. Provision of irrigation water works for crop and livestock production;
3. Strengthening existing marketing cooperatives and establishing new ones especially for the crops and livestock products;
4. Horticultural crop production using irrigation where necessary;
5. Irrigated and rain-fed rice production;
6. Production of hybrid seed suitable for the Lake Victoria Basin;
7. Establishment of fattening ranches and stalls feeding particularly in Transmara, Keiyo and Tanzanian part of the Basin;
8. Beekeeping and honey production;
9. Poultry and eggs production;
10. Milk production;
11. Provision of private extension service;
12. Pig production;
13. Fodder production;
14. Increased sugar cane growing;
15. Oil crops production; and
16. Cotton production.

The LVBC and the NBI cooperate actively in various platforms and joint actions. Example is the Lead Partners Interagency Network Forum (LPIANF) that is a platform for dialogue and joint action bringing together Lake Victoria Regional Local Authorities Cooperation (LVRLAC), LVBC, NBI, UNHABITAT and UCSD.

South Africa Development Cooperation (SADC)

Started as Frontline States whose objective was political liberation of Southern Africa, SADC was preceded by the Southern African Development Coordination Conference (SADCC), which was formed in Lusaka, Zambia on April 01, 1980 with the adoption of the Lusaka Declaration (Southern Africa: Towards Economic Liberation) (http://www.sadc.int/). Its member states are: Angola, Botswana, Democratic Republic

of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe

SADC agriculture and water sector

SADC Protocol on Shared Watercourses came into effect in September 2003 after ratification. The Protocol establishes a legal cooperative framework for managing the water resources of the region. The objective of the Protocol is *"to foster closer cooperation for judicious, sustainable and coordinated management, protection and utilization of shared watercourses and advance the SADC agenda of regional integration and poverty alleviation."*

As one of its main objectives to achieve sustainable utilization of natural resources and effective protection of the environment, SADC is continuing with the monitoring and implementation of the Dar es Salaam Declaration and Action Plan on agriculture and food security as well as the RISDP priorities on food security and natural resources. It has established the SADC Seed Security Network (SSSN) in March 2007, which intends to facilitate the creation of a regional seed market (AU SAI report 2009).

DRC which is a member of SADC also shares membership with Burundi and Rwanda in the NBI. Energy programs of the NBI-NELSAP for the Rusizi River also cover these three countries. With the help financial support from the Global Environmental Fund, since 2007 SADC is implementing the Ground Water Drought Management Project (GDMP). The project aims at implementing the following components:

- Development and Testing of Groundwater Drought Management Plan for the Limpopo River Basin Pilot Areas (signed in February 2008);
- Regional Groundwater Drought Management Support in SADC
- Identification and Establishment of the Groundwater Management Institute of Southern Africa (GMISA) (AU SAI 2009 report).

COMESA-EAC-SADC Tripartite agreement and implication on the Nile

The COMESA-EAC-SADC Tripartite agreement comprises three regional economic blocks involving 26 countries with a population of 600 Million constituting 57% of AU population and a combined GDP of US$ 1.0 trillion, which is about 58% of the African Union GDP. The establishment of the agreement is part of the process of the vision to realise the African Economic Community in accordance with in the Abuja Treaty of 1991.

The Agreement is founded on three pillars which constitute the fundamental objectives as follows:

(i) Market integration based on Tripartite Free Trade Area;

(ii) Infrastructure development to enhance connectivity and reduce cost of doing business; and

(iii) Industrial development to address the productive capacity constraints.

The establishment of the COMESA-EAC-SADC Tripartite agreement was initiated in June 2011 to bring together these eastern and southern Africa based economic blocks under one umbrella. It however has political goodwill from the top African Policy makers as provided for by the African Union Summit in Gambia in 2006. In the light of this the Regional Economic Communities (RECs) should seek to:

(i) Harmonise and coordinate policies and programs of RECs as important strategies for realisation of the agreement, and

(ii) Put in place the mechanisms to facilitate the process of harmonisation and coordination within and among the RECs.

A process to establish the tripartite agreement has been put in place through the June 2011 summit and the outcomes are as follows:

(i) A declaration launching the negotiations for the establishment of the COMESA-EAC-SADC Tripartite Free Trade Area (FTA);

(ii) A roadmap for establishing the Tripartite FTA;

(iii) The Tripartite FTA negotiating principles, processes and Institutional framework; and

(iv) Development of a program of work and roadmap for the industrial pillar.

The COMESA-EAC-SADC Tripartite agreement though still at infant stage however provides the following lessons that can be of relevance for the Nile basin:

(i) Genuine subscription to a common vision as reflected in the Abuja agreement for the future African Economic Community provides a momentum in establishing a process for realisation of the vision;

(ii) The Tripartite Agreement is a building block to the realisation of the African Economic Community which a strategic approach that could be used for agreements to be established in the eastern Nile Countries and Upper Nile Countries. The two blocks are then brought together in a comprehensive framework for the Nile basin organisation; and

(iii) The COMESA-EAC-SADC FTA covers the entire region of the Nile basin Countries and beyond which provides an opportunity to enhance the process for establishment of the corporation.

Effects of Agreement on the Nile basin

1. There is a vision in entire African content to regionalize which is a challenge for the NBI countries to fast track the process of establishing a functional RBO a long a common resources and build synergies to enhance industrial development which will favor agriculture as the major common economic activity in the basin.
2. Provide goodwill for the establishment of the RBO because of the opportunities created by the FTA that RBO can benefit from especially in Agricultural Trade
3. Opening up a wider market and removal of trade provide an opportunity for realization of food security because of free flow of goods and services in a bigger market volume which will encourage agricultural production

Annex 14: Initial global review of basins with RBO

Trans-boundary River Basin Organisation

Name: Participating countries	Principal Issues: Description
River Basin Organisations in Europe	
Danube **http://www.unece.org/env/water/documents/transbwatcoopnis_fin_e.pdf**	
International Commission for the Protection of the River Danube (ICPDR) Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Moldova, Poland, Romania, Slovakia, Slovenia, Switzerland, Ukraine, Yugoslavia (Serbia and Montenegro)	**Water quality, joint management** The ICPDR is an international organisation consisting of 13 cooperating states and European Union, implementing the Danube River Protection Convention. It is the institutional frame not only for pollution control and the protection of water bodies but it sets also a common platform for sustainable use of ecological resources and coherent and integrated river basin management. The ICPDR is the body charged to implement the "Convention on the Protection and Sustainable Use of the Danube River" (Danube River Protection Convention, DRPC).
Danube Commission Austria, Bulgaria, Croatia, Germany, Hungary, Moldova, Slovakia, Romania, Russia, Ukraine, Serbia	**Navigation** The member states should maintain their sections of the Danube in a navigable condition for river-going and, on the appropriate sections, for sea-going vessels and carry out the works necessary for the maintenance and improvement of navigation conditions and not to obstruct or hinder navigation on the navigable channels of the Danube.
Danube (subbasin Sava): http://www.savacommission.org/	
International Sava River Basin Commission Bosnia and Herzegovina, Republic of Croatia, Republic of, Slovenia, Republic of, and Yugoslavia, Federal Republic of	**Water quality, flood control/relief, joint management** International Sava River Basin Commission
Dnieper: http://www.grid.unep.ch/product/publication/freshwater_europe/dniepr.php	
International Dnieper Basin Council Belarus, Russian Federation and Ukraine	**Joint management, border issues** In 2003, Ministers of Belarus, Russian Federation and Ukraine signed a statement on ecological rehabilitation of the Dnieper River, leading to the creation of the International Dnieper Basin Council.
Duero/Douro: http://afeid.montpellier.cemagref.fr/ILWRM/sppocase.pdf **http://afeid.montpellier.cemagref.fr/ILWRM/sppocase.pdf**	
International Commission of International Rivers Portugal, Spain	**Hydropower, water quantity** Established mainly for the regulation of the hydro-electric utilization of the international section of the River Duero and its tributaries.
Elbe: http://rod.eionet.europa.eu/instruments/182 **http://sedoparking.com/search/registrar.php?domain=ikse.de&registrar=sedopark**	

International Commission for the Protection of the Elbe (ICEP) Czech Republic, European Union, Germany	**Water quality, joint management** The contracting parties shall cooperate in the International Commission for the Protection of the Elbe to prevent the pollution of the Elbe and its drainage area. The main goals are the possibility to produce drinking water from water pumped from the river accompanying groundwater, possibility to use the water and sediments for agriculture, return to a close to natural ecosystem with a healthy species diversity, and reducing the bad effects of Elbe river basin on the North Sea.
Garonne (Lake Lanoux sub-basin)	
Joint Commission France and Spain	**Water quantity** Joint Commission set up to supervise the implementation of the measures referred to in the 'Agreement Between the Government of the French Republic and the Spanish Government Relating to Lake Lanoux' which entered into force on 27 January 1970.
Guadiana **http://afeid.montpellier.cemagref.fr/ILWRM/sppocase.pdf**	
International Commission of International Rivers Portugal, Spain	**Hydropower, water quantity** Established mainly for the regulation of the hydro-electric utilization of the international section of the River Duero and its tributaries.
Ob	
Joint Russian- Kazakhstan Commission for Utilization and Protection of Trans-boundary Waters Kazakhstan, Russia	**Water quality, water quantity, joint management** Joint Russian-Kazakhstan Commission for Utilisation and Protection of Trans-boundary Waters.
Oder/Odra: http://www.mkoo.pl/ **http://www.yale.edu/lawweb/avalon/imt/partxii.htm**	
International Commission for the Protection of the Oder River against Pollution (ICPOAP) Poland, the Czech Republic, Germany	**Water quality, flood control/relief, joint management** The objectives of the ICPOAP are: 1. to prevent the pollution of the Oder and the Baltic Sea by contaminants and to achieve a reduction in the pollution thereof; 3. to permit utilisation of the Oder, in particular the production of drinking water from bank filtrate and the use of its water and sediments in agriculture; 4. to provide for precautions against the risk of flood damage and achieve a sustained reduction thereof; and 5. to coordinate implementation of the Water Framework Directive in the Oder river basin.
Rhine: http://www.iksr.org/	

International Commission for the Protection of the Rhine (formerly: International Commission for the Protection of the Rhine against Pollution) (ICPR) European Union, France, Germany, Luxemburg, the Netherlands, Switzerland	**Water quality, flood control/relief, joint management** 1. Sustainable development of the entire Rhine ecosystem 2. Guarantee the use of Rhine water for drinking water production 3. Improvement of the sediment quality in order to enable the use or disposal of dredged material without causing environmental harm. 4. Overall flood prevention and environmentally sound flood protection 5. Improvement of the North Sea quality in accordance with other measures aimed at the protect on of this marine area.
Volga	
Joint Russian- Kazakhstan Commission for Utilization and Protection of Trans-boundary Waters Kazakhstan, Russia	**Water quality, water quantity, joint management** Joint Russian-Kazakhstan Commission for Utilization and Protection of Trans-boundary Waters.
River Basin Organisations in Africa	
Congo/Zaire	
Commission Internationale du Bassins Congo- Oubangui-Sangha (CICOS) Cameroon, Central African Republic, Congo, Republic of the (Brazzaville), Congo, Democratic Republic of (Kinshasa)	**Water quality, navigation, flood control/ relief, infrastructure/ development** Commission Internationale du Bassins Congo-Oubangui-Sangha (CICOS).
Corubal: http://internationalwaterlaw.org/documents/regionaldocs/gambia-river.html	
Gambia River Basin Development Organisation (OMVG: Organisation pour la Mise en Valeur du FleuveGambie) Guinea, Guinea-Bissau	**Hydro-power/ hydro-electricity, flood control/ relief, irrigation, infrastructure/ development** The three principal thrusts of OMVG concern energy, food security and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, FelloSounga and Saltinho on the River Koliba/Corubal and Gaoual on the River Géba. The main objective of OMVG, is to promote socio-economic integration of its members States.
Gambia	

