

NEEDS ASSESSMENT AND CONCEPTUAL DESIGN OF THE NILE BASIN DECISION SUPPORT SYSTEM CONSULTANCY

NILE BASIN DECISION SUPPORT SYSTEM

FINAL INCEPTION REPORT

Main Report

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consulting & knowledge development GmbH



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Table of Content

1	Introduction	4
2	Update on progress	6
2.1	Background	6
2.2	Update on Progress of Work	6
3	Process and Findings of Country Assessments.....	8
3.1	Preparation of the country assessment.....	8
3.2	Methodological tools applied	8
3.3	Experiences in the implementation of the country assessments.....	10
4	Issues identified by key stakeholders.....	11
4.1	Burundi	11
4.2	Democratic Republic of Congo.....	11
4.3	Egypt	12
4.4	Ethiopia	13
4.5	Kenya	13
4.6	Rwanda	14
4.7	Sudan	15
4.8	Tanzania.....	16
4.9	Uganda.....	17
5	Consequences for the remainder of the assignment	19
6	The Nile Basin Initiative.....	20
7	Summary Review of Transboundary Issues.....	22
7.1	Agreements that are already in Place	22
7.2	Initiatives that are already planned or in progress.....	24
7.3	Unresolved challenges and Opportunities.....	25
8	Executive Summary of Situation Assessment Report.....	27
8.1	Nile Basin framework	27
8.2	Data Availability.....	30
8.3	Water Policy and Reform Process	31
9	Executive Summary of Stakeholder Consultation Plan.....	33
9.1	Introduction.....	33
9.2	Institutional reform processes in the water Sector	33
9.3	Stakeholders identification and selection	34
9.4	Proposed programs for the sub-regional consultation workshops	37
9.5	Proposed programs for national stakeholders consultation workshops	38
9.6	Proposed time schedule for stakeholders consultation missions.....	40
10	Executive Summary of DSS Training Plan.....	41
10.1	Course Structure and Content Description.....	41

10.2	Support tools and material	42
11	Executive Summary of Prototype of Web-based Information System.....	43
11.1	The Goals of the Nile-IS	43
11.2	Statement of Scope.....	43
11.3	Key functions.....	43
11.4	Criteria for success.....	44
12	Preliminary Conceptual Framework for the Nile Basin DSS.....	46
12.1	Thematic Categories of Issues.....	46
12.2	Different Phases of the Development of the DSS (From Inception to Conceptual Design)	51
13	Appendix 1: Itineraries of National Assessments.....	53
14	Appendix 2 - Updated Workplan	54
15	Appendix 3 - Proposed Agenda for Regional Workshop	56

1 Introduction

The Consultant's teams visiting different countries during the Inception Phase all experienced great interest and full appreciation. Despite the tight time schedule, meetings in each country were convened and a great wealth of information was assembled. If for reasons not all information could be given or conclusions could be made during the interviews, a lot of partners were very helpful and sent further information by e-mail or fax. The Consultant wishes to note that the excellent team spirit developed so far with the Client including the National DSS, is appreciated very much. This spirit is a precondition for the success of the assignment.

The national assessments resulted in the impression that national stakeholders have great interest in jointly developing a regional DSS together with other Nile riparian countries. While there is in general a common understanding for the need of trans-boundary solution on regional and sub-region development issues, the demand for support on issues predominately important for national decision making was more evident than trans-boundary challenges. Countries which are affected by upstream decisions have developed a better understanding of the need for trans-boundary planning than those located at the sources of the headwaters. However, upstream countries are nonetheless finding mutual benefits in cooperation with downstream countries in the Nile Basin. A wider spectrum of increased sub-regional and regional collaboration as jointly agreed in the NBI Shared Vision still needs to evolve out of currently predominant national and short-term interests.

This is why the Consultants' impression is that the interest of stakeholders will fade if in the short- and medium term national needs and priorities are not served as a priority compared to regional and sub-regional objectives. The tension between national, sub-regional and regional interests needs to be further clarified. This aspect needs great attention especially in the DSS development plan as well as institutional and human capacity building programmes. Prevailing national objectives in the short-term perspective will be the base of medium- and long-term objectives (e.g. 10 and 15 years, respectively) for the development further DSS development more and more contributing and promoting regional decision making issues. Most of the decisions are still taken at the national level, but a future DSS has to serve national, sub-regional and regional needs.

As such it is understood that in short and medium perspectives national decision making processes are prioritized by the majority of stakeholders. National demands are very contextual to national programmes and policy agendas. Because the future DSS may not be able to serve all different purposes (due to limitations of spatial and time scales issues as well as modelling capabilities) a process of further prioritization will have to be conducted during the analysis.

During the National Consultations it was understood that stakeholders differ between the hydrographic watershed divides and a wider conception of the Nile basin which also incorporates the special extension of energy grid systems that reach far beyond the hydro-graphic basin boundaries. The interdependency of hydropower potential/production, transmission and consumption as well as its economic transactions should be reflected in the conceptualization of the future DSS.

"Don't start from scratch" has more than once been an advice or plea made during interviews. Countries have established and further established different data processing and modelling procedures, have developed experiences and various capacities and potentials which should be fully utilized. Stakeholder have expressed that the future Nile DSS should make full use of existing institutional and human capacities. Introduction of the Nile DSS need to be in line with national structures and its further development should be well adapted to national reform processes. The Nile DSS should be a pivotal for the development of national capacities. In this

context it needs to be mentioned that two of the visited nine countries, namely Burundi and DR Congo, find themselves in a post conflict situation; an issue which needs special considerations in terms of institutional strengthening and development of human capacities.

As mentioned in another context, the Consultant has felt great interest and support during the National Consultations. The participatory stakeholder process was well appreciated. Expectations and interests of stakeholders are high, a very positive prerequisite for good progress. However, expectation and communication management will become a great challenge throughout the Nile DSS development process to keep an appropriate level of involvement by all parties and ensure maximum level of ownership.

Hydrological monitoring networks are not effectively operational in all riparian countries. Moreover, the availability of data in terms of spatial accuracy and temporal resolution also varies greatly. Hence, the re-establishment of an operational hydrological monitoring network in some countries and further improvement of fragmental networks in other countries needs to receive high priority. The advantages of automatic instruments with teletransmission of data should be considered not just in the light of running a DSS but also for other purposes such as early flood warning systems.

The establishment of interfaces with other information systems is a challenging topic. Interfaces for information systems or models using the following will be beneficial

- Operating in the same domain on the national, sub-regional or regional scale (e.g. rainfall-runoff models);
- In other domains with relevance to a future DSS such as economic models (e.g. electricity trading) or environmental impact models linked to climate change and variability forecasts, etc;
- That are applied on national or sub-national scales with data of other temporal resolutions that are necessary for a Nile DSS.

It needs to be considered that flexibility should be ensured as much as possible. In this way a maximum of already available resources can be utilized. However, it is a great challenge

- To integrate a considerable number of stakeholders from all riparian countries in a participatory development process;
- To appreciate existing national as well as sub-regional activities, models, data banks, etc.;
- To keep the development of the Nile DSS within is well planned time frame that is successfully monitored and followed-up.

It is unnecessary to mention that strong political will by all riparian countries and clear-sighted political leadership is an important pre-requisite keeping the momentum over many years.

This Inception Report is unusual considering the scope and content of traditional inception reports. This report contains a wealth of information from a large variety of sources that were collected by the Consultant before, during and after the National Consultations. More than collecting and summarizing factual information the Consultant analysed information and made references to the specific objective of developing the future Nile DSS. However, further steps in the analytical work have to be reserved for the Analysis Phase, where Stakeholder Consultation Missions as well as Training and Awareness Creation Workshops will be held at both sub-regional levels and repeated in nine riparian countries.

2 Update on progress

2.1 Background

The Nile Basin Initiative (NBI), within the framework of the Water Resources Planning and Management (WRPM) Project, has launched the Consultancy Services: "Needs Assessment and Conceptual Design for the Nile Basin Decision Support System (NBI-DSS) as the first step in the development of the Nile Basin DSS. A Consortium of three firms led by hydrophil GmbH has been contracted to undertake the needs assessment and conceptual design of the Nile Basin DSS.

The main objective of the present Consultancy Service is "to enhance the usefulness of the planned Nile Basin DSS through identification of user needs and development of DSS design to meet those needs".

The Consultancy Service is divided into three distinct phases, namely, the Inception Phase, the Analysis Phase and the Synthesis Phase.

The Inception Phase (Work Package 1-Situation Assessment), has been designed to last for approximately three months (26/07/07-25/10/07) and signals the start of the Consultancy Service. During the Inception Phase, the Consultant is expected to assess the present situation within the Nile Basin in terms of hydrology, diversity and complexity of the different eco-hydrologic and socio-economic sub-systems of the basin, water availability and use patterns, environmental and socio-economic and other issues pertinent to the use of the shared Nile water resources. The review is expected to lay the foundation upon which the DSS Needs Assessment will be based.

The Inception phase has the following main deliverables:

Inception Report including technical annexes on:

- Situation Assessment Report;
- Materials for DSS Training/Awareness Workshops;
- Stakeholder Consultation Plan; and
- Prototype of the Web-based Information System

2.2 Update on Progress of Work

Following will be a brief account on update on progress of work during the inception phase:

1. The Launch Meeting for the DSS Needs Assessment and Conceptual Design was conducted on 26 July 2007 at the WRPM PMU Office in Addis Ababa Ethiopia. The main objective of the meeting was to create mutual understanding between the Client and the Consultant on the overall consultancy assignment with respect to the scope of work, expected deliverables, methodology, implementation schedule and other key aspects of the assignment. The main expected output of the launch meeting was an agreed upon revised work plan for the Consultancy Service. Accordingly, an agreed work plan was delivered by the Consultant to the Client on 01/08/07.

2. The Client and the Consultant met on 01/08/07 at the WRPM PMU Office in Addis Ababa, Ethiopia to discuss and agree upon the "Guidelines for the Preparation of Programs for the NBI-DSS Country Assessments"; "Generic Checklist/Questionnaire" for resource institutions to be visited in the respective Nile Basin countries; and a "Stakeholder Ranking Matrix" prepared by the Consultant. It was agreed that the Guidelines be sent to the preparation teams who will prepare the programs for the respective Nile Basin countries and the generic checklist and stakeholder ranking matrix be sent later for use during the country assessment missions.

3. The Program for the Country Assessment Studies was prepared by a preparation team mainly composed of local consultants, the National DSS Specialists and the CBSI coordinators in the respective Nile Basin Countries after approval of the draft programs jointly by the Consultant and the Client. The Country Assessment Studies was conducted from 25 August-18 September 2007 in all the Nile Basin Countries (except Eritrea) by a country assessment team mainly composed of 4 international Consultants and Local Consultants with the assistance of the National DSS Specialists in the respective Nile Basin Countries. The Regional DSS Lead Specialist accompanied the country assessment teams in Sudan and Ethiopia. The WRPM Regional Project Manager accompanied the country assessment teams in Egypt and the water resources modeler accompanied the country assessment teams in Burundi and Rwanda (see Appendix 1). The results of the interviews with the identified resources institutions in the respective Nile Basin Countries was compiled as Field Notes by the International Consultants and the Stakeholders' Ranking Matrix filled out by the respective experts in each country was analysed by the Institutional Specialist as an input for the preparation of the Situation Assessment Report and the Stakeholders' Consultation Plan (Annex A and Annex B).
4. The Consultant and the Client met on 27/07/07 to discuss on the goals and contents of the Web Based Information System. Subsequently, the Consultant and the Client have regularly consulted on the development of the Nile-IS customer requirement specifications and the development of prototype including screen design.
5. During the inception period, the Consultant has reviewed relevant existing documents and literature and has worked out the structure for the Inception Report and defined writing responsibilities.

3 Process and Findings of Country Assessments

3.1 Preparation of the country assessment

The preparation of the NBI country assessments was divided into four steps. The first step formed the selection of the institutions in the country that will be asked to become a source of information and data for the Country assessment teams. The second step formed the preparation of a draft interview plan for the potential interview days. The third step formed making arrangements for the visits with the selected institutions. The fourth step was completing the inventory of the datasets and documents that have not yet been mentioned in the Country Base-line studies.

Table 3.1 Steps for preparing the NBI country assessment studies

Step	Activity	Responsible actors	Expected output
1	Selection of the water related institutions that will be visited using the given criteria	National DSS and SC specialists and local consultants	Ranking of the institutions that need to be visited
2	Preparing a preliminary program for interviews with selected organizations from the options provided by consultants	National DSS and SC specialists and local consultants	Preliminary program send to NBI-DSS-LS and DTL for approval
3.	Informal and formal requests for the interviews with the subject matter specialists of the institutions	Local consultant acts as coordinator	Definite program for the country assessment studies
4.	Collecting information about datasets, documents Making an inventory of data that is not yet available in the country baseline study	Local consultant	Available data at sub-basin level for DSS is appraised

The preparation procedure followed enabled the preparation teams at national level to adjust the program to the national context. In some countries there are limited experiences with using computer models for forecasting, simulations and investment planning and therefore the interviews had more an explorative character. In countries where the water administration already uses computerized models, the interviews could focus more on operational issues.

3.2 Methodological tools applied

The Key Institutional Specialist prepared in collaboration with the Key Hydrologist a generic checklist for the interviews and in collaboration with the Deputy Team Leader a draft stakeholders ranking matrix for Ethiopia to be adjusted to the potential stakeholders in each Nile Basin country.