Gambia River Basin Development Organisation Guinea, Guinea-Bissau	**Hydro-power/ hydro-electricity, flood control/relief, irrigation, infrastructure/ development** The three principal thrusts of OMVG concern energy, food security and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, FelloSounga and Saltinho on the River Koliba/Corubal and Gaoual on the River Géba. The main objective of OMVG, is to promote socio-economic integration of its members States.
Komati: http://www.kobwa.co.za/	
Tripartite Permanent Technical Commission (TPTC) Mozambique, South Africa, Swaziland	**Joint management, infrastructure/ development, technical cooperation/ assistance** Tripartite Permanent Technical Commission (TPTC).
Joint Water Commission (JWC) South Africa, Swaziland	**Joint management, infrastructure/ development, technical cooperation/ assistance** The Joint Water Commission was established as a technical advisory commission to advise the Governments of the Kingdom of Swaziland and the Republic of South Africa on water resources of common interest. The JWC was formed through the JWC treaty signed in 1992. There are three commissioners appointed by each Government for a period determined by each Government. The JWC monitors the activities of KOBWA on behalf of the governments of Swaziland and South Africa.
Komati Basin Water Authority (KOBWA) Mozambique, South Africa, Swaziland	**Joint management, infrastructure/ development, technical cooperation/ assistance** A bi-national company formed in 1993 through the treaty on the Development and Utilization of the Water Resources of the Komati River Basin signed in 1992 between the Kingdom of Swaziland and the Republic of South Africa. The purpose of KOBWA is implement Phase 1 of the Komati River Basin Development Project. Phase 1 comprise the design, construction, operation and maintenance of Driekoppies Dam in South Africa (Phase 1a) and the Maguga Dam in Swaziland (Phase 1b). Additional party involved: Mozambique which shares the same river system and is participating through TPTC.
Kunene	
Angola Namibian Joint Commission of Cooperation (ANJCC) Angola, Namibia	**Economic development, joint management, infrastructure/ development, technical cooperation/ assistance** Angola Namibian Joint Commission of Cooperation (ANJCC)
Joint Operating Authority Angola, Namibia	**Economic development, joint management** Joint Operating Authority
Permanent Joint Technical Commission Angola, Namibia	**Joint management, technical cooperation/ assistance** Permanent Joint Technical Commission
Lake Chad: http://www.cblt.org/	

Lake Chad Basin Commission (LCBC) Cameroon, Central African Republic, Chad, Niger, Nigeria,	**Water quality, water quantity, navigation, fishing, economic development, joint management, irrigation, infrastructure/ development, technical cooperation/ assistance, border issues** The Commission is a Regional Government Organisation, designed to manage the basin and to resolve disputes that might arise over the lake and its resources. The aims of the Commission are to regulate and control the utilization of water and other natural resources in the basin; to initiate, promote and coordinate natural resources development projects and research within the basin area; to examine complaints; and to promote the settlement of disputes, thereby promoting regional cooperation. Note: the Central African Republic joined in 1994 and Sudan was admitted as an observer by the 10th Summit held in N'Djamena in July, 2000. It will become the sixth member state after ratifying the convention and statute which created the Commission.
Basin Committee for Strategic Planning (BCSP) Cameroon, Central African Republic, Chad, Niger, Nigeria	**Economic development, joint management, infrastructure/ development, technical cooperation/ assistance** Basin Committee for Strategic Planning (BCSP); created through LCBC, for local initiatives.
Limpopo	
Limpopo Watercourse Commission (LIMCOM) Botswana, Mozambique, South Africa, Zimbabwe	**Economic development, joint management, infrastructure/ development, technical cooperation/ assistance** This commission was negotiated by the Limpopo Basin Permanent Technical Committee. The Commission between South Africa, Botswana, Mozambique and Zimbabwe is to manage the Limpopo River and must facilitate the building of capacity within the four countries to manage the water resource.
Limpopo River Basin Commission (LRC) Botswana, Mozambique, South Africa, Zimbabwe	**Economic development, joint management, infrastructure/ development, technical cooperation/ assistance** Institutional arrangement to manage water. Operating on a river-catchment basis, rather than by national boundaries, this body provides an appropriate institutional vehicle to guide the development in the basin.
Joint Permanent Technical Committee (JPTC) Botswana, Mozambique, South Africa, Zimbabwe	**Joint management, technical cooperation/ assistance** The JPTC was established in 1983 to make recommendation on matters concerning common interest in the Limpopo.
Joint Water Commission (JWC) Mozambique, South Africa	**Joint management, technical cooperation/ assistance** In 1996, after South Africa's political change, the two countries signed in Mozambique, an agreement establishing a Joint Water Commission (JWC), with advisory functions on technical matters relating their common rivers, including the Limpopo.
Mana-Morro	

ano River Union (MRU) Guinea, Liberia, Sierra Leone,	**Joint management** The MRU was established in 1973 to constitute a customs and economic union between the member states in order to improve living standards. Decisions are taken at meetings of a joint ministerial committee. The governments of all three 'Mano River Union' countries recognise that their individual future prosperity depends on increasing dialogue and co-operation between them, and moves to revitalise the Mano River Union are likely to resume as soon as peace has returned to Sierra Leone and to the respective border regions of the three countries.
Niger **http://www.gwptoolbox.org/index.php?option=com_case&id=32;** **http://www.fao.org/docrep/W7414B/w7414b10.htm**	
Niger Basin Authority (NBA) Algeria, Benin, Burkina Faso, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria, Sierra Leone	**Water quality, hydro-power/ hydro-electricity, navigation, fishing, flood control/ relief, economic development, joint management, irrigation, infrastructure/ development, technical cooperation/ assistance** Niger Basin Authority (NBA), formerly the Niger River Commission (RNC). The NBA is one of the oldest African Intergovernmental Organisation as its creation dates back to 1964 when it was called River Niger Commission. The River Niger Commission functioned for seventeen years and the results achieved were deemed insufficient. Consequently, the member states decided to replace it with a new organisation, the Niger Basin Authority which became heir to all the assets, liabilities and programs initiated by the River Niger Commission. The aim of the Niger Basin Authority is to promote cooperation among the member countries and to ensure integrated development in all fields through development of its resources.
Nigeria-Niger Joint Commission for Co-operation (NNJC) Niger, Nigeria	**Joint management, water quantity** This commission was set up to monitor the implementation of the provisions of the 1990 'Agreement between the Federal Republic of Nigeria and the Republic of Niger concerning the equitable sharing in the development, conservation and use of their common water resources'.

Lake Victoria Fisheries Organisation Kenya, Tanzania, Uganda,	**Water quality, fishing, joint management** Objectives: To foster co-operation amongst the Contracting Parties in matters regarding Lake Victoria; To harmonise national measures for the sustainable utilization of the living resources of the Lake; To develop and adopt conservation and management measures to assure the health of the Lake's ecosystem and the sustainability of its living resources. The Lake Victoria Fisheries Organisation was established by a Convention (mandate) signed on 30th June 1994, in Kisumu, Kenya by the "Contracting Parties" who consist of the Governments of the Republic of Kenya, the Republic of Uganda and the United Republic of Tanzania.
The Lake Victoria Basin Commission (LVBC) Kenya, Tanzania, Uganda	**Water quality, joint management** The Lake Victoria Basin Commission (LVBC) was established by the Protocol on Sustainable Development of Lake Victoria Basin. It is the apex institution of East African Community (EAC) mandated with overall coordination. The Commission became effective in July 2005 and launched in June 2006. Previously the mandate was with the Lake Victoria Development Programme (LVDP) since 2001. It's vision is worded as follows: "A prosperous population living in a healthy and sustainably managed environment providing equitable opportunities and benefits".
Okavango	
The Permanent Okavango River Basin Commission (OKACOM) Angola, Botswana, Namibia,	**Joint management** OKACOM is a regional, high-level committee that was formed to ensure the water resources of the Okavango River system are managed in appropriate and sustainable ways and to foster co-operation and co-ordination between the three Basin states; Angola, Namibia, and Botswana.
Joint Permanent Water Commission (JPWC) Botswana, Namibia	**Joint management** JPWC focus is on the bilateral management of the Okavango River and the Kwando-Chobe-Linyati reach of the Zambezi River.
Orange **http://www.lhwp.org.ls/default.htm** **http://www.lhda.org.ls/** **http://internationalwaterlaw.org/documents/regionaldocs/nambia-southafrica.html**	
Orange/Senqu River Commission (ORASECOM) Botswana, Lesotho (Kingdom of), Namibia, South Africa	**Joint management** ORASECOM is the first RBO to be established in terms of the SADC Protocol on Shared Watercourse Systems. The secretariatwasestablished in 2003.

Lesotho Highlands Development Authority (LHDA) Lesotho (Kingdom of), South Africa	**Water quantity, Hydro-power/ hydro-electricity, economic development, joint management, technical cooperation/ assistance** The LHDA was set up to implement and operate that part of Lesotho Highlands Water Project (LHWP) that falls within the borders of Lesotho.
Lesotho Highlands Water Commission (LHWC) Lesotho (Kingdom of), South Africa	**Joint management, technical cooperation/ assistance** The signing of the Lesotho Highlands Water Project Treaty by the Government of Lesotho and of the Republic of South Africa on the 24th October 1986 established the Joint Permanent Technical Commission (JPTC) to represent the two countries in the implementation and operation of the LHWP. The Joint Permanent Technical Commission (JPTC), was later renamed the Lesotho Highlands Water Commission (LHWC) with a secretariat in Lesotho to monitor and oversee the Treaty.
Permanent Water Commission (PWC) Namibia, South Africa	**Joint management, technical cooperation/ assistance** In a bilateral agreement in 1992, Namibia and South Africa established a Permanent Water Commission (PWC). PWC was to act as a technical adviser to the Parties on matters relating to the development and utilization of the Orange water resources.
Joint Irrigation Authority (JIA) Namibia, South Africa	**Joint management, irrigation, technical cooperation/ assistance** Countries signed in 1992 another agreement establishing a JIA, administering an existing irrigation scheme along the riverbanks under the auspices of the PWC.
Senegal: http://www.omvs.org/ **http://www.tematea.org/?q=node/6578&PHPSESSID=8158061ce856872aeabe2b109d4aaf0c**	
Organisation pour la Mise en Valeur du bassin du fleuve Senegal (OMVS) Mali, Mauritania, Senegal	**Water quality, water quantity, hydro-power/ hydro-electriciy, navigation, flood control/ relief, economic development, joint management, irrigation, infrastructure/ development, technical cooperation/ assistance** In 1963, shortly after independence, Guinea, Mali, Mauritania, and Senegal signed the Bamako Convention for the Development of the Senegal River Basin that declared the Senegal River to be an “International River” and create an “Interstate Committee” to oversee its development. In 1968, the Labe Convention created the Organisation of Boundary stares of the Senegal River (OERS - Organisation des Etats Riverains du Sénégal). In 1972 the OMVS, a river management organisation, was created replacing the OERS which broke up after the withdrawal of its fourth member, Guinea.
Volta	
Liptako-Gourma Integrated Authority or Autorite de developpemen tintegre de la region du Liptako-Gourma (ALG) Burkina Faso, Mali, Niger	**Hydro-power/ hydro-electricity, navigation, fishing, economic development, irrigation, infrastructure/ development** The ALG, a sub-regional institution has the primary mission to promote the integrated development of the Liptako-Gourma region with a view to improving the living conditions of the population.
Zambezi http://www.savannas.net/botswana/ruhydro.htm	

Zambezi WatercourseCommission (ZAMCOM) Angola, Congo, Democratic Republic of (Kinshasa), Malawi, Mozambique, Tanzania, United Republic of, Botswana, Namibia, Zambia, Zimbabwe	**Border issues, territorial issues** Commission to manage and develop the Zambezi river's water resources. Besides managing the Zambezi's resources, the Commission, consisting of three organs - a council of ministers, a technical committee and a secretariat drawn from all eight countries - will advise member countries on planning, utilisation, protection and conservation issues around the river. Country representatives will also protect national interests in actual or potential disputes. Signing the agreement is expected to bring benefits across all sectors, including trade, industry, energy production, food security, transport and communication, tourism, regional security and peace.
Zambesi River Authority (ZRA) Zambia, Zimbabwe	**Water quality, economic development, joint management, technical cooperation/ assistance** The Zambezi River Authority is governed by a Council of Ministers consisting of four members, two of whom are Ministers in the Government of the Republic of Zambia and two of whom are Ministers in the Government of Zimbabwe. Mission: to co-operatively manage and develop in an integrated and sustainable manner the water resources of the Zambezi River in order to supply quality water, hydrological and environmental services for the maximum socio-economic benefits to Zambia, Zimbabwe and the other Zambezi River basin countries.
Joint Permanent Water Commission (JPWC) Botswana, Namibia	**Joint management** JPWC focus is on the bilateral management of the Okavango River and the Kwando-Chobe-Linyati reach of the Zambezi River.
River Basin Organisations in Asia	
Amur	
Amur River Coordination Committee China, Mongolia, Russia	**Joint management** Amur River Coordination Committee
Aral Sea **http://www.icwc-aral.uz/**	
Interstate Coordination Water Commission (ICWC) Kazakhstan, KyrgyzRepublic, Tajikistan, Turkmenistan, Uzbekistan	**Water quantity, water quality, joint management** On February 18, 1992 the five Ministers of Water Resources of Central Asian states signed an "Agreement on cooperation in joint management, use and protection of interstate sources of water resources" and this agreement founded the ICWC. Executive bodies of ICWC are River Basin Authorities (BWOs) SyrDarya and AmuDarya. BWOs are in charge of planning and managing water flow schedules and water resources distribution, as well as direct implementation of the decisions made by ICWC relevant to water allocation, schedules of water flow and releases, water quality control.

International Fund for saving the Aral Sea (IFAS) Kazakstan, the Kyrgyz Republic, the Republic of Tajikstan, Turkmenistan, and the Republic of Uzbekistan	**Research and education** An interstate organisation established in order to fund and credit joint regional environmental and research programmes and projects aimed at saving the Aral Sea and improving the environmental situation in the areas affected by the disaster as well as solving regional socio-economic problems. Primary goals include: stabilising and improving the environment of the Aral Sea Basin, rehabilitating the disaster zones, improving water resource management, and increasing the capacity of local and state institutions for planning and implementing programmes.
Jordan	
A Joint Water Committee (JWC) Israel, Jordan	**Water quality, water quantity, joint management** A Joint Water Committee (JWC) - to jointly manage water resources of the West Bank; for the purposes of monitoring, planning, study, information sharing, and dispute resolution. The Joint Water Committee is to manage mutual water resources, operate jointly established monitoring stations to monitor the quality of water along their boundary, and to develop plans to supply Jordan with an additional 50 mcm/yr. of drinking water.38 Article 6 of the Jordan Israel Peace Treaty provides for mutual assistance in the alleviation of water shortages. The JWC served as an institutional mechanism for the interim period, mainly to oversee the implementation of Article 40 (of the agreement deals with water allocation but refers to the immediate needs of the Palestinians without considering the principle of equitable and reasonable utilisation of the water resources by both sides).
Fenney	
Indo- Bangladesh Joint Rivers Commission India, Bangladesh	**Joint management** Mission: to develop the waters of the rivers common to the two countries on a cooperative basis (specifically excluding issues of Ganges development).
Joint Committee of Experts India, Bangladesh	**Joint management, water quantity** Joint Committee of Experts.
Fly **http://www.paclii.org/pg/cases/PNGLR/1980/140.html**	
Fly River Provincial Boundaries Commission Indonesia, Papua New Guinea	**Joint management** Established in accordance with the Fly River Constituencies Act.

Ganges-Brahmaputra-Meghna **http://hqweb.unep.org/dams/documents/ell.asp?story_id=123%20** **http://www.mowr.gov.bd/jrc.htm**	
Indo- Bangladesh Joint Rivers Commission India, Bangladesh	**Joint management** Mission: to develop the waters of the rivers common to the two countries on a cooperative basis (specifically excluding issues of Ganges development).
Joint Committee India, Bangladesh	**Water quantity** Joint Committee to record at Farakka the daily flow below Farakka barrage, in the Feeder canal, at the Navigation Lock, as well as at the Hardinge Bridge.
Ganges-Brahmaputra-Meghna (Mahakalisubbasin)	
Mahakali River Commission India, Nepal	**Water quantity** Mahakali River Commission, resulting from the Mahakali Treaty of 12 February 1996. The Commission has been directed to: (i) seek information on and, if necessary, inspect all structures included in the Mahakali Treaty; (ii) make recommendations for the conservation and utilization of the Mahakali River; (iii) provide expert evaluation of projects and make recommendations thereto; (iv) coordinate and monitor plans of action; and (v) examine any differences arising between the two countries concerning the Treaty's interpretation and application.
Helmand	
Helmand River Delta Commission Afghanistan, Iran, (Pakistan)	**Water quantity, joint management** Task: to measure and divide the river flows between the two signatories.
Indus http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ SOUTHASIAEXT/0,,contentMDK:20320047~pagePK:146736~ piPK:583444~theSitePK:223547,00.html	
Indus Water Commission or Permanent Indus Commission India, Pakistan	**Water quantity, joint management** Regulates the allocation of waters from the Indus River basin between India and Pakistan.
Jordan	

Joint Water Committee Jordan, Palestina	**Water quantity, water quality, joint management** Joint Water Committee set up as a result of the 'Israel-Jordan Peace treaty' of 1994. This treaty provided for this Committee to function as the implementing body of the Program of Action, to oversee water allocation, storage, water quality protection, information transfers and data sharing, and generally to coordinate action in alleviating water shortages.
Jordan (Yarmouksubbasin)	
Joint Syro- Jordanian Commission Jordan, Syria	**Water quantity, joint management** Joint Syria-Jordanian Commission set up under the 'Agreement Between the Republic of Syria and the Hashemite Kingdom of Jordan Concerning the Utilization of the Yarmuk Waters' which entered into force on 8 July 1953. It was established for the application of the provisions of this Agreement, the regulation and exercise of the rights and obligations which the two Governments have assumed there under and supervision over the settlement of all questions to which its application may give rise.
Karnaphuli	
Indo- Bangladesh Joint Rivers Commission India, Bangladesh	**Joint management** Mission: to develop the waters of the rivers common to the two countries on a cooperative basis (specifically excluding issues of Ganges development).
Joint Committee of Experts India, Bangladesh	**Joint management, water quantity** Joint Committee of Experts.
Kura-Araks	
Joint Commission Georgia, Turkey	**Joint Commission**
Mahakali **http://www.unep.org/dams/documents/ell.asp?story_id=123** **http://en.wikipedia.org/wiki/Sarda_River**	
Joint Commission India, Nepal	**Joint Commission**
Mekong: http://www.mrcmekong.org/	

Mekong River Commission (formerly known as Mekong Committee; name change in 1995) Cambodia, Lao PDR, Thailand and Vietnam	**Hydro-power/ hydro-electricity, irrigation, navigation, fishing, flood control/ relief, joint management** A coordinating mechanism between the four countries. Original aim was development of large scale water-resource developments, but this has never been realized. Now objections include hydropower, irrigation, flood control, collection and distribution of hydrological data. Also, the MRC serves as focal point for donor organisations and countries. MRC maintains regular dialogue with the two upper states of the Mekong River Basin, China and Myanmar.The MRC member countries agree to co-operate in all fields of sustainable development, utilisation, management and conservation of the water and related resources of the Mekong River Basin, such as navigation, flood control, fisheries, agriculture, hydropower and environmental protection.
ASEAN- Mekong Basin Development Cooperation (AMBDC) Brunei Darussalam, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam	**Economic development, joint cooperation** ASEAN-Mekong Basin Development Cooperation (AMBDC) was set up by the Ministers of the countries to cooperate in the development of the Mekong Basin. The main objectives of this cooperation are (i) to enhance economically sound and sustainable development of the Mekong Basin; (ii) to encourage a process of dialogue and common project identification which can result in firm economic partnerships for mutual benefit; and (iii) to strengthen the interconnections and economic linkages between the ASEAN member countries and the Mekong riparian countries.
Red River **http://www.rrbo.org.vn/defaulte.aspx?tabid=403** **http://www.iwmi.cgiar.org/Publications/IWMI_Research_Reports/PDF/PUB131/RR131.pdf**	
Red River Basin Organisation. China, Laos, Vietnam	The Red River system is the second largest river system in Vietnam. The Red River is an international river which originates in China and runs through Laos and Vietnam before flowing into the East Sea. The total area of the entire river basin is approximately 169,020 km2, including 81,240 km2 (or 48%) in Chinas territory, 1,100km2 (0.65%) in Laos' territory and 86,660km2 (51.35%) in Vietnam's territory.
Talas	

The Commission of the Republic of Kazahstan and the Kyrgyz Republic on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas Kazakstan, Kyrgyzstan	**Joint management** Article 5 of the international agreement between the Government of the Kazakh Republic and the Government of the Kyrgyz Republic on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas states that "in order to ensure safe and reliable work of water management facilities of intergovernmental status, the Parties shall create permanent commissions to determine the working regimes and the range of necessary expenses for exploitation and maintenance".
Tumen	
The Tumen River Area Development Coordination Committee China, DPRK and Russia	**Economic development, joint management** The Committee's purpose was to advance development of Tumen River Economic Development Area (TREDA).
Tumen River Area Consultative Commission China, DPRK, Mongolia, ROK, and Russia	**Economic development, joint management** The Commission's purpose was to support development in Tumen River Economic Development Area (TREDA) as well as the Northeast Asia region.
Tigris-Euphrates/Shatt al Arab	
Joint Technical Committee on Regional Waters Iraq, Turkey (and Syria)	**Water quantity, technical assistance/ cooperation, joint management** Formed on the basis of a former protocol (1946) concerning the control and management of the Euphrates and the Tigris. Set up in 1980 by both countries to discuss regional water matters. Syriajoined the committeeafterwards.
River Basin Organisations in North America	
Colorado	
International Water and Boundary Commission (IBWC) Canada, United States of America	**Water quantity, joint management** The two Governments through the IBWC jointly administer the terms of the 1944 Water Treaty relating to the Colorado River, which provides that of its waters there are allotted to Mexico, (a) a guaranteed annual quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) and (b) any other quantities arriving at the Mexican points of diversion with certain conditions stipulated in the 1944 Treaty. The application of these terms began in 1950. The operations are performed in collaboration with the United States Bureau of Reclamation, Department of the Interior.
Columbia: http://www.ijc.org/en/home/main_accueil.htm	