The checklist covered the thematic issues that could be covered during the interviews with the resource institutions. The thematic clusters covered by the generic checklist were:

- a. administrative facts,
- b. type, scope and status of the organization,
- c. organisational structure,
- d. functions, responsibilities and activities,

- e. performance and service delivery,
- f. sub-sector framework,
- g. socio-economic developments,
- h. water management agricultural area,
- i. water management residential area,
- j. sub-sector issues,
- k. cross-cutting issues,
- l. financial aspects,
- m. human resources and capacities,
- n. NBI specific capacities and requirements,.
- o. data collection and availability,
- p. inventory of key sector infrastructure and documentation, and
- q. cooperation with other stakeholders.

The interviewers prepared the interviews using these generic checklists. For each interview the relevant issues were selected from the checklist. The checklist contained per thematic issue a lead question and some follow-up questions. The interviews develop into a kind of dialogue that was also interesting for the respondents, in which the issues were explored and the respondents were asked personal opinions about new developments and their visions. After the interview, the checklist could be used to write field notes of each interview. By merging the field notes of all interviews during the country assessment and sorting them, the country study field notes could be prepared. These country field notes could be shared among all members of the Consultants team, for writing the inception reports and preparing themselves for stakeholders' consultations during the second phase of the project.

For the selection of the stakeholders that would be involved during the stakeholders' consultation phase a participatory ranking tool was developed. The country assessment teams were asked to prepare a list of stakeholders of public, private and voluntary organizations that were involved at national and sub-national level in water resources management. The visited organizations, which were active in the field of water resources management, were asked to make a ranking of the institutions along six criteria: 1) current involvement in water decisions at national level; 2) desirable involvement in water decisions at national level; 3) current involvement in water decisions at sub-national level (state or basin); 4) desirable involvement in water decisions; 5) current involvement in transboundary water initiatives, and 6) level of importance of their decisions for transboundary water management issues. The representatives of the resource institutions could add stakeholders to the list that they considered important. A hard or soft copy of the ranking matrix would be given to each of the respondents towards the end of the interviews as an assignment.

The consultants evaluated the methodological tools after the country assessments in Sudan and Kenya. It was the intention to pre-test the checklist and the ranking matrix in Addis Ababa, however this failed due to time constraints. Therefore the international consultants, who coordinated the first two country assessments, reviewed the tools on the 1st of September 2007. The checklist was considered too long and therefore a shorter version was prepared that focused on the central issues. The stakeholders ranking matrix was evaluated positively although it required that the local consultant would be active in collecting them later from the respondents.

The results of the ranking matrixes were analysed by calculating the absolute average of the scores per stakeholder. The respondents give the stakeholders that they could rank a score that varied from 1 (no involvement) to 5 (high involvement). For calculating the absolute average only

the filled scores were considered while for the weighted average a non-score was considered as zero. The absolute average was used since that was considered more in accordance with the opinions of the respondent. A respondent added by one respondent and given a high score would remain in the list of selected stakeholders with the absolute average, while the stakeholder would disappear from the list in case of weighed average would have been applied.

3.3 Experiences in the implementation of the country assessments

3.3 Experiences in the implementation of the country assessments

The findings of the country assessments will be presented in the inception report and especially in the Annex A and B. Therefore this section will focus on the experiences of the consultants in implementing the country assessments.

Comparing the implementation of the assessments in the different countries is difficult since the contextual conditions differ widely. The proportion of the national territory located in the Nile Basin varies widely. The experiences with computer models differ widely in the riparian states. The countries that are already involved in a cooperative planning effort have a clear knowledge advantage. The dialogues focused more on the potential functions of the DSS, availability of information, data quality and data sharing. In the riparian states that more recently joined the cooperative planning effort, more fundamental issues had to be discussed like the mandates and internal organization of the institutions.

In some countries the respondents were reluctant to give direct answers on questions raised during the interview. In some cases the respondents would have liked to obtain a list of questions in advance so that they could consult their superiors. In other cases the respondents thought that they needed to consult documents for giving an appropriate answer. The formalistic attitudes and in-experiences with qualitative research methods made it quite difficult to establish rapport with some respondents.

The resource institutions that actually ranked the stakeholders was limited in some riparian states. The ranking matrix was in all riparian countries distributed to representatives of ten to twenty institutions in the water sector. In most of the countries, around 50% of the respondents made a ranking and returned the matrix to the teams. In some countries only few matrixes were returned and the calculation of the absolute average has been based on few rankings. However, for qualitative research methods, which commonly use purposive sampling techniques and the triangulation principle for verification, the sample seize is less important than for quantitative research methods.

The country assessments had beside the explorative study component also a strong public relations component. For some organizations it was the first time to hear about the NBI initiative to develop a Nile Basin Wide DSS system. The technical oriented organizations were interested in the analytical potentials of a DSS system and the modelling options. The more social and environmental-oriented organizations were interested in the potential capacities of a DSS to inform and make the decisions making process more transparent for the involved stakeholders. The resource institutions that supplied data saw the DSS more as a potential client for the data that they produce. The launching of the NBI-DSS project has created expectations that need to be managed carefully during the development process.

This public relation component of the DSS launching at national level put an additional burden on the international consultants. In the guideline for the preparation, the teams had been asked to limit the number of interviews to four per day since the time needed for writing the field notes had to be considered. Consequently the preparation teams invited for some interviews more than three resource institutions. These combined interviews remained more superficial, but added an extra burden to the international consultant for writing field notes

4 Issues identified by key stakeholders

The following are some of the key water resources related issues that were identified by the stakeholders in the respective countries of the Nile Basin. These issues were categorized into structural and institutional issues.

4.1 Burundi

- Structural Issues
 1. Need for drinking water services provision
 2. Rehabilitation & Installation of Climatological & Hydrological monitoring systems
 3. Need for reliable hydrological forecasting real time information
 4. Impacts of Climate Change on flooding, soil erosion, and water quality
 5. Impacts of deforestation on run off, and soil erosion
 6. Food security
 7. Fishery Management
 8. Drainage of Marshlands for Agriculture
 9. Optimal Use & Transboundary development of hydropower potential
 10. Improving & Developing navigation potential
 11. Biodiversity conservation
 12. Water pollution due to mining activities and lack of sanitation services
 13. Gaps on groundwater development knowledge
- Institutional Issues
 1. Post conflict land tenure and rights
 2. Overlap of responsibilities in the water sector
 3. Gaps in regulations and Laws

4.2 Democratic Republic of Congo

- Structural Issues
 1. Optimal Use and Analysis of Transboundary hydropower development and inter-connection potential alternatives
 2. Deforestation impacts on run off, soil erosion and loss of fertility
 3. Biodiversity conservation
 4. Need for drinking water facilities provision
 5. Pollution to water bodies due to lack of proper sanitation services
 6. Rehabilitation and installation of climatological and hydrological monitoring system
 7. Need for reliable hydrological forecasting real time information

8. Impact of climate change in flooding, soil erosion, and water quality
 9. Food security
 10. Drainage of Marshlands for agriculture
 11. Improving and developing navigation potential
 12. Water pollution due to mining activities
 13. Watershed management
 14. Water hyacinth
 15. Pollution from petroleum exploration of Albert Lake
 16. Assessment of water resources potentialities
- Institutional Issues
 1. Fishery Management
 2. Lack of complementing top-down with bottom-up planning approaches
 3. Training of scientist in hydrology, hydrogeology and meteorology.

4.3 Egypt

- Structural Issues
 1. Need to increase water conservation capacity to cope with potential increased variability in extreme events of high floods and droughts
 2. Need to supplement Egypt's share of the Nile water through cooperation with the Nile Basin Countries
 3. Optimal use of the available Nile Water resources through minimizing the water losses and obtaining the highest value of crops per water drops
 4. Better Assessment of the potential Nile Water resources and Upper Nile water losses savings potential through cooperation with the Nile Basin Countries
 5. Need to improve flood forecasting & drought prediction through sharing of historical and real-time hydrological & meteorological data with Nile Basin countries
 6. Water quality degradation in terms of health impacts, water born diseases, use of POPS, saltwater intrusion, and sediment transport
 7. Increased energy demand, hydropower inter-connection opportunities with Upper Nile Basin countries, and potential to use carbon credits upstream in Joint hydropower project.
 8. Socio-economic and environmental impacts of planned projects
 9. The effect of climate change on Nile Basin countries' water resources.
- Institutional Issues
 1. Need for increased public awareness and local responsibility in coping with water scarcity and in preventing water pollution;
 2. Better communication of water distribution policies to water users organizations for effective planning demand management by individual agricultural water users;

3. Expediting the process of institutionalizing the legal framework for water users organization and participatory irrigation management of public owned irrigation and drainage systems

4.4 Ethiopia

- Structural issues
 1. Food security due to lack of supplementary irrigation facilities
 2. Desertification of semi-arid areas
 3. Siltation of irrigation and drainage canals
 4. Soil erosion, sedimentation and land degradation
 5. Diminishing base flow in rivers in most times of the year
 6. Waste water drainage and hygiene in densely populated areas in the wet zone
 7. Limited funding for modern measurement gauges to collect accurate hydrologic information
 8. Need to enhance flood forecast and drought prediction capacity with real time hydrological and meteorological data
 9. Limited potable water infrastructure
 10. Need for groundwater potential assessment & production
 11. Energy needs
 12. Watershed Management
- Institutional issues
 1. Lack of transparency of the planning and decision process of major water infrastructure projects
 2. Conflict of interests between different stakeholders (fishery, nature conservation, irrigation, drinking water and hydro-power) for water release plans of dams and reservoirs
 3. Lack of institutional and legal framework for CBO and WUO involvement in water sector
 4. Mobilization of funds and prioritization of expenditures for water resources development

4.5 Kenya

- Structural issues
 1. Water availability under changing climate condition
 2. Proper planning and management of resources for times of shortage
 3. Water conflicts in pastoral areas, and where land use and water allocation may be a driving force
 4. Water pollution (siltation, point and non-point)
 5. Climate variability and impact on floods, droughts, and food security
 6. Deforestation, incision of forest land for settlement and agriculture)

7. Logging, wood fuel
 8. Water resources assessment and monitoring
 9. Groundwater resources under-development
 10. Salinization of lake Victoria
 11. Effect of upstream pollution and industrial effluent and wastewater disposal on rivers and Lake Victoria
 12. Encroachment on wetlands & riparian land
 13. High silt loads and sediment plumes due to poor farming methods
 14. Lake Victoria level fluctuation
 15. Invasive weeds (water hyacinth), algae, and Eutrophication
 16. Need for flood early warning systems
 17. Capacities in terms of resources and infrastructure
 18. Rehabilitation and upgrading of monitoring network
 19. Land use practices that increase the rate of floods
 20. Water resources distribution is a problem
- Institutional Issues
 1. Lack of knowledge at community and household level on water storage
 2. Illegal water abstractions
 3. Inadequate financial resources for the water sector
 4. Synergies with international bodies such as IGAD and African Ministers Council on Water (AMCOW).

4.6 Rwanda

- Structural Issues
 1. Impact of deforestation on Soil Erosion
 2. Watershed Management
 3. Lack of adequate & good quality drinking water supply facilities
 4. Lack of sanitation services
 5. Climate change and impact on floods and droughts
 6. Installation & Rehabilitation of hydrological stations for water resources monitoring and assessment.
 7. Wastewater disposal and microbiological Pollution of water bodies
 8. Water hyacinth
 9. Pollution from industrial and mining activities
 10. Flood forecasting and preparedness
 11. Need to improve rainfall harvesting practices

12. Limited Capacity in marshlands drainage methods for agricultural activities
 13. Lack of knowledge on water resources assessment (surface & groundwater)
 14. Lack of knowledge on rain water harvesting
 15. Lack of monitoring of natural water quality
 16. Lack of integrated watershed management
 17. Food insecurity due to lack of irrigation facilities
 18. Lack of flood mitigation facilities
 19. Loss of biodiversity due to environment degradation
- Institutional Issues
 1. Lack of awareness of existing laws and legislations
 2. Land Tenure
 3. Lack of enough capacity (logistics, human, institutional)
 4. Lack of institutional framework and forum to discuss DSS development
 5. Lack of proper Data Management Information Systems in institutions.
 6. Limited funds and need to promote cooperation with national, regional and international financial organizations
 7. Implementation of new law
 8. Inadequacy of data quality control system

4.7 Sudan

- Structural Issues
 1. Lack of modelling for optimal use of the Sudanese withdrawals
 2. Food insecurity due to lack of supplementary irrigation facilities
 3. Desertification of semi-arid areas
 4. Siltation of irrigation and drainage canals
 5. River bank erosion, sedimentation of reservoirs, rivers widening, and morphological change
 6. Limited base flow in Blue Nile, Atbara and Sobat rivers towards the end of dry season
 7. Waste water disposal and hygiene in densely populated areas along the Nile River
 8. Limited funding for modern measurement equipment to collect accurate information on hydrologic and climatic parameters and update of land use/cover images,
 9. Huge potentials in irrigation and limited available water resources
 10. Need to enhance flood forecast and drought prediction capacity through better monitoring and sharing of hydrological and meteorological data with Nile Basin countries.
 11. Limited potable water infrastructure
 12. Need for groundwater potential assessment & production

13. Disparity between available water and future demand for the different sectors according to mid- and long-term plans and ambitious future plans in the different states.
 14. Water hyacinth problems in the states
 15. Navigation improvement
 16. Water losses
 17. Need to increase storage
 18. Wetland management
 19. Water harvesting
- Institutional issues
 1. Lack of coordination between the different states and the definition of the roles and responsibilities of the Federal and state Governments
 2. Lack of complementing top-down with bottom-up planning approaches
 3. Lack of transparency of the planning and decision process of major water infrastructure projects
 4. Lack of preparation of the Irrigation Service Directorate, the Sudan Gezira Board and the water users for the understanding of their new roles and required capacities.
 5. Fisheries Management
 6. Application of legislation & laws on water use and distribution.
 7. Lack of appropriate capacity in the state and at local level.
 8. Capacity building (human and institutional)
 9. Stakeholder participation
 10. Awareness of public and decision makers

4.8 Tanzania

- Structural Issues
 1. Poverty reduction
 2. Water catchments degradation
 3. Water security, food security, & energy security
 4. Soil erosion, river bank erosion, and reservoir sedimentation
 5. Destruction of natural forests
 6. Destruction of wetlands
 7. Water pollution from mining activities, industrial and sewage disposal
 8. Declining water levels in lakes, and declining flows in rivers
 9. Disposal of wastes into the rivers, and encroachments of river banks and wetlands
 10. Agrochemical seepage into the rivers
 11. Climate change & rainfall variations

12. Competing demand for domestic water, hydropower, irrigation etc.
 13. Water allocation
 14. Eutrophication
 15. Water hyacinth
 16. Transboundary power trade
- Institutional Issues
 1. Transboundary Information sharing
 2. Better water resources management

4.9 Uganda

- Structural Issues
 1. Inadequate coverage of safe potable water.
 2. Reduction of pollution of water bodies leading to decreased costs of water treatment and increase in fish production
 3. Degradation of catchments leading to siltation water bodies including river, wetlands and lakes
 4. Water quality degradation
 5. Need to increase water storage and conservation to adapt to impacts of floods and drought.
 6. Strengthen capacity of water for production (irrigation, livestock watering, and aquaculture development).
 7. Need to assess, develop and optimize the hydropower energy potential to meet the increasing demand.
 8. Optimize utilization of water resources for poverty eradication and alleviation
 9. Need to improve flood forecasting and drought prediction (climate variability) through generation of real time hydrological and meteorological data.
 10. Need to reduce forest conversion, apply good agricultural practices and the application of clean technologies for industries.
 11. Inadequate law enforcement to secure natural resources (wetlands, forests, water etc)
 12. Lack of adequate sanitation facilities along the beaches and high water table areas.
 13. Need for a comprehensive water resources assessment.
 14. Cultural norms and practices that are not in consonant with sustainable water resources management (pastoralists and cultivators) in relation to climate variability.
 15. Need for improved data collection and management for effective utilizations of the fishery.
 16. Need to control of invasive species which affect the ecosystem balance and related services.
 17. Need to increase public awareness and local responsibility in coping with water scarcity and in preventing water pollution.

18. Better communication of water distribution policies to water users for effective planning and demand management.
 19. Need to enhance tourism through use of water resources.
 20. Review of water policy framework to include trans-boundary considerations (national) and strengthen the IWRM aspects.
- Institutional Issues
 1. Conflicts between pastoralists and cultivators
 2. Need for better management of fishing practices

5 Consequences for the remainder of the assignment

The experience of the Consultant in the Inception Phase has revealed certain constraints that may have consequences in the next phase of the consultancy assignment (Analysis Phase) and that requires due consideration by the Client.

The National Consultations for most of the the country assessment studies were conducted under a very tight time schedule in almost all of the Nile basin countries visited. As a result of the tight time schedule, additional mission days had to be added. Furthermore, due to the extremely tight meeting schedule for interviews in all countries visited, the International Consultants have been faced with time constraints in writing the field notes and adequately assessing the inputs of the National Consultations for the preparation of the Draft Inception Report.

The tight time schedule for the National Consultations constrained the collection of some relevant documents from the respective countries. Where this has compromised the quality or extent of data included in this report, the Consultant intends continually to update the document using any additional or better data that may be made available before the end of the Analysis Phase.

In light of this, the Client may need to consider that the Consultant has sufficient time to successfully conduct the subsequent project phases.

For a detailed overview on the resources additionally spent compared to the original budget, please refer to Monthly Administrative Report #02 of 1 October 2007.

The Consultant would like to point out that he appreciates very much the Client's strong ownership and support during the Inception Phase.

This document continues below with executive summaries of Annexes A to D in which the Inception Phase findings are presented in detail. Before proceeding to these summaries however, a brief description of the NBI itself is presented in Chapter 6 and a summary review of Transboundary issues, in Chapter 7.

6 The Nile Basin Initiative

The Nile Basin Initiative (NBI) is a basin-wide transitional cooperative framework among the basin states of the Nile (Congo DR, Rwanda, Burundi, Uganda, United Republic of Tanzania, Ethiopia, Sudan, Kenya, Egypt) which provides a forum for cooperative development of the water resources of the Nile River. The NBI started with a participatory process of dialogue among the basin countries that resulted in a shared vision "to achieve sustainable socioeconomic development through the equitable utilization of, and benefit from the common Nile Basin water resources," and a Strategic Action Program to translate this vision into concrete activities and projects.

The NBI Strategic Action Program consists of:

i) a Shared Vision Program (SVP) which is a basin-wide grant-funded collaborative action, exchange of experience and analytical work intended to build a strong foundation for regional cooperation. The objective of the SVP is to build trust, capacity and an enabling environment for investment in the Nile Basin countries. This objective is intended to be achieved through the implementations of various projects within the SVP portfolio composed of seven basin-wide thematic projects which are:

- Nile Transboundary Environmental Action;
- Nile Basin Regional Power Trade;
- Efficient Water Use for Agricultural Production;
- Water Resources Planning and Management;
- Confidence Building and Stakeholder Involvement;
- Applied Training; and
- Socioeconomic Development.

The SVP includes an eighth component known as "SVP Coordination" which is intended to strengthen the capacity of the NBI institutions to effectively execute and coordinate the cooperative basin-wide projects.

ii) The other component of the Strategic Action Program, known as the Subsidiary Action Program, has the objective of initiating concrete investments and action on the ground at sub-basin levels. Accordingly, two distinct sub-basins with their respective programs have been formed, namely: the Eastern Nile Subsidiary Action Program (ENSAP) which includes Ethiopia, Sudan and Egypt and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) which includes Burundi, Democratic Republic of Congo, Rwanda, Kenya, Uganda, Tanzania, Sudan and Egypt. The ENSAP programs are implemented by the Eastern Nile Technical Regional Office (ENTRO) which is located in Addis Ababa, Ethiopia while the NELSAP programs are managed by the Nile Equatorial Lakes Coordination Unit (NEL-CU) which is located in Kigali, Rwanda. There are a number of investment projects that are under preparation by the two SAPs which focus on power production, irrigated agriculture, flood-risk reduction, hydropower production, watershed management etc.

The NBI Institutional Structure is governed by a transitional arrangement which consists of the Council of Ministers (Nile-COM), which is the highest decision-making body and provides policy guidance on matters relating to water resources management of the Nile; the Technical Advisory Committee (Nile-TAC), composed of senior officials from the respective Nile member countries which renders policy and technical advice to the Nile-COM; and the NBI Secretariat (Nile-SEC) which executes decisions and acts as the executive body providing administrative services to the

Nile-COM and Nile-TAC. The Nile-SEC also has a unit which coordinates the programs/projects under the SVP.

The organizational structure at the sub-basin level is more or less the same as at the basin level. The EN and NEL regions each have a Council of Ministers, technical advisory groups and an executive arm-ENTRO and NELSAP-CU respectively.

At the national level, each Nile member country has designated national focal point institutions and individual projects have arrangements in place that include line ministries and other national stakeholders.

7 Summary Review of Transboundary Aspects of the Nile

Transboundary aspects of the Nile fall into three categories:

1. agreements that are already in place,
2. initiatives that are already planned or in progress and
3. unresolved challenges and opportunities - this category can be sub-divided further as follows:
 - Data and Information
 - Institutions
 - Environment
 - Development.

7.1 Agreements that are already in Place

The Consultant has identified that there are, or have been, 15 such agreements:

Table 7.1 Trans-boundary treaties in Nile Basin

Date	Basin/Sub-basin	Signatories	Treaty Name or Description
05/08/1994	Lake Victoria	Kenya, Tanzania, Uganda	Agreement to initiate program to strengthen regional coordination in management of resources of Lake Victoria
01/07/1993	Nile	Egypt Ethiopia	Framework for general co-operation between the Arab republic of Egypt and Ethiopia
18/15/1981	Kagera	Burundi, Rwanda, Tanzania, Uganda	Accession of Uganda to the agreement for pertaining to the creation of the organization for the management and development of the Kagera river basin
24/08/1977	Kagera	Burundi, Rwanda, Tanzania, Uganda	Agreement for the establishment of the organization for the management and development of the Kagera river basin
08/11/1995	Nile	Sudan, Egypt	Agreement between Egypt and Sudan the government of the united Arab Republic and the government of Sudan
16/07/1952	Nile	Egypt, Great Britain and Northern Ireland	Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owner Falls dam in Uganda
19/01/1950	Nile	Egypt, Great Britain on behalf of Uganda	Exchange of notes constituting an agreement between the government of the united Kingdom of Great Britain and Northern Ireland on behalf of the government of Uganda and the government Egypt regarding cooperation in meteorological and hydrological surveys in certain area of the Nile basin
05/12/1949	Nile	Egypt, Great Britain on behalf of Uganda	Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and government of Egypt regarding the construction of the Owen Falls dam, Uganda
31/05/1949	Nile	Egypt, Great Britain	Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the owner Falls dam, Uganda
07/12/1946	Nile	Egypt, Great Britain	Exchange of notes constituting an agreement between the government of the united Kingdom of Great Britain and Northern Ireland and Egypt regarding the utilization of profits from the 1940 British government cotton buying commission to finance schemes for village water supplies

Date	Basin/Sub-basin	Signatories	Treaty Name or Description
22/11/1934	Kagera (?)	Belgium; Great Britain	Agreement between the United Kingdom and Belgium regarding water rights on the boundary between Tanganyika and Ruanda -Urundi
07/05/1929	Nile	Egypt; Great Britain	Exchange of notes between his Majesty's government in the United Kingdom and the Egyptian government in regard to the use of the waters of the river Nile for irrigation purposes
20/12/1925	Lake Tana	Great Britain, Italy	Exchange of notes between United Kingdom and Italy respecting concessions for a barrage at Lake Tana and a railway across Abyssinia from Eritrea to Italian Somaliland
13/12/1906	Nile	France Great Britain, Italy	Agreement between Great Britain, France and Italy respecting Abyssinia
09/05/1906	Nile	DR Congo, Great Britain	Agreement between Great Britain and the independent state of the DR Congo, modifying the agreement signed at Brussels 12 May 1894 , relating to the spheres of influence of Great Britain and the Independent State of the DR Congo in East and Central Africa
15/05/1902	Nile	Ethiopia, Great Britain	Treaties between Great Britain and Ethiopia, relative to the frontiers between Anglo- Egyptian Sudan, Ethiopia, and Eritrea
1/03/1902	Nile	Ethiopia, Great Britain	Exchange of notes between Great Britain and Ethiopia
15/04/1891	Nile	Great Britain, Italy	Protocol between Great Britain and Italy for the demarcation of their respective spheres of influence in Eastern Africa

Source: UNEP (2002), Atlas of International Freshwater Agreements

7.2 Initiatives that are already planned or in progress

There are already many such initiatives, the most obvious of which in this context being the NBI itself – but this was described in chapter 6 above.

Initiatives planned or taking place under the aegis of the NBI include the following:

Under the Eastern Nile Subsidiary Action Program there are the:

- Irrigation and Drainage Project
- Eastern Nile Planning Model Project (ENPM)
- Watershed Management Project
- Ethiopia-Sudan Transmission Interconnection Project

- Flood Preparedness and Early Warning Project
- Baro-Akobo Multi-Purpose Water Resources Development
- Eastern Nile Power Trade Investment Program Study
- Joint Multi-Purpose Program

Under the Nile Equatorial Lakes Subsidiary Action Program there are the:

- Coordination Unit for Equatorial Lakes Projects
- Mara River Basin Project Transboundary IWRM Project (Kenya and Tanzania)
- Kagera River Basin Transboundary IWRM Project (Burundi/Rwanda/Uganda/Tanzania)
- Sio-Malaba-Malakisi Catchments Transboundary IWRM Project (Kenya and Uganda)
- Water and Agriculture Project
- Kagera Water hyacinth Abatement Project
- Environmental, Social, Strategic and Sectoral Assessment of Energy Generation Alternatives in the Equatorial Lakes countries
- Lakes Edward and Albert Fisheries Pilot Project (Uganda/DRC)
- Lake Victoria Environmental Management Project II (Burundi/Rwanda)
- Regional Rusumo Falls Hydropower and Multipurpose Project (Rwanda/Burundi/Tanzania)
- Regional Interconnection Project (Rwanda/Burundi/Kenya/Tanzania/DRC)

Other joint government & private sector development projects between riparian countries of the Nile basin include:

- Joint operation and Management of the Owens Dam (Uganda & Egypt)
- Joint operation and Management of the High Aswan Dam (Sudan & Egypt)
- Joint Abatement of the Hyacinth in Lake Kyoga (Uganda & Egypt)
- Joint Groundwater Development Project for Drinking Purposes in Kenya (Kenya & Egypt)
- Joint Groundwater Development Project for Drinking Purposes in Uganda (Uganda & Egypt)
- Joint Groundwater Development Project for Drinking Purposes in Ethiopia (Ethiopia & Egypt)
- Joint Modern Irrigation Technology Development in Ethiopia (Ethiopia & Egypt)
- Joint Modern Irrigation Technology Development in Uganda (Uganda & Egypt)
- Joint Lake Tanganyika Biodiversity Conservation Project (Burundi, DR Congo, Zambia)
- Mara River Water Users Association Project (Kenya and Tanzania)
- Information Products for Decisions on Water Policy and Water Resources Management in the Nile Basin (FAO)

7.3 Unresolved challenges and Opportunities

Data and Information sharing, although vital for the long term success of the DSS in particular and the sustainable, equitable management of the Nile Basin resources in general remains constrained by a range of factors. These include a lack of protocols and arrangements for sharing data and information; lack of harmonisation with respect to data and information agglomeration structures; different densities of data collection facilities and a lack of uniformity concerning monitoring indicators and criteria.