International Joint Commission (IJC) Canada, United States of America	**Joint management, border issues** The International Joint Commission is an independent bi-national organisation established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or trans-boundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the trans-boundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of trans-boundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
IJC Board: International Columbia River Board of Control Canada, United States of America	**Water quantity, joint management** The Board keeps the Commission apprised of stream flow and water-level data on both sides of the international boundary and reports to the Commission each April. Established by Order of the International Joint Commission (IJC) dated 15 December 1941 to ensure the implementation of the provisions of that Order-which granted approval for the United States to construct and operate the Grand Coulee dam and reservoir (Frankin D. Roosevelt Lake)-and to continue to study the effect of the operation of the Grand Coulee dam and reservoir upon water levels at and above the international boundary
Mississippi	
International Boundary and Water Commission (IBWC) Mexico, United States of America	Joint management Has the responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise out of these treaties.
Rio Grande	
Río Grande/ Río Bravo Basin Coalition Mexico, United States of America	**Joint management, water quality** The mission of the Río Grande/ Río Bravo Basin Coalition is to facilitate local communities in restoring and sustaining the environment, economies, and social well being of the Río Grande/ Río Bravo Basin.
International Boundary and Water Commission (IBWC) Mexico, United States of America	**Joint management** Has the responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise out of these treaties.

International St. Croix River Board Canada, United States of America	**Joint management** On September 26, 2000, the International Joint Commission formally combined its existing International St. Croix River Board of Control (founded in 1915) and its International Advisory Board on Pollution Control - St. Croix River and established the International St. Croix River Board. It's mandate is to assist the Commission in preventing and in resolving disputes regarding the boundary waters of the St. Croix River, to monitor the ecological health of the St. Croix River boundary waters aquatic ecosystem, and to ensure compliance with the Commission's Orders of Approval for structures in the St. Croix River.
St. Lawrence **http://www.glfc.org/home.asp%20**	
International Joint Commission (IJC) Canada, United States of America	**Joint management** The International Joint Commission is an independent binational organisation established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or trans-boundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the trans-boundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of trans-boundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
Great Lakes Commission Canada, United States of America	**Joint management** The Great Lakes Commission is a bi-national public agency dedicated to the use, management and protection of the water, land and other natural resources of the Great Lakes-St. Lawrence system.
Yukon: http://www.ijc.org/en/home/main_accueil.htm	
International Joint Commission (IJC) Canada, United States of America	**Joint management, border issues** The International Joint Commission is an independent bi-national organisation established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions. In particular, the Commission rules upon applications for approval of projects affecting boundary or waters and may regulate the operation of these projects; it assists the two countries in the protection of the trans-boundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of trans-boundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.
River Basin Organisations in South America	
Amazon	

The contracting parties of the Organisation of the Amazon Cooperation Treaty (OTCA) Brazil, Peru, Bolivia, Colombia, Ecuador, Venezuela, Guyana, Suriname, French Guiana	**Water quality, economic development, joint management** OTCA has agreed to undertake joint actions and efforts to promote the harmonious development of their respective Amazonian territories in such a way that these joint actions produce equitable and mutually beneficial results and achieve also the preservation of the environment, and the conservation and rational utilization of the natural resources of those territories
The International Commission on Limits and Waters between Mexico and Guatemala (CILA) Guatemala, Mexico	**Water quantity, border issues** The Commission has the authority to advise the governments of the two countries concerning border issues, to conduct investigations, and to develop works that have been previously approved by the two governments. The Commission also has the authority to develop projects concerning the equitable use of international waters for the benefit of both countries.
La Plata (Del Plata) **http://rosenberg.ucanr.org/documents/argentina/Pochat%20FINAL.pdf**	
Joint Commission of the Parana River (COMIP: Comision Mixta del Rio Parana) Argentina, Paraguay, Brazil?	**Economic development, joint management, technical cooperation/ assistance** The Parana forms an international sub-basin within the La Plata River Basin. COMIP was agreed to by both Paraguay and Argentina in 1971. This agreement legally binds both countries to a set of laws regulating the shared use of the Paraná River as a natural resource. COMIP functions as an international organisation, as such it is responsible for conducting evaluations in such areas as industrial, agricultural and recreational use of Paraná River.
La Plata (Uruguay subbasin)	
The River Uruguay Executive Commission (CARU: Comisión Administradora del Río Uruguay) Uruguay, Argentina	**Joint management** Set up after the Statute of the River Uruguay entered into force in 1976. CARU directs, regulates and conciliates the objectives and interests of both parties in the shared segment of the river.
Binational Autonomous Authority of the Lake Titicaca (ALT) Bolivia, Peru, Chile	**Water quality, economic development, joint management, technical cooperation/ assistance** The ALT is an entity of international public right with autonomy in its decisions and administrations in technical and economic fields; ALT's political functioning is associated with the Peruvian and Bolivian State Secretaries. ALT's General Objective is to promote and conduct actions, programs and projects, to dictate norms of management control and protection of the water resources in the Hydrologic System of the Lake Titicaca, the Desaguadero river, lake Poopo and The Coipasa Salt Lake (TDPS); under the framework of the Master Plan of the TDPS system.
Parana	

Joint Argentine- Paraguayan Technical Commission for the utilization of the water- power from and the improvement of the navigability of the River Paraná at the islands of Yacyretá and Apipé Argentina, Paraguay	**Hydropower** Established by the 'Agreement Between the Argentine Republic and the Republic of Paraguay Concerning a Study of the Utilization of the Water Power of the Apipe Falls'.

National River Basin Organisations

Country: Name	Principal Issues: Description
Murray-Darling **http://www.mdba.gov.au/**	
Australia: The Murray Darling Basin Authority	The Murray–Darling Basin Authority's principal aim is to manage the Basin's water resources in the national interest. The establishment of the MDBA means that a single agency is responsible for planning integrated management of the water resources of the Murray–Darling Basin. In December 2008, MDBA assumed responsibility for all of the functions of the former Murray–Darling Basin Commission. The Authority is made up of six members who are supported by an office of around 300 staff. The Ministerial Council and the Basin Officials Committee play important roles in providing advice and making high level decisions relating to the functions of the MDBA.
Mississipi **River** **http://www.tva.gov/**	
USA: TenesseValleyAuthority	The Tennessee Valley Authority, a corporation owned by the U.S. government, provides electricity for 9 million people in parts of seven southeastern states at prices below the national average. TVA, which receives no taxpayer money and makes no profits, also provides flood control, navigation and land management for the Tennessee River system and assists utilities and state and local governments with economic development.
Chao Phraya http://www.unesco.org/water/wwap/case_studies/chao_phraya/chao_phraya.pdf	

Thailand: Chao Phraya River Basin Organisation	THAILAND'S CHAO PHRAYA RIVER BASIN supplies a major metropolitan region. It covers 160,000 square kilometres (km2) representing 30 percent of the country's total area, and is home to 23 million people. Of these, some 8 million live in the capital city of Bangkok. Unlike Japan and France, however, the country has been slow to adopt a comprehensive approach to reform and legislation. It also cannot afford high-tech solutions to such critical water problems as floods, droughts and pollution. When drought conditions lead to water shortages in Bangkok, the result is over pumping of groundwater and subsequent land subsidence and more flooding. Deforestation in the basin's rural areas leads to flash floods, erosion and landslides. There is hope that the newly created River Basin Committees will bring about a more equitable sharing of the resource and that participatory approaches will lead to wiser governance.

Annex 15: A Review of current NBI agricultural functions

DEFINING NBI CORE AGRICULTURE FUNCTIONS

Task Two

A Review of the Current NBI Institutional Structure Related to Agricultural Functions

Written by Anton Earle and Ana Cascao of SIWI

Executive Summary

This component analyses the past and current agriculture-related functions that have been performed by the Nile Basin Initiative (NBI) and its subsidiary institutions – ENSAP (Eastern Nile Subsidiary Action Programme) and NELSAP (Nile Equatorial Lakes Subsidiary Action Programme). The analysis shows that there have been some achievements, namely at the subsidiary level, and that the major achievement has been the fact that agriculture was included in the regional cooperative agenda of the Nile Basin, an issue that had been always considered as the most controversial and politically sensitive. The analysis also shows that several challenges have been faced by all programs, including those with agricultural functions. This component aims at better understanding those challenges and their political context, in order for the CAF project to avoid similar obstacles. Looking back at the experience of the NBI in the agriculture sector will be relevant to define the potential agricultural functions of the future Nile Basin Commission, regardless of the design to be adopted by the member states.

Introduction

The Nile Basin Initiative (NBI), with the opening for signing of the Cooperative Framework Agreement (CFA) in 2010, has entered an important phase in its evolutionary development towards the establishment of a permanent river basin organisation. As part of this process, various studies and other activities have been initiated to understand better the roles and responsibilities of the future Nile River Basin Commission (NRBC), namely the functions to be performed by the NRBC. One of the institutions under the NBI is the Nile Equatorial Lakes Subsidiary Action Programme (NELSAP), initiated to promote activities in that Lake Victoria sub-basin area. The Regional Trade and Agricultural Productivity (RATP) project of NELSAP has commissioned a study to define the core agricultural functions (CAF) of a future Nile River Basin Commission. This report forms Task Two of the CAF and seeks to describe the current institutional structure of the NBI and its subsidiary programmes in relation to performing agricultural functions.

As described in the Inception Report of the CAF study:

"The output from this task will be based on a desk review of current NBI institutional arrangements. Emphasis will be made on internal linkages and operations of the institutions and their strengths and weaknesses in delivering on their mandates".

This report provides an overview and draws on work developed under the NBI Institutional Design Study (IDS) currently being performed by BRL and SIWI during 2010 and 2011.

The genesis of the NBI in its current form can be traced to the Nile Council of Ministers (Nile-COM) meeting held in Dar es Salaam, Tanzania, in 1999. At this meeting Burundi, DRC, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda committed to establish a transitional cooperative arrangement – the NBI – to be replaced by a permanent river organisation in the future. Eritrea has joined the NBI as an observer member.

Some key organisational milestones in the creation and operationalisation of the NBI help in understanding the current NBI institutional organisation. They notably include (NBI, 2011):

1. **1997.** Establishment of the D3 Project, the predecessor of the Cooperative Framework Agreement

(CFA). Creation of a Panel of Experts (PoE) constituted by legal experts from all riparian states to initiate negotiations for the establishment of the institutional and legal framework.