Although there are examples of national **institutions** that have specific mandates to deal with Transboundary issues (for instance Uganda's Water Policy Committee, Tanzania's Environment Division, Ethiopia's MWR Boundary and Trans-boundary Department, or Kenya's Drought Monitoring Centre) many stakeholders questioned so far identified a lack of connectivity between typical riparian institutions and called for structuring in order to improve transboundary institutional communications, coordination and operations.

Reported transboundary **environmental** issues include

- *Physical or chemical impact that cross national boundaries downstream-* deforestation and soil erosion can increase vulnerability to drought and lead to increased sedimentation and greater floods downstream, while sediments also accumulate in wetlands, reservoirs, canals and drains. Urbanization, industrialization and increased use and improper application of pesticides and fertilizers lead to increased runoff and pollution that harm downstream water users.
- Loss of degradation of wetlands and lakes- Water-dependent ecosystems throughout the Nile basin contribute to the stability, resistance and resilience of both natural and human systems to stress and sudden changes. Significant transboundary benefits derive from various ecosystems' roles in maintaining water quality, trapping sediment, retaining nutrients, buffering floods, stabilizing micro-climates and providing storm protection.
- *Need for trans boundary cooperation to protect key habitats.* Many key plant and animal species have habitats in adjoining countries, often requiring cross-border protected areas and other conservation measures for effective management. For example, the Nile is a principal flyway for birds migrating between central Africa and Mediterranean Europe, and Nile wetlands in a variety of countries provide indispensable habitats for these birds.
- *Lack of early warning systems.* Floods and droughts due to climatic conditions compounded by inadequate land management regularly affect many parts of the basin, causing considerable human suffering and ecological damage.
- *Spread of exotic and invasive water weeds.* Water hyacinth and other invasive aquatic weeds have spread throughout many parts of the Nile basin, impairing the functions of natural ecosystems, threatening fisheries and interfering with transportation.
- *Waterborne diseases* such as malaria, diarrhea and bilharzia (schistosomiasis) are among the leading causes of death especially among the old and very young. Their spread is related to a variety of different factors such as increased breeding ground for disease vectors, growing resistance to drugs that fight these diseases, and lack of sanitation infrastructure, often compounded by the lack of adequate hygiene education.

With respect to **development**, many stakeholder have particularly stress the need for a transboundary approach to hydropower and power trading.

Finally, it is worth mentioning the role that virtual water plays as a Transboundary issue, a typical example would be the water used to raise livestock in Ethiopia for export to Egypt

8 Executive Summary of Situation Assessment Report

8.1 Nile Basin framework

Annex A describes the details of the situation assessment of the Nile Basin from different perspectives. It includes **physiographic information** of the Nile basin. Fifteen sub-basins are proposed and have been provisionally named. Each sub-basin is described briefly. There is a clear indication that by far the greatest contribution to the Nile flow originates in the Southern and Eastern portions of the basin, where altitudes tend to be higher. It is also clear that significant losses accrue to evaporation from Lake Victoria, the Sudd wetlands and the Aswan Dam. Of these, the most significant is the Sudd because of its extremely high evaporation/precipitation ratio and surface area/storage ratio, whereas Lake Victoria has a much lower evaporation/precipitation ratio and the Aswan has a lower surface area/storage ratio..

Socio-economic aspects.

Annex A includes a description of the **socio-economic aspects** in the Nile basin where approximately 150 million people live. The basin includes large cities such as Cairo which includes about 10 percent of the basin's total population. The rich human geography in the Nile is characterized by ethnic, religious, and cultural diversity, cutting across national as well as basin boundaries with neighbouring river basins. Many riparian states have great diversity: Ethiopia alone has over fifty ethnical groups and is roughly split between Muslim and Christian population. Equally important as ethnicity is the range of livelihoods associated with the demographic characteristics of the basin. For many populations within the basin, subsistence production is the mainstay of their survival, whether through pastoral livestock production in the lowlands of Sudan and Ethiopia, or the highland agriculture in countries like Rwanda, Burundi and Kenya, or irrigated agriculture in the lowlands of Sudan and Egypt.

The ethnic identities have influenced the administrative structures in the riparian states. Some countries have a federal administrative structure with sub-national states that govern territories formed along ethnical boundaries, like Ethiopia and Sudan. Other riparian states have a centralized administrative structure with sub-national governorates or provinces. For decision makers and managers the ethnical and administrative layers add to the complexity in the ways in which trans-boundary initiatives will develop and implement projects based on the equitable sharing of benefits between states and ethnic groups.

The water resources of the Nile Basin provide a huge potential for consumptive and non-consumptive uses. The potentials for hydropower generation in the Upper Nile Basin remain largely underdeveloped. Egypt has largely developed its potentials for hydropower. However this represents about 15% only of its electricity production and this percentage is declining due to sharp increase in the portion of electricity demands that are being satisfied by thermal power plants. By way of contrast, Ethiopia and Burundi generate currently 95% of their electricity needs through hydro-power and there are still huge potentials for hydropower in the Upper Nile Basin.

Existing data on the incidence of water-borne diseases indicate that these are mostly prevalent in areas where people use contaminated water or have little water available for daily use. The information shows that such water related diseases count for over half of the diseases affecting the population.

The swamps in the Upper Nile Basin and the irrigation systems in the plains are open waters that function as breeding grounds for mosquitoes. Therefore malaria is widely spread in the swamps. Also Bilharzia flourishes in streams and swamps with low water velocities, where farmers are in constant contact with the water and proper sanitation and sewage facilities are lacking. This has also caused the spread of other water borne diseases such as dysentery, cholera and typhoid which have remained a leading cause of mortality and morbidity in the Upper Nile Basin.

Environmental Issues

Among the **key environmental issues** in the Nile basin is deforestation where relatively few forests remain in western Ethiopia or northern Sudan as an example. Forest area in Ethiopia as a whole decreased from 16% to 2% of the land area between the 1950s and 1980s. The use of former forest and grazing lands for crop cultivation without adequate soil protection has dramatically increased soil erosion, compounded by increasing numbers of livestock being forced onto shrinking pastures. Demographic pressures in the Kagera Basin have led to deforestation as wood is harvested for firewood and land cleared for agricultural production.

In the Lower Nile Basin, Egypt is losing 13,000 hectares of agricultural land along its banks each year as a result of expanding settlements mainly in the outskirts of existing cities. In both Sudan and Egypt, sand encroachment from desert onto nearby farmlands occurs, threatening agricultural development, settlements and traffic flows in reclaimed areas. Wetlands in the Nile basin are threatened by drainage (for agriculture, industry and settlements), filling (for solid waste disposal, roads and settlements), dredging and stream canalization (for navigation and flood protection), hydrological alteration (for canals, roads and other structures), groundwater abstraction, siltation, and discharges of pesticides, herbicides, and sewage. All of these reduce the value and productivity of wetlands. In some cases waste loads have increased to such an extent that the wetlands' natural capacity as buffer and filter for sediments and certain pollutants is exceeded. The number of economically important fish species in the Lakes has declined during recent decades from about twenty species to only two or three, mainly Nile perch and tilapia. Point source pollution from insufficiently treated domestic, urban and industrial wastes is mainly concentrated around settlements and factories and for the most part serious around urban centers such as Kampala, Khartoum, Cairo and other urban centers in Egypt. Sedimentation problems are closely related to soil erosion problems. High sediment loads are found in many rivers, especially those draining the mountainous areas that are severely affected by soil erosion. Sediment loads are very high in the Blue Nile, the Atbara and the rivers of the Kagera basin, as well as many of the other rivers flowing into Lake Victoria. Siltation of major reservoirs imposes direct economic costs by reducing the efficiency of irrigation and power production, sometimes necessitating expensive desilting operations. Sediment and debris carried by the Blue Nile, the Atbara and their tributaries affect the storing capacity in Sudan's reservoirs and irrigation canals, especially the Sennar, Roseires and Khasm El Girba reservoirs and the Gezira, Rahad and Halfa irrigation schemes. The loss of reservoir capacity can be as high as 50 percent (50 percent in Sennar, 40 percent in Roseires and 50 percent in Khasm El Girba). With the exception of the transported material that settles in the inlet channels of Sudan's major irrigation schemes, almost all of the sediment carried to the Nile's lower reaches becomes trapped in the Aswan High Dam, a reservoir which is estimated to have a large enough capacity to store sediment inputs for hundreds of years without impairing hydroelectric power generation.

Flooding is a serious problem in the Nile basin due to the high variability of both climate and river flows, compounded by the dependence of large numbers of people on the floodplains for their livelihood. Floods have also had some very beneficial effects historically, by increasing land fertility, recharging shallow aquifers and reducing irrigation costs. Floods in 1988 and 1998 were some of the most damaging ever recorded. Extensive damage was caused to crops, livestock, water pumps, wells, canals, roads, houses, schools and health centers. Possible climate change may make such severe flood events more frequent in the future. A final type of flood event occurs in arid areas, where flash floods derived from short but intense storms sometimes result in considerable damage and loss of life. At present there is no integrated flood warning system for the basin.

Another impact of climate change on Nile Basin countries could be frequent drought events. Drought is a major problem in the Ethiopian highlands and throughout the semi-arid parts of the Nile basin. Sudan has been very seriously affected, with many human and livestock fatalities in a succession of dry years from 1978 to 1987, which also caused three million people to resettle

near the Nile and in urban areas. While Egypt used to suffer from devastating droughts, the Aswan High Dam has been able to store sufficient water to maintain supplies in very dry years when the only losses suffered have been from reduction in hydropower production and the associated costs of increased thermal power generation.

Annex A includes a compilation of the most DSS- relevant **models available and their use** where they serve as Decision Support System tools in the planning and management of Nile Waters at the basin-wide transboundary level, and national level.

Models Available at the Ministry of Water Resources & Irrigation of Egypt, includes the Decision Support System for HAD, The Rainfall Estimation Model, The MESO-ETA Model Applications, , The Hydrological Simulation Models, Forecast Modules, High Aswan Dam Decision and Control System, Nile Basin Hydro-meteorological Information System (NBHIS), Egyptian Water Resources, Socioeconomic and Environmental System (EWRSES)-DSS, Integrated Water Resources Model for Sustainable Development (IWRMESD), Nile Basin Simulation Model (NBSM), River Basin Simulation Model (RIBASIM), Planning and Distribution Model (PDM), Simulation of Water Management Model (SIWARE), and the National Water Resources Plan Decision Support System (NWRP-DSS). There are few other models of DSS nature that are being used in other Nile riparian countries. Some of these models in the Nile Basin and other basins include the Nile Decision Support Tool (Nile-DST), Lake Victoria Decision Support Tool (LVDST and HEC-5 / HEC-ResSim (Ethiopia).

Elsewhere, models that could be considered for consideration and/or adaptation include: GLOWA Volta DSS for the Basin, DSS for Komati Water Resources Planning, DSS for the Senegal River Delta, Kafue DSS, Global Water Availability Assessment (GWAVA) model, Water Evaluation and Planning Model (WEAP), , The Mekong Decision Support Framework (DSF).

Water Availability in the Nile basin is spatially variable as indicated by the north–south orientation of the River Nile on the African continent which produces extreme variability in climate between the extremes of the basin. The North for instance (Egypt and Sudan in particular), is characterised by extreme aridity and extensive desert while in the South and East strong rainfall results in lush vegetation, humid conditions and even tropical rainforest in some locations. In an average year the basin receives some 650 mm of rainfall corresponding to around 1,900 bcm/year of water. Long-term mean annual flow at Aswan is only about 84 bcm per year, making the annual runoff coefficient of the basin around 4.5% (Nicol 2003). This figure is small and, for example, is just 10% of that of the Rhine.

Despite significant unexploited groundwater resources in the Nile basin, it already plays a significant role in the socio-economy and productivity of the basin. It is for instance a common source of water for both urban and rural water supply, and in the case of latter, especially so where there is no connectivity to formal reticulations. Groundwater represents a significant potential water resource and especially for drought mitigation.

Annex A also refers to **specific thematic issues** in the Nile basin such as soil salinisation and drainage requirements in to control flooding in upper Nile countries and reduce water logging problems in irrigated agriculture areas such as in Egypt. It also includes description of the coastal interaction with the Nile basin at the Mediterranean Sea with all the associated issues of salt water intrusion and coastal shore erosion, and possible sea water rise impacts. It also addresses the issue of climate change impacts on the Nile basin and the conflicting results of research that predicts varying impacts on Nile flows with some showing possible decrease in flows and others sowing possible increase in future flows.

As far as **water use patterns and infrastructure** is concerned, the agriculture sector in the Nile basin is characterized by being mostly rainfed with some supplemental irrigation in upper Nile countries and mostly irrigated in lower countries, namely Egypt and northern Sudan. Water withdrawals for irrigated agriculture in the whole basin amount to about 107 bcm/year. Water supply coverage for drinking water varies from one country to another and is a factor of the GDP

of the country with Egypt having almost 95% percent coverage and other countries ranging from 50% to 70% coverage. The total withdrawal for urban water supply in the basin is about 8 bcm/year. Total withdrawals of industrial uses amount to 4.5 bcm/year. Livestock is another major water consumption factor not only because of the amount of water needed for drinking but because of the virtual water embedded in the grazing and fodder that is required for sustaining this livestock and amounts to about 150 bcm/year. It needs to be mentioned that the two countries with the most livestock population in Africa, Sudan and Ethiopia, lie in the Nile basin. Hydropower is another non-consumptive water use in the Nile basin with about twelve significant hydropower generating facilities in the basin. Annex A presents the existing generating capacity of hydropower in the Nile basin countries. Tourism is an indirect water use sector in the Nile Basin with all its navigational water needs and those needed to sustain wild life reserves and national parks for observation tours. On the other hand, the storing capacity of the existing structures along the Nile is about 230 bcm.

Annex A presents list of the **Trans-boundary treaties and agreements** as well as the **regional and sub-regional projects** among the countries of the Nile.

The **Existing human and institutional capabilities** in the Nile Basin especially in modeling Decision Support Systems and/or supporting models are limited. Many existing models within the region appear to be dealt with as “black boxes”, with some regional staff able to operate the models, but lacking the knowledge and experience to maintain and upgrade the models after donor projects and funding have ended. However a few Nile Basin countries capacity to model and operate models exist but face several challenges of sustainability and continuous knowledge transfer and upgrade.

8.2 Data Availability

Data availability is a critical issue for the design of the DSS. Any model needs reliable data for calibration and validation, and the wide range of (potential) effects of water decisions is reflected by a considerable variety of data requirements.

Not surprisingly, data availability in the Nile basin varies in a wide range, according to the state of socio-economic development, the predominant issues, climate and stability of each country; sometimes it depends on a single initiative, usually supported by international organisations, whether data are being collected or not. The tables in chapter 4 of Annex A provide a detailed overview.

Meteorological data collection has generally encountered a serious reduction in the last decades. In particular the dense rain-gauge networks have been reduced, sometimes drastically. A core network of meteorological stations, either classical or automated stations, is available in all countries, but the density distribution is low in most of the Nile Basin countries. Detailed assessment of areal precipitation is difficult, in particular in mountainous and hilly areas where topographic effects occur. It is recommended to take advantage of remote sensing techniques to interpolate between ground stations.

Hydrological data collection of streamflow monitoring shows a comparable but even more pronounced picture. Both the density of the networks and the reliability of the collected data have been in decline for many years. The latter is more typical due to hydrological services' inability to visit the stations regularly and update the rating curves. In two countries, Rwanda and DR Congo, hydrological data collection is interrupted since many years and has not yet resumed; in Burundi, rating curves have not been updated since the early 1990s. Generally, the degree of automation of the hydrometric networks is still very low, and data teletransmission is unknown in most countries.

It is recommended to consider, in the context of DSS development and implementation, to promote the establishment of a core network of well maintained stations that are linked to a regional teletransmission network.

Groundwater levels and water quality – both of surface waters and groundwater – are rarely monitored on a regular basis but rather sporadically - that is, in the context of studies or projects. Data are often scattered. Remarkable exceptions are Kenya and Uganda where an IWRM approach has been adopted with the support of major programmes. Sediment transport is monitored in those countries where this is a priority issue.

Demographic and socio-economic data are relatively easy to obtain, mainly because there is always a national agency (Bureau of Statistics) in charge of collecting these data, and there are international quality standards for demographic, socio-economic and public health surveys.

Water use data need to be collected from the individual sub-sector stakeholders, and often the available statistics refer to production data (energy produced) or to area data (irrigated area) rather than to the actual water use; conversions are not necessarily straightforward.

8.3 Water Policy and Reform Process

Policy development in the water sector is a highly complex process that is influenced by many different constituencies of interests that attempt to influence the outcome of the formulation process. These interests are imbedded in institutions inside and outside the public water sector. A distinction is made between endogenous and exogenous factors that influence the policy formulation and institutional change processes. Endogenous factors, ie those originating within the system are related to water scarcity, water quality, public service performance deterioration and financial constraints issues. Exogenous, those originating outside the system factors are related to developments at international and national level and technological progress.

The policy contents vary considerable according to the national physical conditions, agendas and institutional arrangements. Land, water and nature conservation form a focus of water and environmental policies in the riparian states in the Upper Nile river basin. Increasingly attention is paid the potential role of water resources for generating socio-economic development and enhancing food security as part of a poverty alleviation strategy. Efficient use of water resources, matching supply and demand and water quality form the focus of the riparian states in the lower river basin. In the lower basin the management structures are more hierarchically organized than in the upper basin, which is commonly explained on the basis of the water distribution management function in large-scale irrigation schemes. The function requires the development of a regulatory framework that has to be enforced on all water users.

The discourses in the global water platforms since the early 1990s have affecting policy and institutional developments in the Nile Basin. In all countries apart from DR Congo (2005) water policies are either in place, drafted, completed or awaiting implementation. These policies aim at supporting the national socio-economic development while protecting the natural environment. New institutional arrangements are introduced through the strategies that aim for the development of consistent divisions of mandates and of collaboration mechanisms within and between ministries directly or indirectly involved in water resources management. The strategies aim for enhancing the role of the private and voluntary sector in the formulation, design and management of water related initiatives.

In all countries in the Nile Basin, water resources management mandates increasingly are assigned to one ministry that covers both water resources management and public services provision. Another trend is that the constitutional and organizational functions are divided between the central ministry and water resources management authority organized along the hydrological boundaries of river basins. This prevents conflict of interests between the government function to protect the public interest and the operational function of service

provision. Still another trend is that these public authorities have consultation platforms with public, private and voluntary organizations engaged in water resources management for coordination of initiatives and for consultation on important water resources management decisions.

The riparian states are experimenting with complementing top-down policy approaches with bottom-up planning approaches. All governments are supporting participatory processes at local level to orient the public sector services in the water sector stronger on the demands of the voluntary and private sectors. The management responsibilities for water supply and irrigation systems at local level get increasingly attention of the water administration because experiences show that beneficiaries care better and contribute more to the management of the systems if they share in the ownership.

9 Executive Summary of Stakeholder Consultation Plan

9.1 Introduction

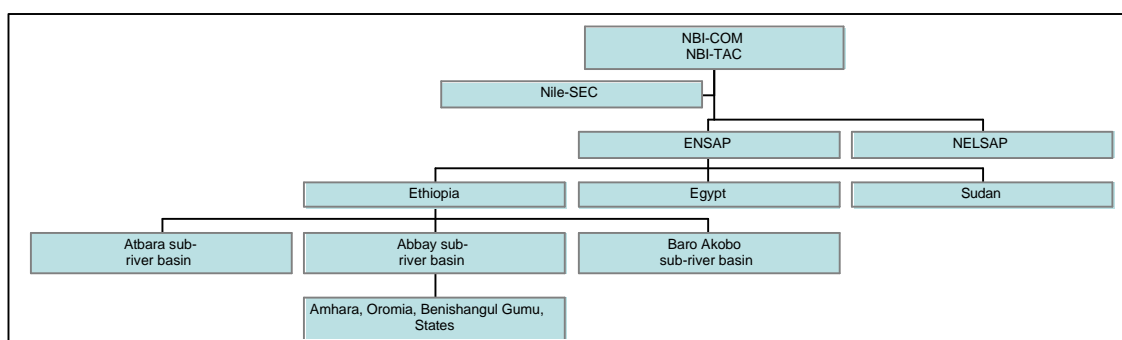
One of the four objectives of the inception phase of the conceptualisation and design of the Nile Basin Decision Support System is the identification and selection of stakeholders for the decision support system. The selected stakeholders will be consulted during the analytical phase about the key decisions, data needs, scenario and evaluation criteria around which the basic DSS will be designed.

The results of the stakeholders selection and the preparation of the stakeholders consultation plan are presented in Annex B. This section forms the executive summary of Annex. After a discussion of the institutional reform processes, the report explains the stakeholders classification systems that have been applied for the stakeholders selection and the preparation of the stakeholders consultation plan.

9.2 Institutional reform processes in the water Sector

Governance systems determine who gets what water, when and how. The representation of various interests in water decision-making and the role of politics are important components in addressing governance dynamics. Water is power, and those who control the flow of water can exercise this power in various ways. However, many people around the world are currently lacking a voice in decision making over water use and the distribution of water supply and sanitation. As opportunities to expand water supplies decrease in many parts of the world, competition over current supplies can easily escalate, creating the need for improved governance.

Figure 9.1 Indicative Portion of the Emerging decision hierarchy within the Nile Basin



Governments are increasingly collaborating at regional level to deal in an effective way with the water management challenges. The institutional development process of integrated water management in the Nile Basin foresees the development of four administrative levels. Table 9.1 shows the administrative levels that are currently being developed in the Nile Basin: regional, sub-regional, national and sub-national level. Table shows the management functions and the administrative levels to which the public sector management functions are allocated.

New institutional arrangements are piloted that focus on integrated water resources management at river basin level and collaboration between the public-private-voluntary sectors at national, sub-

national and regional level. Hydrological units are the appropriate operational units for water resources management and national states are increasingly using the basins for reorganizing their water administration. In addition, regional collaboration at trans-boundary basins between riparian states is intensifying and new institutional and technical frameworks are being established.

A second development is that the water administrations are enhancing the participation of stakeholders from the private and voluntary sector for creating syntheses between the initiatives of stakeholders at national, regional and local level initiatives. Dealing with the water shortages and water quality challenges requires a concerted effort of the water administration, the private sector, and voluntary organizations to raise awareness and enhance the responsibilities of the various stakeholders

Table 9.1 Administrative levels and the allocation of management functions

Administrative level	Management functions¹
1. National level	Constitutional, Organisational and Operational Functions
2. Regional level	Constitutional Function: vision establishment, policy development, formal legislation, creation institutions, co-ordination of strategies and strategic planning
3. Sub-regional level	Organisational Function: strategies, Criteria guidelines and standard development, secondary legislation/regulations, organization of planning and implementation
4. Sub-national level	*Operational Function: Implementation, water use management, water utility management, monitoring, enforcement of laws and regulations

Another development is that the national and supra-national administrative levels are increasingly focusing on the constitutional function. The organizational function is either transferred to the water administration at sub-national level or to a semi-public authority that is organized on the basis of river basins. The operational function is delegated to the lowest management level within the water administration or to water offices within the local government authorities and private and voluntary sector stakeholders.

9.3 Stakeholders identification and selection

The term 'stakeholders participation' is widely used in the water management literature. It covers a person or a group with a direct interest, involvement or investment in an initiative, project or enterprise. There are theoretical discussions about: What is a 'stake' in water management? What is considered under stakeholders? The direct stakeholders to water, like water users or people with no access to safe water, or the indirect stakeholders like government officials in a water resource management function? Different classification categories of stakeholders can be applied for specific purposes.

For the stakeholders identification and selection process two classification systems have been applied: a sectoral system for the identification and selection and a functional system for the potential role in the DSS development process. For awareness purposes a list of the potential stakeholders has been prepared for each of the riparian countries that clustered the stakeholders in public, private and voluntary sector organizations at national, sub-national and supra-national

¹ **Organisational Function:** tasks and competencies needed to develop regional strategies as logical combinations of members measures and to organise their implementation

Operational Function: tasks and responsibilities to carry out strategies (IHE: 2001,15).

Governance functions cover both the tasks and competences related to the constitutional and organizational management functions.

level. For the preparation of the stakeholders consultation plan the stakeholders were divided into four categories on the basis of their potential involvements in the DSS development process.

The managers of the resource institutions that were visited during the country assessments ranked the stakeholders on three dimensions: their current involvement in water management decisions at national, sub-national and supra-national level. For appraising the institutional reform processes the respondents were also asked to rank the stakeholders on desirable involvement at the three territorial levels in future.

The results of the ranking are influenced by the administrative structures of the water sector in the riparian countries. Sub-national water administrations ended high in the ranking in riparian states with a federal structure and low in states with a central structure. However, in the riparian countries of the Upper Basin, central states are implementing an administrative reform process that aims for a decentralization of the operational function to the lowest appropriate water management level. In these states the water administrations at basin and local levels received high rankings.

The rankings show that the managers of the water administrations see the need for consultation and participatory process with the private and voluntary sector. Universities, potential investors, non-governmental organizations with an interest in water and environment received moderate rankings. However, a comparison of the rankings on current and desirable involvements shows that the senior managers in the water administrations support an active involvement of voluntary, private and semi-public organizations, which perform a societal function in the field of water resources and environmental protection, in the water sector. For the involvements in the water resources management commonly a distinction is made between water users, stakeholders and interested parties in water resources management.