2. **22 February 1999.** Nile-COM meeting in Dar Es Salam. Endorsement of transitional institutional arrangements and adoption of the Policy Guidelines for the Nile River Basin Strategic Action Programme (NRBSAP) prepared by Nile-TAC. Establishment of the NBI as the transitional arrangement for regional cooperation in the Nile Basin.

3. **June 1999.** Nile-SEC began operations in Entebbe, Uganda, in June 1999 and was officially launched on 3 September 1999.

4. **4-5 August 2000.** Nile-COM meeting in Khartoum. Decision to invest the Nile-SEC with legal capacity to receive and administer grant funding on behalf of NBI member States.

5. **2000:** Approval of the Portfolio of the Shared Vision Programmes (SVPs), including one specific on agriculture issues (Efficient Water Use for Agriculture –EWUA).

6. **25 June 2001**: First ICCON (International Consortium for Cooperation on the Nile) meeting, involving several bilateral and multilateral donors. $140 million pledged for funding NBI programs, in particular the SVP activities.

7. **14 February 2002.**Nile Basin Initiative Act signed. Nile-COM meeting in Cairo. Decision to invest NBI, on a transitional basis pending conclusion of the Cooperative Framework Agreement (CFA), with legal personality to perform all functions entrusted. Decision to establish and operate the subsidiary action programmes – ENSAP and NELSAP Management Units (future ENTRO and NELSAP-CU).

8. **2002.** The Government of Uganda granted formal legal status to Nile-SEC by enacting "The Nile Basin Initiative Act, 2002¨.

9. **11 December 2002:** Declaration signed by the Ministers of Water Resources of Federal Democratic Republic of Ethiopia, Arab Republic of Egypt and the Republic of Sudan, to establish and operate the Eastern Nile Technical Regional Office (ENTRO), whose headquarters are located in Addis Ababa, Federal Democratic Republic of Ethiopia. ENTRO is in charge of the implementation of the eight ENSAP projects, some of which include agricultural components. ENTRO acquires legal personality.

10. **2003:** Establishment of the Nile Basin Trust Fund (NBTF), at the request of the Nile-COM, as the preferred mechanism to administer and harmonise donor partner support pledged to the NBI in the ICCON meeting in 2001. This multi-donor trust fund is administered by the World Bank on behalf of all donors who contribute to the fund to be used in the NBI programmes and activities.

11. **2004:** The 2004 headquarters agreement provides NELSAP-CU with legal personality.

12. **2004-2005:** Launching of the Shared Vision Programmes (SVPs), based on the several capitals of the Nile Basin States.

13. **June 2007:** Conclusion of the CFA negotiations – preparation of a final draft CFA agreement for political consideration of the heads of state of the Nile riparians.

14. **2008-2009:** Phase out of the Shared Vision Programmes (SVPs).

15. **End of 2008:** Launching of the Institutional Strengthening Project (ISP), aimed at strengthening the relationships between the NBI institutions and projects, as well as preparing the institutional transition from the NBI to the Nile Basin Commission (NBC). Models for the future institutional structure (and its functions) of the NBC are being studied under the ISP auspices.

16. **May 2010:** Opening of the Cooperative Framework Agreement (CFA) to signature. Five countries have signed. Burundi would sign later in February 2011. Three countries have not yet signed: Egypt, Sudan and Democratic Republic of Congo.

17. **May 2011:** CFA Agreement open for ratification by signatory countries

Over time, the NBI and its subsidiary institutions have become more institutionalised, assuming responsibility for a large number of projects and studies in the different sub-basins. It can be said that many of the functions the NBI performs today are akin to those performed by other (fully constituted) River Basin Organisations (RBOs). The worn aphorism that *form follows function* is applicable to RBOs. Countries provide a mandate for an RBO, outlining the various functions the organisation is expected to perform. It is important to remember that RBOs respond to the needs of their clients – i.e. the member state governments representing the citizens of those respective states, including those living in the basin as well as other parts of the country. Countries delegate responsibility for the performance of a set of core functions to an RBO. The use of the term "core" function is used differently by different persons and in different documents. In this report it means those functions that are essential to maintain the institution and for the delivery of its mandate and without which the organisation would cease to be effective.

Thus the institutional architecture of NBI reflects the functions it carries out. The various components of the NBI will be described briefly, along with a summary of their functions. The NBI's "Policy Guidelines for the Nile River Basin Strategic Action Programme" (NBI, 1999) presents the main objectives of the NBI as:

1. To develop the water resources of the Nile Basin in a sustainable and equitable way to ensure prosperity, security and peace for all its peoples;
2. To ensure efficient water management and the optimal use of the resources;
3. To ensure cooperation and joint action between the riparian countries, seeking win-win gains;
4. To target poverty eradication and promote economic integration;
5. To ensure that the program results in a move from planning to action.
6. In an effort to achieve these objectives a Strategic Action Programme was agreed on, and consisted of two interlinked components:
7. Eight basin-wide **Shared Vision Programmes** (SVPs), which main goal had been to build confidence and capacity across the basin and;
8. Two **Subsidiary Action Programmes** (SAPs), which main goal had been to identify concrete investments and action on the ground with potential regional benefits, in both the Eastern Nile and the Nile Equatorial Lakes sub-basins.

The SVPs focused on building regional institutions, capacity, and trust, laying the foundation for unlocking the development potential of the Nile, which can be realized through concrete investments (see Figure 1).The SVP consisted of eight basin wide projects financed through grants. SVP programmes and activities had been mainly financed through the Nile Basin Trust Fund managed by the World Bank and, to a smaller extent, through bilateral grants.

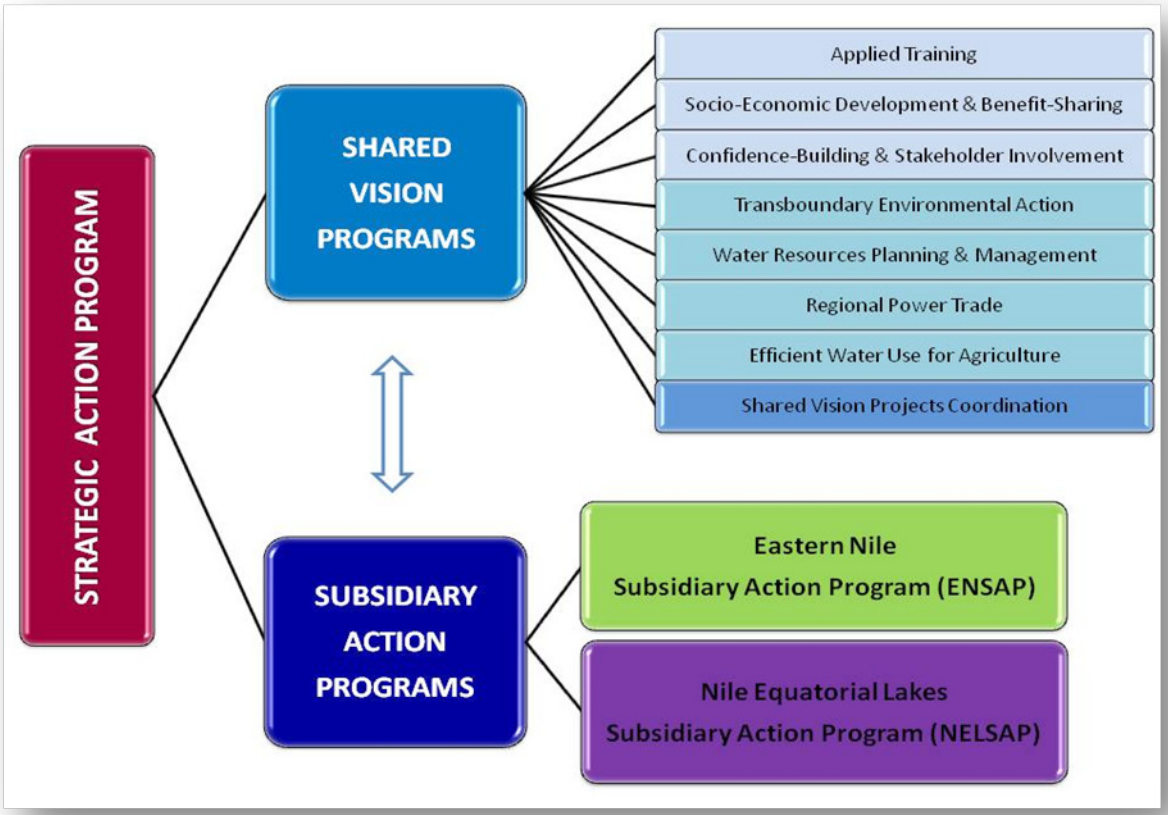


Figure 1: Structure of the Nile Basin Strategic Action Programme (Cascao, 2009)

In effect the SVP built trust amongst the riparian countries, developed capacity and generally laid the foundation for long-term basin management and associated development investments. Of the eight SVP programmes listed in Figure 1above only the Water Resources Planning (only the DSS component) and Management and the Regional Power Trade ones are still running, because its mandate have been extended. All the others have phased out in 2008/2009, and its products were expected to be streamlined in the ISP. The SVPs has resulted in gains made in three key areas:

1. Increase in trust, dialogue and confidence amongst basin stakeholders;
2. Enhanced institutional and technical capacity in the basin; and
3. Promotion of a basin-wide approach to the management and development of the basin resources (Cascao, 2009).

In support of the basin-wide vision aimed for under the SVP, the two SAPs were formed to identify development projects with tangible benefits for the region and the countries in their respective parts of the basin (NBI, 2010). To manage the subsidiary programs and their functions, two institutions were established: the Eastern Nile Technical Regional Office (ENTRO), based in Addis Ababa - Ethiopia and the NELSAP–Coordination Unit (NELSAP-CU), based in Kigali - Rwanda. The main role of these two institutions is two-fold:

1 – to identify projects with the regional benefits and carry out pre-feasibility and feasibility studies; 2 –to prepare for implementation a portfolio of investment projects, including hydropower, irrigation and multipurpose projects – see Figure 2(Cascao, 2009). According to its scope, technical or political complexity and funding availability, the different ENSAP and NELSAP projects have evolved at different paces and show different levels of achievement.

Figure 2: The two SAPs and associated projects (Cascao, 2009)

Thus a simplified snap-shot of the NBI is conceived as shown in Figure 3 below, consisting of the two sub-basin institutions and their associated programmes and governance structures and then also the basin-wide entities.

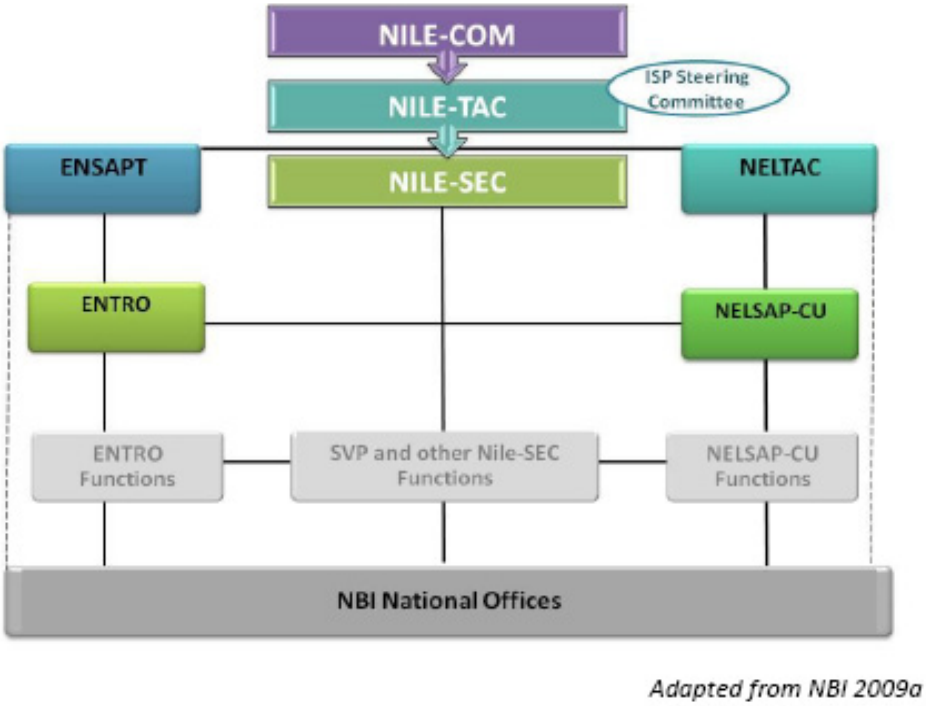


Figure 3: Simplified schematic of the NBI (NBI, 2011)

The various programmes and projects and organisations are connected and interact with each other through several channels. Each of the three implementing organisations – Nile-SEC, ENTRO and NELSAP-CU – is headed by a political body (or Council of Ministers, thus Nile-COM, ENCOM and NELCOM respectively). These "COMs" are responsible for ultimate decision making in each of the organisations, however they are advised by the technical committees (Nile-TAC, ENSAPT and NELTAC respectively).In brief, and according to the Nile Basin Act, the Nile-COM is the highest decision-making body in the Nile Basin cooperation, and its mandate is to oversee the NBI projects portfolio and provide overall guidance on policy matters. The Nile-TAC is the responsible for reviewing the NBI projects portfolio and to provide technical advice to the Nile-COM.

ENTRO reports to the Executive Director (ED) of Nile-SEC as a professional courtesy and to the Head of Strategic Planning and Management on ISP related affairs, but to ENCOM via ENSAPT on other programs and projects under its management. The ENTRO ED is ultimately accountable to ENCOM via ENSAPT. NELSAP-CU reports to the ED of Nile-SEC, and the Regional Coordinator of NELSAP is ultimately accountable to the ED of Nile-SEC, but reports to the Head of Strategic Planning and Management on ISP related affairs, and to NELCOM via NELTAC for other regional projects (NBI, 2011). Added to the above scheme are the NBI national offices in each of the basin countries – promoting coordination with national agencies.

The institutional architecture of the NBI is presented in Table 1 below, capturing the main elements of the various organisations comprising the NBI, some of their functions and modes of operation.

That is followed by Table 2 which presents an overview of the functions performed by the NBI, both currently as well as potential future ones. Note that the data presented in both tables are based on the assessments made by the BRLi-SIWI consultancy team on the IDS and have not yet been endorsed by NBI.

Table 1: Institutional Architecture of the NBI (NBI, 2011)

Mandate	**Scope**	To achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.
	Objectives	NBI provided a *transitional* cooperative mechanism with two functions: 1 - to foster confidence, trust and a shared vision among riparian states and build an enabling environment for investment; 2 - to identify cooperative development opportunities to realise physical investments and tangible results (i.e. action on the ground in the fields of agriculture, energy, fisheries, multipurpose, etc). Functions of the NBI would end once the transition arrangement would be replaced by a *permanent* cooperative arrangement.
	Devolution	No devolution of power to the NBI Secretariat – decisions are subject to Nile-COM's political decisions.
Institutional Structure	**Secretariat role**	Overall responsibility for project delivery on behalf of the Nile countries through Nile-Com and Nile-TAC, and ensure integration, coordination and information-sharing between NBI institutions and programmes (as defined in the NBI Act, but at the Secretariat ended playing more a facilitating role than a coordinating role).
	Organisational form	Nile-COM (political decision-making body: ENCOM+NELCOM): oversees portfolio and provides overall guidance on policy matters; Nile-TAC (technical body; ENSAPT + NELTAC): reviews NBI projects portfolio and provides advice to the Nile-COM; Nile-SEC (executive body): coordination of NBI programs (including between different NBI projects, namely SVP and SAP programs); ENTRO and NELSAP-CU: subsidiary institutions of the NBI, executive arms of ENSAPT and NELTAC; NBI National Offices: national arms of the NBI.
	Technical task teams	NBI implemented the Shared Vision Programmes (SVP), with technical task teams. Currently, the Institutional Strengthening Project (ISP) and the remaining SVP Water Resources Development Project have their own technical task team. ENTRO and NELSAP-CU also implement various similar projects with their own technical task teams.
	Subsidiarity	The principle of subsidiarity is a guiding principle in the NBI architecture. From the beginning of NBI, two Subsidiary Action Programs (SAPs) were defined - ENSAP for Eastern Nile and NELSAP for Equatorial Nile (plus executive arms: ENTRO and NELSAP-CU). The function of SAPs has been to identify the potential cooperative investment projects (agriculture, hydropower, multipurpose, etc) for each of the two sub-basin complexes. "The country Offices, currently under restructuration, will also facilitate the respect of the principle of subsidiarity when the management of NBI projects should be closer to the national level."
	Stakeholders	NBI had been often criticised for being a mainly inter-governmental organisation that failed to involved other stakeholders. However, the CBSI programme directly, and indirectly other NBI programmes, have promoted the involvement of other non-governmental stakeholders in NBI activities. The Nile Basin Discourse – a regional platform of civil society – is increasingly present in the NBI the meetings, workshops and studies.

Rules of Procedure	**Operational**	Decisions in the Nile-COM made by consensus. However, a "two-thirds majority" has been introduced in the Nile Cooperative Framework Agreement, opened to signature.
	Coordination	Under the NBI, there is no automatic coordination of national laws, policies or national water/development plans. Namely, several unilateral projects (including hydropower dams and irrigation schemes) have been developed at national level in the Nile Basin without consultation or coordination with the NBI.
	Monitoring	There is not a regional monitoring or database system, but NBI had been working in the development of a Decision Support System (DSS), with the countries sharing the exiting data and information (to a certain extent).
Decision making Mechanisms	**Regulatory**	No regulatory functions
	Enforcement	NBI does not have any enforcement powers, namely because there is not yet a legal and institutional framework in place. NBI is only a transitional arrangement.
	Adjudication	So far consultations and negotiations are with the Nile-COM (the ENCOM and/or NELCOM), then at the national level. No other mechanism in place.
Financial Arrangements	**Transaction costs**	The Nile Basin Trust Fund (NBTF) was created to manage the financial resources allocated to the NBI, and harmonise donor partner support. The Trust Fund is managed by the World Bank.
	Financial contributions	Financial contributions three different sources: the states themselves, external donors through the NBTF, and from external donors in a bilateral basis. Contributions from riparians states is limited (and mainly for operational costs OF Nile-SEC) to and it is usually made of in-kind contributions. The Nile Basin Trust Fund is the main source of financial assistance, and it includes 10 bilateral and multilateral partners. In the first decade of the Nile cooperation, most of the NBTF funds had mainly been used for the Shared Vision programs and operational costs (only 1/3 in the SAPs). The NBI receives financial contributions from 8 other bilateral and multilateral partners outside the NBTF.
	Mobilisation of resources	For the first decade of NBI activities, funds were mobilised during the ICCON (*International Consortium for Cooperation on the Nile*) meeting in 2001. Concomitantly, non-NBTF funds have been also mobilised from diverse donors for the SAP activities and projects.

Table 2: NBI Functions – current and possible (NBI, 2011) – see note at foot of table for colour-coding

RBO Functions	Sub-set of RBO functions	NBI Activities
Policy formation & Cooperation	Develops basin-wide policies for water management	The SVP RPT project provides the countries with tangible results for achieving compatibility in the policy and regulatory environment, establishing common technical operating standards and access rules, and fostering the appropriate framework within which trade can occur. The SVP WRPM project participates to developing effective national water policies and implementation strategies, especially concerning data sharing and data harmonization processes. The NELSAP Regional Agriculture Trade Program (RATP) contributes to lowering barriers to regional trade.
	Cooperation for peace & security	During the last decade, NBI has facilitated peace & security through cooperation of the Nile Basin Countries for optimizing the management of their common water resources. NBI has provided dialogue mechanisms.

RBO Functions	Sub-set of RBO functions	NBI Activities
Strategic Planning	Develops medium to long-term strategic options for basin wide water development and management.	No Centralized Nile River Basin Water Management Plan or Nile River Basin Investment Plan.
	Develops strategic options for sub-basin or regional water development and/or management	The ENSAP JMP1 projects will use the Nile-DSS for planning purposes. The ENSAP Baro-Akobo project will propose multi-purpose development activities. The NELSAP Mara, Sio-Malaba-Malakissy and Kagera Trans-boundary IWRM projects have Established a sustainable framework for the joint management and development of the water resources – enabling environment for cooperation – and are preparing for sustainable development oriented investments (multi-sector, multipurpose)to improve the living condition of the people and to protect the environment.
	Develops strategic options for sector development and/ or management	The SVP RPT project facilitates infrastructure development for power trade by promoting key regional investments, particularly backbone interconnections, in coordination with the SAPs and organising investment seminars, among others. The ENSAP Eastern Nile Power Trade Investment Program promotes Eastern Nile regional power trade through coordinated planning and development of power generation and transmission interconnection and creation of an enabling environment. The ENSAP Irrigation and Drainage Project Supported development and expansion of irrigated agriculture, to improve productivity of small- and large-scale agriculture through improved agricultural water use. The NELSAP LEAF Pilot Project established a sustainable framework for the collective management of the fisheries in the two lakes and prepared an agreed investment plan based on the resources endowments in the basins. The NELSAP RATP enhanced the productivity of agriculture and will develop irrigation strategies. The NELSAP Strategic Sectoral Social and Environmental Assessment of Power Development options is developing a NELSAP Power master Plan to assist the NELSAP riparian countries in selecting best power supply options and regional transmission inter connection.