Table 9.2 Operational definitions stakeholders categories for the development of DSS

Stakeholder categories	Interest in NBI-DSS
Potential DSS using organizations	Institutions that for the water management and socio-economic development mandates have an interest in using in future the DSS for preparing and taking rational and scientific decisions
DSS development partner organizations	Institutions that can contribute to the development of the knowledge base and modelling of the DSS for simulating the effects and impact of human interventions in the river basin or its sub systems
Interested organizations	Institutions that through their societal functions and involvements in the water sector an interest to follow the DSS development process and to be informed about forthcoming investments and water allocation decisions
Data supplying organizations	Institutions that collect and process climatic, biophysical, hydrometric, spatial and socio-economic data needed for the development of a DSS

For the involvements in the development of a Decision Support system a distinction is made between four categories: potential users, potential development partners, data suppliers and interested parties. Table 9.2 shows the definitions of the four categories. For the category of potential users a sub division can be made between the decision makers and the management and technical staff. The technical staff is structurally involved in the development process of the DSS system and the involvement of decision makers concentrates on milestone decisions. For the development partners and interested parties a sub-division can be made between institutions that operate at national and international level.

The international organizations can be considered as development partner or interested party at regional level but not as stakeholder for a DSS at national level. The role and mandates of international development organizations makes them potential development partners at regional level especially due to their involvement in knowledge development. However they cannot be

considered as stakeholder for the DSS development process since they are not part of the national society and their relations with national organizations is regulated through contracts based on international law. These contracts specify the roles and responsibilities of international organizations concerning their technical and financial collaboration initiatives.

Table 9.3 General results of stakeholders ranking)

Stakeholder categories	Ranking results
Stakeholders national level	<ul style="list-style-type: none"> *Transboundary water resources management issues are responsibility of public administration at national level *Water administration/agencies and water knowledge centres are major stakeholders institutions at national level *Public, private, voluntary partnerships become increasingly important at national level for dealing with water resources management challenges
Stakeholders regional level	<ul style="list-style-type: none"> *NBI initiatives need a permanent institutional structure for dealing with regional water resource planning and management issues *Regional knowledge centres need to engaged in DSS development process to make use of their knowledge and expertise
Stakeholders sub-national level	<ul style="list-style-type: none"> *Decentralization processes in public water sector to state, river basin and local government needs to be anticipated *Stakeholders at sub-national level needs to be engaged in DSS development process

Table 9.3 shows the general results of the stakeholders ranking on desirable involvements in water management decisions at national, regional and sub-national level. Transboundary water resources management is considered the mandate of the national public sector organizations. The water administration and water research centres that focus on transboundary water management issues received the highest ranking. They are followed by the Ministries that have a stake in water resources management at national (Agriculture, Energy, Internal Affairs) and international level (Foreign Affairs)

The Nile Basin Initiatives, the intergovernmental organizations in the region and the International development organizations are ranked highest as stakeholders at regional level. The NBI Focal Point or Technical Organ of Water Resource and the NBI Subsidiary Action Programs and NBI Subsidiary Vision Program received the highest ranking. They were followed by the regional intergovernmental organizations that manage water related projects. In addition, the resource agencies that made rankings entered international development and funding agencies on the list of regional stakeholders, however their rankings were generally low.

The decentralization and initiative partnership initiatives that are prepared or implemented in the Riparian States of the Nile Basin are reflected in the ranking. The managers of the water agencies gave high ranking to regional organisations to which operational responsibilities in water resources management are delegated, like Sub-River Basin organizations. It was also observed that private and voluntary organizations received higher scores for their desirable involvement in water management issues compared to their current involvements. The managers consideration might have been that voluntary water users organizations and private investors are expected to play a more prominent role in facilitating participatory processes in local communities and investing in the infrastructure.

The stakeholders ranking shows a need for the NBI-WPMP to develop a communication and expectation management strategy for the DSS development process. Firstly, the national decision makers need to be briefed accurately about the development phase and the milestone decisions, Secondly, the managers and planners of the national water administration, and the water related ministries are the core participants of the workshops during the preparation of the conceptual design. Thirdly the conceptual design needs to enable the NBI-WPMP to develop a

communication strategy towards the water regulators, the water related research institutes, the interested parties and the data suppliers. Through the communication strategies the NBI-DSS partners need to develop realistic expectations about their contributions to the development and testing of the DSS in the short and medium terms.

Stakeholders consultation plan

The objective of the analysis phase is to identify the key decisions, information needs and data requirements of the Nile Basin DSS. The analysis will focus on the decision making hierarchies and policies, institutional concepts and arrangements between the organizations involved in planning processes of the different water resources. . For that purpose, two sub-regional and nine national awareness and training workshops will be conducted to enhance the stakeholders understanding about the DSS capacities. Linked to these trainings activities, consultation workshops will be organized where the key features of the DSS system will be discussed.

The participants of the sub-regional DSS awareness and training workshop will be the same as the participants of the regional stakeholders consultation. The sub-regional training and consultation workshops will be organized back-to-back so that the consultation workshop will benefit from the awareness/training the participants received. The participants of the sub-regional awareness/training workshops are the members of the regional DSS-network, the nine National DSS specialists, and the nine national DSS counterparts. The members of the regional DSS network are the senior managers of the NBI programs and water related research programs in the region. The NBI organization will be responsible for the invitation of the participants in the sub-regional workshops.

The participants of the national DSS training workshops and the national stakeholders consultation will differ slightly. The participants of the training will come from the staff of potential users and development partners of the DSS. The participants of the national consultations will cover also leaders of the potential users, potential development partners, and interested parties. National consultations will be organized in all riparian countries for which the consultants have prepared a three-days program.

The programming of the stakeholders consultations needs to be done in a flexible way taking into consideration the different administrative and socio-economic contexts at national levels. The consultations are a participatory process in which the stakeholders are consulted about the main trans-boundary water management issues, the key decisions that form the target for a basin-wide DSS in short, medium and long terms, and the information requirements..

9.4 Proposed programs for the sub-regional consultation workshops

Two-days workshop will be organized back-to-back for the participants of the sub-regional DSS awareness/training workshops in Addis Ababa and Kigali. The proposed agendas need to be adjusted to contextual factors in the Lower and Upper Nile basin

Table 9.4 Proposed Agenda: Day One

Working Sessions	Content	Method
0. Opening		
1. Thematic and Key Issues	Inception report	PowerPoint presentations and plenary discussions
2. Stakeholders Mapping	Inception report	Briefing, group work and plenary discussion
3. Identification and Clustering of Decisions	Inception report	Power point presentation
4. Ranking decisions	Inception report	Group work and Plenary Discussion

Table 9.5 Proposed Agenda: Day Two

Working Sessions	Content	Method
0 Opening		
5. Output, Criterion and Indicators	Inception report	Briefing, group work and Plenary Discussion
6. Models/Tools and Data/information	Inception report	Briefing, group work and Plenary Discussion
7. Institutional arrangements	Inception report	Briefing, group work and Plenary Discussion
8. Workshop Conclusions	Summary of Workshops Findings	To be decided

9.5 Proposed programs for national stakeholders consultation workshops

A three-days workshop is proposed for which 40 participants are invited who have been identified during the Country Assessment Studies. The stakeholders at national level have been divided into five categories: 1. Decision makers, 2. Potential users, 3. Potential development partners 4. Interested parties, and 5. Potential data suppliers. The decision makers, who take the milestone decisions concerning the DSS concept and development process, have delegated the preparations to the managers of the water related public organizations at national level. Therefore it is important that the highest ranked potential users of the DSS system are represented by a manager and a planner. In addition, the organizations need to be represented whose management responsibilities will increase as a consequence of the institutional reform processed that will be piloted or implemented.

The Preparation Teams of the National Stakeholder Consultation are responsible for inviting the participants considering the results of the participatory stakeholders rankings. The National DSS specialist, the National DSS counterpart, the coordinator of the NBI-focal office or Technical Organ of Water Resources and the local consultants form the Preparation Teams of the National Stakeholders Consultations. Guidelines for the selection of the stakeholders are prepared by the international consultants and send to these teams. The guidelines aim for the participation of managers and planners of the potential users of the DSS system, and the leaders of the water related research institutes, water agencies at sub-national level, and of private and voluntary sector organizations involved in the national and sub-national water sector. The Preparation Teams have to use the results of the participatory stakeholders ranking and categories. However the teams can also invite stakeholders that have been added to the list of stakeholders during the review process of the inception report as long as they justify their decision.

The consultants will prepare a special report on the objectives and organization of the national stakeholders consultations. Therefore this inception report only presents the agenda of the three-day workshop.

Table 9.6 Proposed Agenda: Day One

Working Sessions	Content	Method
0. Opening		
1. What is a DSS and what can it do? and Thematic and Key Issues	Inception report	PowerPoint presentations and plenary discussions
2. Stakeholders Mapping	Inception report	Briefing, group work and plenary discussion
3. Identification and Clustering of Decisions	Inception report	Power point presentation

Table 9.7 Proposed Agenda: Day Two

Working Sessions	Content	Method
0 Opening		
4. Ranking decisions	Inception report	Group work and Plenary Discussion
5. Output, Criterion and Indicators	Inception report	Briefing, group work and Plenary Discussion

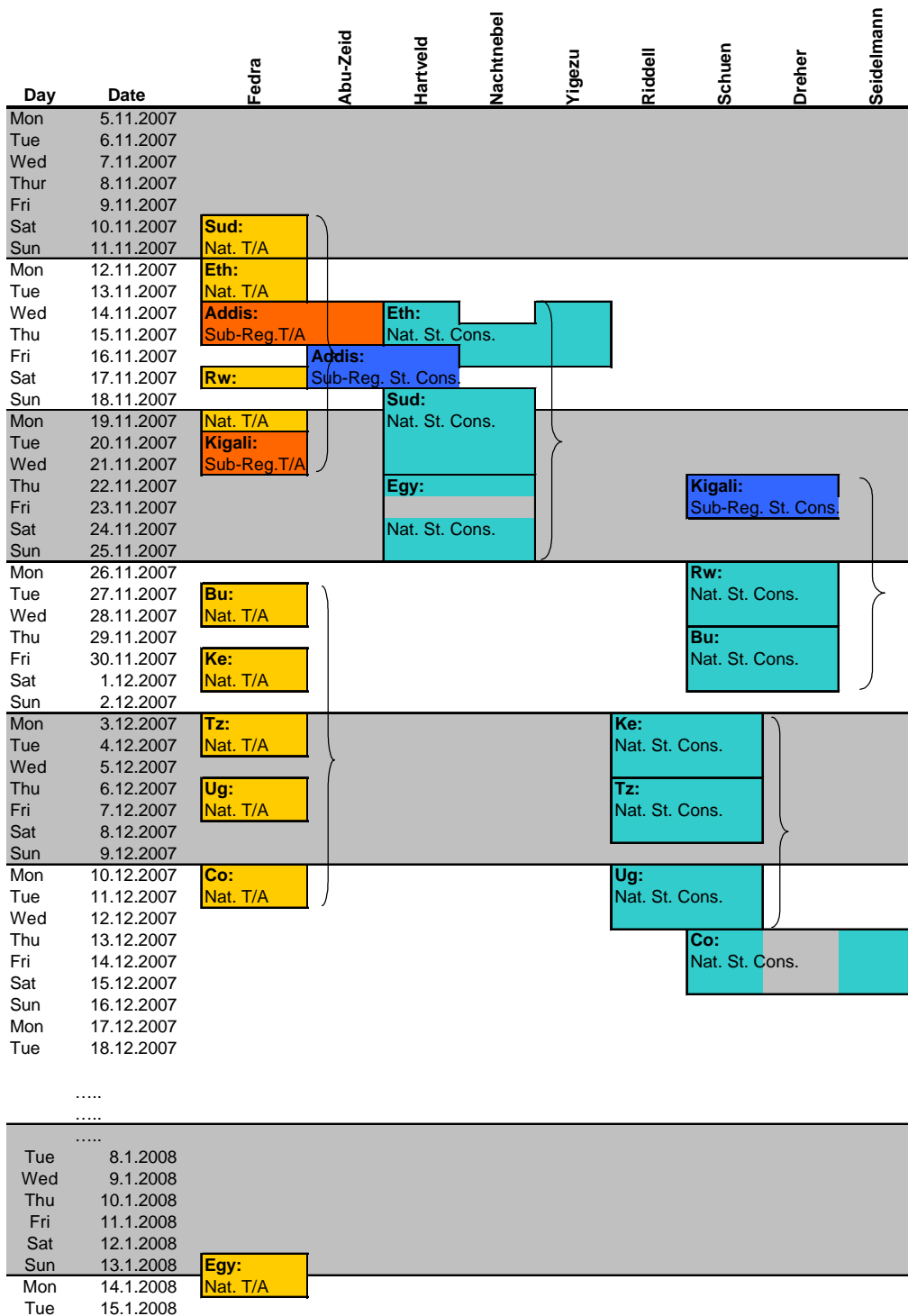
Table 9.8 Proposed Agenda: Day Three

Working Sessions	Content	Method
0 Opening		
6. Models/Tools and Data/information	Inception report	Briefing, group work and Plenary Discussion
7. Institutional arrangements	Inception report	Briefing, group work and Plenary Discussion
8. Workshop Conclusions	Summary of Workshops Findings	To be decided

9.6 Proposed time schedule for stakeholders consultation missions

Mission Schedule Analysis Phase

key: T/A ... Training and Awareness Creation Workshop
 St. Cons. ... Stakeholder Consultations
 Nat. ... National
 Sub-Reg. ... Sub-Regional



10 Executive Summary of DSS Training Plan

The objective is to introduce the potential of DSS tools, illustrate the scope and benefits of possible applications, but also their limitations, data requirements, and infrastructure and institutional requirements. The overall aim is to raise awareness to the potential of DSS, the diverse didactic methods of the workshop are designed to get the participants interested in active involvement, including the exploratory application of the on-line tools for any specific problem or project as well as cross-cutting decision relevant issues raised by the participants.