RBO Functions	Sub-set of RBO functions	NBI Activities
Water Resource Management	Guidance on Management Issues of concern in Nile basin & BMPs	All the SVP projects and the current ISP have provided basin wide guidance on water resources management issues (general or sectoral)
	Coordinates member states re land and water management activities (can include agricultural water use)	Strategic options for the agricultural sector have been proposed, but no concrete application yet.
	Water Allocation/Quota Management	The water allocation/quota issue is still controversial in the Nile Basin.
	Water Use Efficiency	The SVP EWUAP established a forum to assist stakeholders at regional, national and community levels to address issues related to efficient use of water for agricultural production in theNile Basin.
	Water Quality Management	The SVP NTEAP notably dealt with water quality, but this subject appears to be very marginal in the NBI projects.
	Protecting and conserving ecosystems and environment	The SVP NTEAP provided a strategic environmental framework for the management of the trans-boundary waters and environment challenges in the Nile River Basin. The ENSAP Watershed Management Project Established sustainable framework for the management of selected watersheds to improve living conditions of the people, enhance agriculturalproductivity, protect the environment, reduce sediment transport and siltation of infrastructure, and prepare for sustainable development oriented investments. The NELSAP Water Hyacinth Abatement in the Kagera River Basin Project is reducing to manageable levels the infestation of water hyacinth in the Kagera River basin.
	Operational rules and procedures (e.g. flow management)	No possible rules and procedures regarding water quantity (or even water quality) when the water allocation issue is not treated.
	Emergency Measures (floods, spills, droughts...)	The ENSAP FPEW project strengthens the existing capacities of the EN countries in flood forecasting, mitigation and management.
Knowledge Management	Collects and/or collates basin information and manages quality assurance	The SVP WRPM project develops the Nile-DSS, which includes a large information management system. Most of the NBI (SVP and SAPs) projects start with data collation (for instance, the NELSAP RATP project will increase knowledge of agriculture issues in the basin countries).
	Develops & Operates Decision Support Systems	The SVP WRPM project develops the Nile-DSS. ENTRO will develop the ENPM. The ENSAP JMP1 projects will use the Nile-DSS for planning purposes.
	Protocols for harmonizing/ sharing data, and KM programs	The SVP WRPM project participates to developing effective national water policies and implementation strategies, especially concerning data sharing and data harmonization processes.
	Research & Expertise	

RBO Functions	Sub-set of RBO functions	NBI Activities
Communication	Manages public information/ awareness programs	SVP projects often includes basin wide awareness activities.
	Manages public consultation/ participation program	The Nile Basin Discourse is increasingly involved in NBI activities. However, despite remarkable progresses, its decision power and influence are still estimated to be low today.
	Communicates/ representation with international community	NBI participates in some international water events (World Water Week in Stockholm, World Water Forum…) and meets the development partners at least twice a year.
Capacity Building	Builds national capacity (internal, related professional, related institutions)	The SVP ATP aimed to improving water planning and management in the Nile basin through capacity building. Other SVP projects also often included the provision of forums to discuss development paths.
	Implements Outreach Programs (to educate and inform public, sectors, & related professionals)	The SVP CBSI project aimed to develop full confidence in regional cooperation under the NBI and to ensure full stakeholder involvement from the basin countries in the NBI and its projects. The SVP SDBS project built a network of professionals from economic planning and research institutions, technical experts from public and private sectors, academics, sociologists, and representatives from civic groups and NGOs from across the basin to explore alternative Nile development scenarios and benefit-sharing schemes.

RBO Functions	Sub-set of RBO functions	NBI Activities
Water Resource Development	Mobilizes resources for water resources development projects	NBI (and its SAPs) is only entering now into a development investment phase. Resources mobilization will be an important function of the NBI (or its successor) in the short term future.
	EIA (develop criteria – harmonise, develop criteria, supervision)	The ENSAP Baro-Akobo and JMP1 projects will include EIA studies. ENSAP projects (irrigation and drainage project for instance) have proposed some EIA to be implemented by the member States.
	Mitigation measures for trans boundary impacts (including EIA.)	The ENSAP Baro-Akobo and JMP1 projects will include mitigation measures
	Safeguard measures such as relocation…	The ENSAP Baro-Akobo and JMP1 projects will include safeguards measures
	(Pre) Feasibility and design studies of specific developments	The ENSAP Baro-Akobo and JMP1 projects will includes FS and design studies. The ENSAP Ethiopia-Sudan Transmission Interconnection project facilitates, through high voltage transmission line, cross-border power trade between Ethiopia and Sudan, and thus optimise utilization of existing and planned generation capacity.
	Engineering, Procurement & Construction	The ENSAP Baro-Akobo and JMP1 projects should lead to multi-purpose infrastructure development. The NELSAP LEAF pilot project provided small-scale investments at the community level to improve protection of water catchment areas. The NELSAP Mara, Sio-Malaba-Malakissy and Kagera Trans-boundary IWRM projects will implement small scale invests in the river basins focusing on confidence building. The NELSAP Rusumo Falls Development project will develop the multi-purpose use of water and energy resources with investment in sustainable livelihoods within the Kagera.
	Owns, Operates or Manages Infrastructure (e.g. dams)	While the subject has been studied in some SAPs projects (NELSAP Rusumo Falls Development project for instance), the infrastructure operation is still at the options stage today.

Blue highlight *are main functions of current and past NBI and* ***pink highlight*** *are secondary functions (Consultant's estimation). When only future activities are shown to illustrate the potential functions of NBI, no highlight colour is used. The* ***green highlight*** *sections have direct (or possible) links to agricultural development in the basin.*

To some degree the sub-basin entities, ENTRO and NELSAP-CU, could be characterised as being more engaged with the development functions of an RBO. In contrast, the Nile-SEC is engaged primarily with the management functions of an RBO. In reality, as can be seen in Table 2 on the NBI Functions, the organisations have considerable overlap in the performance of their functions and mandates with some projects falling directly under the control of the Nile-SEC and the sub-basin organisations at times performing more of the management related activities (NBI, 2011). The discussion on the balance between management functions and development functions of a future Nile Commission is one which will be brought up later in this document. In Table 2 the current NBI functions (or completed projects) with an explicit involvement in agricultural development or management are highlighted. The next section will discuss these in more detail and refer to Table 2.

Existing and Possible Links to Agricultural Functions

The items highlighted in the green colour in Table 2 above are by no means the only functions of NBI which have an impact on agriculture. Many of the other functions have an implicit impact – by laying the foundation for future agricultural development and agriculture trade in the Nile basin. For example, the construction of the Nile Decision Support System (DSS) while not explicitly about agricultural development would be highly suited to planning options and generating scenarios on future agricultural development in the basin. Likewise the various projects dealing with regional electricity generation and transmission lines may contribute to the viability of planned large-scale irrigated agriculture in the basin by making pumped supply schemes possible.

This component focus on the past and current programs linked with agriculture functions. It will only focus on the NBI/SAP projects that are directly linked to agriculture functions, in order to understand the successes achieved and the obstacles faced by these projects. By doing so, it is possible to understand the potential challenges that the Nile Basin Commission is expected to face when planning and assuming agricultural functions.

The projects with an explicit agriculture function to be analysed in this component, are:

1. The SVP 'Efficient Water Use for Agriculture project (EWUAP)'

2. And the SAP projects consisting of:

    a. ENSAP's Irrigation and Drainage project

    b. ENSAP's Watershed Management Project

    c. NELSAP's Regional Agriculture Trade and Productivity Project (RATP)

Efficient Water Use for Agriculture Project (EWUAP)

Of all the Shared Vision Programmes of the NBI, the EWUAP was the one dealing specifically with agriculture issues. The objective of this SVP project was "to establish a forum to assist stakeholders at regional, national, and community levels to address issues related to efficient use of water for agricultural production in the Nile Basin" (NBI, 2010).

The desired outcomes for the EWAUP included:

a) The establishment of regional dialogue, the dissemination of best practices, and the enhancement of awareness and national capacity for water harvesting, community-managed irrigation and public and private-managed irrigation and;

b) The provision of national level support for agricultural and irrigation policy development.

The key change being fostered was the promotion of approaches and technologies to use agricultural water more efficiently through technological innovation and policy, legislation and institutional reforms. The beneficiaries of the project included the professionals in the field of agricultural water, the policy makers and professional institutions, research centres, NGOs, and private organisations (from EWUA website). In brief, the project was to enhance capacities, strengthen cooperation, and develop practical guidelines for sustainable and efficient use of water for agriculture. The first phase of this project was closed in 2009, and there was no extension for a second phase.

The project has operated basin wide and was to contribute to the institutional foundations for improved agricultural production in the basin (NBI, 2009). The project was expected to lay the foundations for the more development-oriented projects associated with the SAPs. The project management unit (PMU) was located in Nairobi, Kenya, but with operations in all nine basin states. The main task of the Nile-SEC was to provide guidance, supervision, monitoring and evaluation; and facilitate coordination with other SVP projects and the SAPS (2009 s. 14). In 2008, EWUAP have also considered that one of the priorities of the project would be to: identify and implement joint activities with the two Subsidiary Action Programs (SAPs).

The achievements of the project included various reports completed and disseminated on the following topics (Cascao, 2009):

1. Overview of Agricultural Water in the Nile Basin (baseline assessment)
2. Best Practices in Water Harvesting and Community-managed Irrigation
3. Large-scale Irrigation in the Nile Basin

In terms of other achievements, EWUA have also paved the way to enhance knowledge in agricultural practices at the small, medium and large scale. For example, in 2007 training courses on small-scale farming and water harvesting were held at various locations in the basin and a study tour to India was conducted (for ENTRO stakeholders).In 2007, EWUAP also organised a workshop for all Nile riparians on Best Practice Sites for Water Harvesting (WH) Community Managed Irrigation (CMI), and Public-Private Managed Irrigation (PPMI). In 2008, EWUAP organised an inception workshop related to best practices and best practice sites on Large Scale Irrigation (LSI) in the Nile Basin.

Additionally, a draft Memorandum of Understanding (MOU) defining in much broader terms the kind of relationship to be established and the desired linkages between the selected and willing institutions and the NBI or future RBO was prepared and submitted to the NBI-Secretariat for review, endorsement and future use to establish linkages (NBI, 2009). It is not clear what progress has now been made with implementing this MoU.

Some of the challenges identified with the EWUA project include (Cascao, 2009):

1. Mainly consultative tasks have been performed, but little follow-up actions after the training courses and workshops organised;
2. Absence of clear guidelines for future irrigation/agriculture development food trade that could become the basis of a regional agriculture policy for the Nile Basin region;
3. Weak linkages between the EWUA project and the SAP projects with an agricultural component;
4. Agricultural development in the upstream riparians, in particular irrigation, remains politically sensitive and not properly addressed, especially as water allocation has not proceeded;
5. The EUWA project has been downplayed by the countries, and had been among the SVPs with a smaller budget and with few extra resources allocated;

6. Weak communication on the project between the different nodes – this included links between the various organs of NBI, links to the national counterparts as well as links to other sectors (NBI, 2009)

7. The knowledge products from the project (reports, studies, guidelines etc.) are not readily available. For instance it is not possible (in May 2011) to download them from the NBI website.

The project has now closed but has left a legacy of promoting a basin-wide approach to the planning and development of agriculture in the basin. Supposedly, the outcomes and products of the Project have been streamlined to the activities of Nile-SEC and the SAPs, but it remains unclear how influential they can be in the implementation of future agriculture projects, that often are 'national' projects and not regional-based ones.

The challenges associated with the EWUAP, identified above, could become weaknesses of a future Nile Commission's agriculture functions. And since the EWUAP was closed in 2009, other new challenges can be identified, namely the ever increasing phenomenon of foreign direct investment, including the leasing of several thousands of hectares of land for commercial agriculture, in several of the Nile riparians (e.g. Sudan, Ethiopia, Kenya and Tanzania). Old and new challenges need to be addressed and responded to with input from a broad variety of stakeholders in all the basin states.

ENSAP's Irrigation and Drainage project

ENSAP has considered that food insecurity, deepening rural poverty, and population pressures are among the major development challenges in the Eastern Nile region, and that this project on 'Irrigation and Drainage' was designed in order to address these challenges. The Eastern Nile Council of Ministers (ENCOM), realizing that the development of irrigation and intensification of existing agriculture offers the potential to increase food security, enhance agricultural productivity and improve livelihoods in the sub-region, decided in March 2001 that funding should be sought to advance studies of promising irrigation and drainage sites to feasibility study and design level (from ENTRO website).

The objective of the 'Irrigation and Drainage' project is "to support the development and expansion of irrigated agriculture in the Eastern Nile region, and improve productivity of small and large-scale agriculture through efficient water use" (ENTRO, 2009). The project has a more on-the-ground development approach to it than the SVP projects, with direct goals of expanding irrigated agriculture in the sub-basin, although for the moment is still at the small-scale, at least compared to great existing and potential for irrigation in the Eastern Nile Basin, in particular in Sudan. All three ENSAP countries (Ethiopia, Sudan and Egypt) have participated in the project.

So far, the project has supported and facilitated the identification of 100,000 hectares of fast-track irrigation development projects in each of the three countries for feasibility studies (of this, 20-25,000 ha per country for immediate implementation). The projects had later been implemented in the countries by national authorities, in particular in Ethiopia (irrigation in Lake Tana), Egypt (West Delta Irrigation Rehabilitation) and Sudan (irrigation in Upper Atbara). Projects in Ethiopia and Egypt under implementation and financed by World Bank, while Sudan's component had been financed by the government.

The other most important achievement of this ENSAP project had been the development Cooperative Regional Assessment(CRA), which are joint assessment and analysis of opportunities for irrigation development (projects and polices) with multiple regional benefits (inception and analysis completed). The Cooperative Regional Assessment (CRA) for the 'Irrigation and Drainage' project had been conducted. The goals of the CRA were:

1. to prepare guidelines for the identification and selection of irrigation and drainage projects presenting regional benefits;

2. undertake trans-boundary analysis to identify the challenges and opportunities and assess the need for institutional and legislative reforms;

3. and to propose a cooperative framework and a common agenda on irrigation development in the Eastern Nile Basin for the medium and long term.(ENTRO, 2009).

The most relevant and important feature of the CRA, is that is a study that for the first time includes a "no-borders"/trans-boundary analysis to identify challenges and opportunities for irrigation development and propose mechanisms for regional cooperation in this particularly politically-sensitive area of cooperation.

The fact that development of agriculture upstream, in particular irrigation, had always been a contentious between the Eastern Nile riparians, this project was considered ambitious and several challenges expected. Some of the challenges associated with the project include (Cascao, 2009):

1. Not always regional dimension was present. For example, the fast-track projects were nationally, rather than regionally, identified and implemented, thus have remained limited in their ability to lead to basin-wide planning or benefits;
2. So far, projects identified and implemented are still of very small-scale (so far 20,000ha per country) in the context of the Basin's huge potential for irrigated agriculture;
3. Irrigation development in Ethiopia is still one of the most controversial and sensitive issues in the Eastern Nile Basin, because of potential impacts on the Nile flows and the lack of agreement on water allocations between the three countries; and the project had not been able to overcome this political intricacies;
4. The major challenges in the Eastern Nile region remain: first, to assess availability of water for irrigation projects in the EN Basins – Blue Nile, Baro-Akbo-Sobat and Tekeze-Atabara (including cooperative and unilateral projects) is still a difficult if not impossible task; and, second, to identify or prioritise or negotiate water allocations among countries or agriculture projects is still kept out of the cooperation agenda, taking into account the strong objections from Egypt towards development of irrigation in the upstream catchments.

ENSAP's Watershed Management Project

The 'Watershed Management Project' of ENSAP, although not directly related to agriculture development, it is intimately linked to the improvement of environmental and social conditions of agriculture production. According to ENTRO the "threat posed by watershed degradation-land degradation and soil erosion- on the livelihood of millions of people residing in the region is grave. Land degradation and soil erosion also are resulting in economic damage by shortening the life span of reservoirs, siltation of irrigation channels and damaging HP generation infrastructure downstream. A comprehensive, multi-sectoral and integrated approach is required to addresses the root causes" (ENTRO, 2009).

The objective of the Watershed Management project is to "improve standards of living of the population living within selected watersheds in the Eastern Nile region, decrease population pressures and increase land productivity so that sustainable livelihoods and land use practices can be secured for the target populations" (ENTRO, 2009).

Some of the project achievements had been: the preparation of pre-investment projects and appraisals of fast-track projects. Three Fast-Track Projects in sub-watersheds in Ethiopia, Sudan and Egypt have been identified, although only in Ethiopia implementation has started. But the most relevant of the project achievements is that an Eastern Nile Knowledge Base has been generated jointly and expanded. The Knowledge Base components, known commonly as Cooperative Regional Assessments (CRA), are the first of their kind in East Nile to provide a comprehensive and system wide analysis of the watershed situation and designed a long term joint program to address the challenges facing sustainable watershed management. The CRAs consist of a series of trans-boundary, EN collaborative analytic studies including documents and projects plans:

1. Cross border Watershed characteristics identified,
2. Trans-boundary distribution of environmental, social and economic negative/positive impacts analysed,
3. Opportunities for regional cooperation identified,
4. Degree of cooperation and process required for effective implementation of the long term watershed management programme formulated.

Despite the achievements mentioned above, the ENSAP's Watershed Management Project has faced some serious challenges (Cascao 2009):

1. Projects were mainly identified and implemented on a national basis, and their scale is so small that it is difficult to show the expected regional benefits;
2. Riparian states have only afforded the project a low political priority;
3. Need to reinforce the focus and importance of agriculture and land-use practices within watershed management policies ;
4. The major challenge had been to raise funding for CRA projects that require large-scale investment, but have little commitment from riparians or donors in comparison to other SAP projects (as for example the Hydro power-related projects, that by default are considered politically less sensitive)

These challenges are particularly important to be taken into account, because any new agriculture policy to be developed under the NBI or the Nile Basin Commission might face very similar challenges, such as issues related to politically sensitive, but also of scale of implementation, distribution of benefits and costs, political involvement, funding, among others.

NELSAP's Regional Agriculture Trade and Productivity Project (RATP)

The project aims to promote a core agricultural agenda for NBI, improve crop productivity (irrigated and rain fed) and promote regional trade in agricultural products. The project is now in its second phase (NELSAP-CU, 2009).

According to the NELSAP website "in its efforts to promote poverty alleviation, sustainable economic growth and the reversal of environmental degradation, the NBI through its implementation agency, Nile Equatorial Lakes Subsidiary Action Programme, initiated the Regional Agricultural Trade and Productivity project (RATP) in 2006". Financing was obtained in April 2008. The project is to be implemented in two phases: A preparatory phase of about 15 months and an implementation phase of 30 months. The present preparation phase is supported by a grant from Canadian International Development Agency (CIDA) managed by the World Bank under the Nile Basin Trust Fund.

Countries participating in the RATP are Burundi, DRC, Egypt, Kenya, Rwanda, Sudan, Tanzania, Uganda and Ethiopia (NELSAP-CU, 2009).

Phase One of the RATP has been completed, with the main outputs related to activities to identify and further elaborate on opportunities for regional trade and productivity increases.

Challenges associated with the project include (Cascao, 2009):

1. Still missing a scoping study on needs and opportunities for regional agriculture projects,
2. There is a lack of data on irrigated as well as rain fed agriculture in the region,
3. The definition of NBIs core agricultural functions remains unclear – hence the current project (the subject of this report) which aims at rectifying this situation.

Conclusions

The projects discussed above all form valuable foundations upon which a future Nile Basin Commission can build, in terms of agriculture functions. In this sense, the fact that projects have preceded the formation of a permanent RBO is something of an advantage as the steps toward a basin wide development vision taken by the projects will contribute to the functions of the future RBO. It is instructive to consider the achievements of these projects, although they have been very limited – but even more important is to analyse the challenges and weaknesses associated with them. These challenges and weaknesses will impact just as much on a future RBO – irrespective of its institutional design – and as such they need to be understood. Namely the challenges related to the development of irrigation in the upstream countries need to be analysed at the light of the political and legal circumstances that influence and determine the regional cooperation and development process in the Nile Basin. To ignore these challenges means an anticipated failure to address agriculture development in the basin.

The balance between the management and the development functions of a future RBO also needs to be considered. As can be seen in Table 2 showing the NBI Functions; the current institutional setup has led to a range of activities in both these areas. In some ways it is less important to decide on the balance between management and development functions of a future RBO and indeed more important to consider which functions need to be performed in the basin – irrespective of which institution carries them out.

The implication is that a lighter-weight RBO (one of the options being considered under the IDS) would concern itself mainly with the management type of activities. These would include, but are not limited to, for example:

1. Corporate management
2. Financial management - cost recovery
3. Monitoring and modelling (water and natural resources data and socioeconomic and legal developments)
4. Pollution control/monitoring
5. Information and communication
6. Stakeholder engagement
7. Conflict resolution
8. Visioning and trust building

The development functions would then be carried out by other institutions – either nationally by government agencies (or civil society and the private sector) or by the sub-basin organisations in the Eastern and Equatorial regions. The development functions include (but are not limited to):

1. Strategic basin planning (input to regional planning)
2. Policy and strategy development (economic, social and environmental issues)
3. Water allocation (to sectors and/or users)
4. Pre investment work at multi-country level
5. Support to in-country development planning
6. Transaction advisory services
7. Operation and management of joint infrastructure

In the long run most of the above functions – both management as well as development – would need to be performed at the basin level. At present, most of the functions associated with development are performed only at the national level – that is where development plans are initiated and implemented, water allocated to uses and users and where the infrastructure is built (including construction and

maintenance of irrigation canals). Due to the existence of the sub-basin programmes (ENSAP and NELSAP) some of these functions are happening at the next level up – as part of the basin wide institutional framework. If one assumes that most of these functions need to be performed irrespective of the institutional model chosen for a future RBO then the important question to ask is what the added value of a basin wide institution would be. The benefits derived from basin wide cooperation are well known, summarised most succinctly by Sadoff and Grey – benefits *to* the river, benefits *from* the river, benefits *because of the* river and benefits *beyond* the river. The current project will explore further some of these benefits associated with various institutional models.

Works Cited

Cascao, A E. 2009.*Institutional Analysis of the Nile Basin Initiative: What worked, what did not work and what are the emergent instituional options?* Colombo : IWMI, 2009.

ENTRO. 2009. Water Resource Management Project Summary. *ENSAP Overview.* [Online] 2009. http://ensap.nilebasin.org/index.php?option=com_content&task=view&id=43&Itemid=129.

NBI. Policy Guidelines for the Nile River Basin Strategic Action Programme.*1999.* Entebbe : NBI, Policy Guidelines for the Nile River Basin Strategic Action Programme.

—. 2011.*Component One Report - Institutional Diagnosis and Options.* Entebbe : NBI, 2011. A part of the Institutional Design Study performed by BRLi-SIWI.

—. 2009.*INTERNAL EVALUATION OF EFFICIENT WATER USE IN AGRICULTURL PRODUCTION.* Entebbe : NBI, 2009.

—. 2010. NBI Projects. *NBI.* [Online] 2010. http://www.nilebasin.org/newsite/index.php?option=com_content&view=section&layout=blog&id=10&Itemid=71&lang=en.

NELSAP-CU. 2009. NELSAP Projects Overview. *NELSAP.* [Online] 2009. http://nelsap.nilebasin.org/index.php?option=com_content&view=section&id=11&Itemid=124.