10.1 Course Structure and Content Description

The DSS awareness and training workshops are planned for a two days duration and will be offered in two sub-regional workshops, and 9 national workshops. The material presented will be flexibly adapted to the respective audience, its background and expectations in each case, aiming at a high level of interactivity.

The first day will be dedicated to a series of introductory lectures of about an hour each including 15-20 minutes questions and answers; each lecture can be concluded with an optional multiple-choice test, discussions of invited written questions from the participants, answers to be shared on-line (DSS workshop web page: <http://www.ess.co.at/WATERWARE/NILE>). The main topics to be address cover DSS methodology, tools and applications:

1. Definitions, theory, DSS structure, DM process, basic approaches
2. Problem structures: IWRM, DPSIR, criteria for assessment, valuation
3. Formal decision making with DSS, objective functions
4. IWRM decisions, design of alternatives, instruments, constraints
5. Uncertainty and risk, game theory
6. DSS tools and methods (including the Nile DST).

On the second day, this will be followed by live demonstrations of selected demo cases including examples drawn from the Nile basin.

Details of the lecture units (course content) and the proposed schedule for the workshop are available on-line at

1. <http://www.ess.co.at/WATERWARE/NILE/workshop.html>
2. <http://www.ess.co.at/WATERWARE/NILE/schedule.html>

for comments and suggestions by the participants to ensure the adaptation of the material to the expectations and background of the respective target groups of national and regional DS specialists and key stakeholders. The lecture notes (PowerPoint in handout format) will be made available to the participants in electronic format.

10.2 Support tools and material

A number of online support tools have been implemented, including

- A web page dedicated to the workshops with on-line registration (or registration forms for downloading) of participants, an interactive on-line database of stakeholder institutions, and questionnaires, as well as on-line versions of the lectures and associated multiple-choice test for participant self evaluation;
- On-line web based model and DSS tools exploratory self study.

These tools will be made available for the duration of the project in support of the two day awareness workshop to provide distance learning support at a more technical level.

11 Executive Summary of Prototype of Web-based Information System

11.1 The Goals of the Nile-IS

Nile-IS shall target the development of a framework of the KB with essential features and sufficient flexibility for scaling up to the full-fledged Nile Basin Knowledge Base. The following shall specifically be supported.

- Make all information obtained and generated in the “Needs Assessment and Conceptual Design Exercise” available to NBI, the identified stakeholders, and the interested public (world) in a transparent and well structured manner on a central platform
- This implies that information obtained will be available to subsequent tasks and projects no matter within or outside NBI. This will assure effective utilization of accumulated information and increase efficiency.
- Reveal to any user of the IS the implications of the usage of the information contained in the IS especially with respect to applicability and quality.
- Possibility to exchange data with other systems (like the website www.nilebasin.org)
- Different Access levels
- Workflows to guarantee a high level of information quality

The Nile-IS is **not** intended to provide

- A fully fledged Document Management System (with Lock-Mechanisms on any documents to be edited; containing all the documents generated throughout the whole communication processes of the NBI)
- Communication-Tools like Groupware systems usually provide

11.2 Statement of Scope

Nile-IS will provide an easy-to-use platform which enables all participants of NBI to store, retrieve and exchange information in a structured way.

High quality of data can be achieved by feedback mechanisms, trustworthiness by implementing a sophisticated concept which supports information flow from inner circles of the community out to the public.

Through the implementation of state of the art technologies like “Lucene” a scalable and future-proof system will be developed.

11.3 Key functions

The general layout / key functions of Nile-IS will be as follows:

- Content archiving (structured document repository with search functionalities) and versioning
- Metadata database
- Tool for the storage and exchange of information between NBI units and stakeholders

- Web portal for general public (linked from NBI website)
- The web based back-end offers an easy-to-learn and user-friendly (Microsoft Windows like user interface!) administration environment (IE 5.0+ is recommended) where
 - Metadata and assets can be administrated
 - Documents can be uploaded
 - Users and user groups and their access rights can be administrated and
 - Log Files of the system can be seen
- In addition to the web based back-end an MS-Excel based offline client can serve as a simple way to collect data (due to the well defined asset types) when users are offline (e.g. during some periods of the inception phase). This so collected data can be imported to the database with a special parsing routine
- All content of Nile-IS is organised as assets which are always of one of the well defined asset types. To any asset one or more assets of the type "Document" can be linked. Documents can contain either unstructured (e.g. Text formatted as Adobe PDF, MS Word etc.; Images formatted as JPEG, GIF etc.) or semi-structured data (e.g. Datasets formatted as MS Excel etc.) and will always be described by a special asset type called "Document" (therefore extensive use of Dublin Core Metadata will made).
- All metadata collected about any asset will be stored in the conX DB-System and will be indexed together with the documents (except certain document types like pictures) in the conX Index-System (which is based on Lucene).
- At the web based front-end (which will be optimised for IE 5.0+ and Firefox 2.0+) any asset for which the user has access rights can be browsed and searched by using a high performance and scalable search engine, which can used in two ways
 - Simple Google-like Search (by typing in a search phrase)
 - Moderated Search based on basic metadata like selecting countries, sub basins, themes or types of information (asset types)²

11.4 Criteria for success

The client attaches great importance to the scalability of the system. Future extension of the system, both in the scope of functionalities and in the data volume, should not be restricted by design constraints but should be possible in a modular manner.

- Conceptual design of an (intelligent) web-based information system
- Screen design (styleguide) for efficiency information systems (including usability & accessibility)
- Technical implementation of the web-based information system
- High level Web-hosting/-housing
- Know-how on conception and implementation of intelligent search engines
- Know-how on conception and implementation of semantic web components

Further criteria

- Consulting along the whole project schedule

²See also categorised search at <http://www.reegle.info>

- Conceptual design of the system (structure of content and information, system architectures → performance, robustness, scalability, security, screen design → usability, accessibility)
- Precise search mechanism to achieve high quality output of information
- Development of a target-oriented (screen)design according to community and the audience

Self-evident – but important criteria

- User friendly interfaces – consistent guidance for the user
- Media-compatible preparation of content
- High performance of the web-based system
- Definition of window-headers and meta-tags to be indexed by other search engines
- Testing (e.g. operating systems, different browser)
- Tight project management and frequently & transparent communication and co-ordination of the project
- WAI conformity (as needed) by using XHTML technology.

12 Preliminary Conceptual Framework for the Nile Basin DSS

The objectives of the Nile Basin DSS as envisaged in the Nile Basin DSS project document and as expressed in the different DSS Baseline Assessment reports are to enhance the analytical capacity in the Nile Basin to support planning and management efforts on regional, sub-regional, and national levels in a sustainable manner. The DSS would provide a platform for sharing knowledge, understanding river system behavior, evaluating alternative development and management schemes, and supporting informed decision making from a regional perspective. The Nile Basin DSS would include a modeling system and other analytical tools (river basin modeling system, and multi-criteria decision analysis) to support planning of cooperative joint projects.

Based on the preliminary discussions, brain storming, and situation assessment consultations conducted with the key stakeholders in the Nile Basin countries, In addition to the results of the working group discussions at the inception workshop, the following are some of the preliminary decision support needs described as thematic categories of issues that can assist in conceptualizing the type of Nile Basin Decision Support System which could be useful for Water Resources Planning and Management in the Nile Basin.

12.1 Thematic Categories of Issues

The above mentioned country key issues have been thematically categorized to be the regional category of key themes as shown in the table below. A sample of the key issues have been included as examples of the main concerns of the countries, and a sample questions have been selected as examples of the type of questions that could be addressed by the proposed Decision Support System.

Table 12.1 Thematic Categories

Thematic Category	Main Concerns (Sample Country Key Issues)	Sample Key Questions
1. Environmental Management	<ul style="list-style-type: none"> • Wetlands degradation • Biodiversity conservation • Water Quality • Pollution, Industrial Waste activities; • Salinization; agrochemical seepages; • eutrophication 	<ul style="list-style-type: none"> • How would the hydrology of the wetlands be affected/alterd due to contemplated interventions (u/s; d/s)? What are their potential impacts? • What is the current status and trends in hydrological and related features of wetlands (water quantity/quality; other relevant indicators) • What is the observed current trend and projected future key economic activities affecting key wetlands or basin eco-systems?
2. Climate Change and Variability	<ul style="list-style-type: none"> • Increased flow variability , • Floods and Droughts • Declining water levels in lakes and rivers 	<ul style="list-style-type: none"> • What are the observed patterns (including trends in) key/relevant climate parameters in the Nile Basin? • What are the projected changes in climate variables in the Nile Basin? • What are the potential impacts of climate change on planned/existing water infrastructure (storages • What would be the performances of contemplated adaptation options (to climate change)?
3. Fisheries Management	<ul style="list-style-type: none"> • Need for improved data collection and management for fisheries development 	<ul style="list-style-type: none"> • What are the trends in Fisheries production in basin Lakes? • What species of fisheries are suitable for the Nile river basin? • What's the impact of water hyacinth reduction on fisheries production in the Equatorial lakes region? • What was the tonnage of Nile perch exports to the European Union during the period 2004-2006?

Thematic Category	Main Concerns (Sample Country Key Issues)	Sample Key Questions
4. Floods/Droughts Management	<ul style="list-style-type: none"> • Flood Forecasting and Preparedness • Drought Prediction • Sharing/exchange of real time data • Coping with droughts and floods; 	<ul style="list-style-type: none"> • What are the historical trends in the prevalence (severity /frequency) of floods and droughts in the Nile Basin? • Which parts of the basin are prone to frequent floods /droughts? What are the socio-economic impacts of such extremes? • What are the expected seasonal (or short-term) patterns of climatic variables and stream flow at a given location of the basin? • What are the response times and magnitudes of floods for a given rainfall event?
5. Food security	<ul style="list-style-type: none"> • Irrigation • Rain fed agriculture • Drainage of Marshlands for agriculture; 	<ul style="list-style-type: none"> • What are the current and projected future patterns of consumptive water uses in the Nile Basin? • Which parts of the basin are most food - insecure? • What are the water requirements for planned irrigation schemes? • What are the tradeoffs among planned irrigation projects (by country/sector)?
6. Hydropower development and power trade	<ul style="list-style-type: none"> • Increased energy demand • Use of carbon credit to finance power project • Lack of capital for investment 	<ul style="list-style-type: none"> • What are the observed trends in energy demands/consumption; generation potentials; transmission options? • What are the total energy production from planned development sites/interventions? • What is the best way for sequence of development of planned generation facilities? • What are the multi-purpose benefits of planned/existing storage schemes? • How best can existing facilities be operated to maximize their multi-purpose benefits ?

Thematic Category	Main Concerns (Sample Country Key Issues)	Sample Key Questions
7. Watershed Management	<ul style="list-style-type: none"> • Land use, Cover change, impacts on runoff • Watershed degradation (Destruction of natural forests), • Soil/Bank erosion • Sedimentation of hydraulic infrastructure 	<ul style="list-style-type: none"> • What are the land use/land cover distributions in the Nile Basin? What are the historical trends in land use/cover changes? • What are the potential impacts on stream flow of land use/cover changes (historical; projected future)? • What are the sedimentation rates of planned/existing reservoirs?
8. Navigation	<ul style="list-style-type: none"> • Improving and developing navigation potential 	<ul style="list-style-type: none"> • Which parts of the river network are used for navigation? What are their features (length, vessel size, min depth requirements, etc)? • What are the minimum depth requirements for all navigable reaches? What are the available flow depths and their seasonal fluctuations? • What the minimum flow available at various sites of relevance for navigation? How to achieve these? • What is the impact of hydraulic infrastructure on navigation?
9. Water Conservation and Allocation	<ul style="list-style-type: none"> • Water resources availability • Optimal utilization of available water resources • Water use efficiency, demand management • Need to improve conservation to cope with CV e.g. through Rain water harvesting • Intra- and inter-annual fluctuation; • Conflicts in water use (pastoralists etc) 	<ul style="list-style-type: none"> • What is the water balance of the sub-basins of the Nile Basin? - current; historical trends and projected future situation (use, availability etc) • What are the best options for operation of existing facilities to ensure optimal use of resource from basin-wide perspective? • What is the best operation /management option for Lake Victoria to reduce lowering of lake level? • What are the tradeoffs (US/DS) of planned interventions? • What are the opportunities for conserving water in the Nile Basin?

Thematic Category	Main Concerns (Sample Country Key Issues)	Sample Key Questions
10. Socio-economic Issues	<ul style="list-style-type: none"> • Water supply and sanitation • Tourism • Poverty Reduction • Socio-econ impacts of planned projects • Population structure/settlement patterns • Land tenure system • Social and cultural beliefs and norms • Financing mechanisms 	<ul style="list-style-type: none"> • What are the socio-economic impacts of water resources development projects?
11. River Basin Monitoring & Water Resources Assessment	<ul style="list-style-type: none"> • Monitoring for hydro- meteo forecasting • Inadequate tools for WR planning • Need for Water Resources (S & GW, others) assessment 	<ul style="list-style-type: none"> • What are the gaps in data and information for River Basin management?

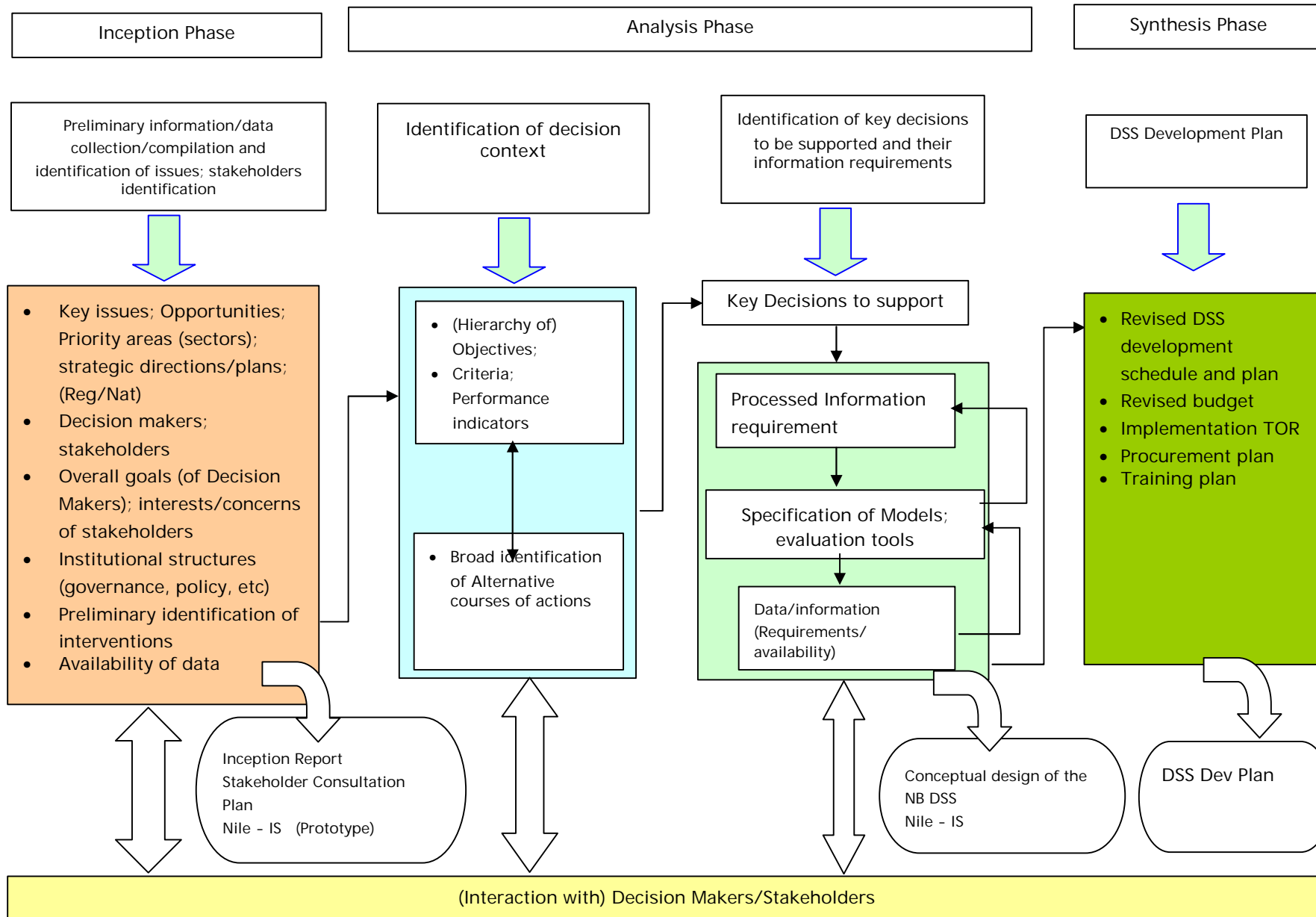
The above mentioned country key issues expressed under the thematic categories of issues will be further analyzed to come up with the key questions (a sample of which is provided) to be used later to develop decision variables. These variables will form the core of the required educated and well informed decisions which are envisaged to be supported by the proposed Nile Basin DSS. This will then be followed by identifying the data needs, and the possible models and tools that could be used by the Decision Support System.

These decision variables when addressed by the Nile Basin DSS will lead to the achievement of the **Nile Basin Initiative Shared Vision** with its objectives and programmes at the national, sub-regional, and regional levels.

The NBI SV is: ***To achieve sustainable socio-economic development through the equitable utilization of and benefit from, the common Nile Basin Water Resources.*** The Nile Basin DSS is intended also in this manner to achieve the development objective of the Water Resources Planning & Management (WRPM) Project which is: ***To enhance analytical capacity for a basin wide perspective to support the development, management, and protection of Nile Basin Water Resources in an equitable, optimal integrated, and sustainable manner.***

12.2 Different Phases of the Development of the DSS (From Inception to Conceptual Design)

The key decision variables identified at all levels, the decision makers, and the stakeholder identified, and their concerns and interests, the institutional infrastructure, and the preliminary assessment of data needs and availability in addition to the physical description of the Nile River Basin System are all parts of what was compiled for the Inception Phase as presented in this report. This phase is illustrated in the diagram below as part of the whole conceptual framework for the development of the Nile DSS design plan.



13 Appendix 1: Itineraries of National Assessments

Country	Mission Teams	Dates
Egypt	Abuzeid, Elbadawy, A.Ghani	2-6 Sept 2007
Ethiopia	Hartveld, Defere, Seid	3-7 Sept 2007
Sudan	Hartveld, Abdelsalam, Seid	25-30 August 2007
Uganda	Jung, Santa Izama	5-7 Sept 2007
Tanzania	Jung, Maganga	31 Aug - 4 Sept 2007
Kenya	Jung, Munyikombo	28-30 Aug 2007
Rwanda	Seidelmann, Rusanganwa, Beyene	4-7 Sept 2007
Burundi	Seidelmann, Girukwishaka, Beyene	10-13 Sept 2007
DR Congo	Seidelmann, Moyengo	14-18 Sept 2007

14 Appendix 2 - Updated Workplan

Updated WORK SCHEDULE based on AGREED WORK SCHEDULE after Launching-Meeting in Addis, 26 July 2007																		
No.	Activity	Months																
		July 2007	Aug.07	Sep.07	Oct. 07	Nov.07	Dec. 07	Jan. 08	Feb.08	March 07	Apr.07							
	Project Management																	
1	Activity 1.1.0 – Consultancy Launching Meeting																	
2	Activity 1.1.1 - Identify Nile Basin Features and System Components																	
3	Activity 1.1.2 - Assess Availability of Data																	
4	Activity 1.1.3 - Water availability																	
5	Activity 1.1.4 - Water Use Patterns																	
6	Activity 1.1.5 - External Impacts																	
7	Activity 1.1.6 – Inventory of Regional Projects																	
8	Activity 1.1.7 – Identify Stakeholders and Develop Consultation Plan																	
9	Activity 1.1.8 – Assess Human and Institutional Capacity																	
10	Activity 1.1.9 – Develop Modules for DSS awareness/training workshops																	
11	Activity 1.2.1 – National Consultations																	
12	Activity 1.3.1 – Development and Set up of Web-based Water Information System																	
13	Activity 1.4.1 – Regional Work shop – inception phase																	
14	Activity 2.1.1 – Planning and Implementation of NWRM/DSS Awareness and Consultation Workshops																	
15	Activity 2.2.1 – Identification of key decisions and information requirement																	
16	Activity 2.3.1 – Identify needs for DSS-related data																	
17	Activity 2.4.1 – Identify long term needs for data collection and monitoring																	
18	Activity 2.5.1 – Identify Overall needs / requirements																	
19	Activity 2.5.2 – Functional sectoral capability of DSS																	
20	Activity 2.5.3 – River Basin Modelling and multi-objective Analysis Tools																	
21	Activity 2.5.4 – Basin Wide Communication and Information/Knowledge System																	
22	Activity 2.5.6 – Training Needs Assessment																	
23	Activity 2.6.1 – Stakeholder Consultation Missions																	
24	Activity 2.7.1 – Preparation of DSS Design Specifications																	
25	Activity 2.8.1 – Regional Review Workshop																	
26	Activity 3.1.1 – Preparation of DSS development plan																	
27	Activity 3.2.1 – Preparation of Training Plan																	
28	Activity 3.3.1 – Elaboration of Inputs to Tender Documents																	
29	Activity 3.4.1 – Final Review Workshop																	
30	Agreed work plan	X																
31	bi-weekly e-mail report		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
32	monthly project report			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
33	final note																	X
34	Inception report					X (Draft)	X (Final)											
35	DSS Requirements Report											X (Draft)	X (Final)					
36	DSS Development Plan																X (Draft)	X (Final)
37	Project Critique																	X

15 Appendix 3 - Proposed Agenda for Regional Workshop

Nile Basin Initiative
Water Resources Planning and Management Project
Needs Assessment and Conceptual Design of the NB Decision Support System
Inception Workshop
17 – 18 October
Addis Ababa, Ethiopia

Description	Responsibility	Time
Day 1, 17 October, 2007		
Registration	WRPM project	8:30 - 9:00
Opening Session		
Welcome/introductory Remark	Dr. Hesham A. Ghany, Regional Project Manager	9:00- 9:15
Opening Remark	Teferra Beyene, Nile-TAC Member – Ethiopia	9:15 – 9:30
Working Session – 1: Overview (Facilitator: Dr. Hesham A. Ghany)		
Introduction to the workshop program	Dr. Mekuria Beyene	9:30 – 9:40
Overview on the DSS Needs Assessment and Conceptual design	Dr. Abdulkarim H. Seid Regional DSS Lead Specialist	9:40 – 10:00
Coffee / Tea Break		10:00 –10:30
Overview of the Draft Inception Report	Team Leader Khaled AbuZeid	10:30–11:00
Compiled Comments on the Draft Inception Report	NBI DSS LS Abdulkarim-H. Seid	11:00–11:30
Working Session 2: Thematic Presentations of the Inception Report (Facilitator: Dr. Hesham A. Ghany)		
Institutional Assessment & Stakeholder Consultation Plan	Senior Institutional Specialist Aard Hartveld	11:45–12:05
Water Availability, Water Use Patterns, & Infrastructure	Senior Water Resources Engineer; Phil Riddel	12:05–12:25
DSS Training / Awareness Raising Program & Material	Senior DSS Training Specialist Kurt Fedra	12:25–12:50
Prototype of the Nile Information System	Information Systems Specialist Andreas Koller	12:50–1:10
Key Issues, Conceptual Framework, & Available Models	Team Leader Khaled AbuZeid	1:10-1:30
Lunch Break		1:30–3:00
Working Session 3: Thematic Working Group Discussions (Facilitator: Dr. Abdulkarim H. Seid) (Coffee / Tea on the side)		
Group forming and orientation to break-out sessions	Consultant	3:00 – 3:15
Institutional Assessment & Stakeholder Consultation Plan	Chairperson/facilitator and Rapporteur – from the Group Consultant: Aard Hartveld / Imeru Tamarat	3:15–5:30
Water Availability, Water Use Patterns, & Infrastructure	Facilitator Rapporteur Consultant: Phil Riddell/ Reinhold Seidelmann	
DSS Training / Awareness Raising Program & Material	Facilitator Rapporteur Consultant: Kurt Fedra	
Prototype of the Nile Information System	Facilitator Rapporteur Consultant: Andreas Koller	
Key Issues, Conceptual Framework, & Available Models	Facilitator Rapporteur Consultant: Khaled AbuZeid	

Description	Responsibility	Time
Day 2, 18 October, 2007		
Working Session 3: Thematic Working Group Discussions (Continuation) Coffee on side (9:45 – 10:00)		
Working Groups prepare presentations on key findings	Working groups,	9:00-10:00
Coffee / Tea Break		9:45–10:00
Working Session 4: Presentations of Thematic Group Discussions Results (Facilitator: Facilitator: Dr. Abdulkarim H. Seid)		
Institutional Assessment & Stakeholder Consultation Plan	Facilitator/Rapporteur	10:00-10:10
Discussion	All	10:10-10:40
Water Availability, Water Use Patterns, & Infrastructure	Facilitator/Rapporteur	10:40–10:50
Discussion	All	10:50 -11:20
DSS Training / Awareness Raising Program & Material	Facilitator/Rapporteur	11:20 –11:30
Discussion	All	11:30- 11:45
Prototype of the Nile Information System	Facilitator/Rapporteur	11:45 -12:00
Discussion	All	12:00 - 12:30
Key Issues, Conceptual Framework, & Available Models	Facilitator/Rapporteur	12:30 – 12:40
Discussion	All	12:40 – 1:10
Lunch Break		1:10 – 2:30
Working Session 5: Way Forward (Facilitator: Dr. Mekuria Beyene)		
Methodology and Workplan for Phase II	Khaled AbuZeid, TL	2:30 – 3:00
General discussion	All	3:00 – 3:30
Coffee / Tea Break		3:30 – 4:30
Report on the Workshop Recommendations	Phil Riddell, Consultant	4:30 – 4:45
Closing of the 2nd Day & the Workshop	Dr. Hesham A. Ghany, RPM	5:00