Call for the procurement of Consultancy Services on the "Development & Draft selected sections of the 'Nexus Assessment Report' related to modernizing and increasing the value and viability of agriculture"

The Global Water Partnership Mediterranean is seeking to hire an external Consultant in the framework of the "Making Water Cooperation Happen in the Mediterranean' project, for the activity: "Development & Draft selected sections of the 'Nexus Assessment Report' related to modernizing and increasing the value and viability of agriculture"

The background of the Project and details about the duties are provided in the Terms of Reference in Annex A.

Type of Contract:	**Service Contract** : the successful candidate will be contracted by GWP-Med's Host Institute, MIO-ECSDE a civil non-profit society based in Greece
Duty Station:	Home Country
Shooting period:	December 2018– January 2019
Occupation:	Part time engagement
Application deadline: Monday 14 January 2019	
Budget: 6 250 € Gross Total (including all foreign taxes and the 20% Greek tax when non-double taxation is applicable)	

The Global Water Partnership (GWP) is a global action network of partner organisations supporting countries and regions in their vision for a water secure world. GWP´s mission is to advance governance and management of water resources for sustainable and equitable development. Since 1996 when it was launched, GWP has grown into a network of over 3,000 Partner organisations, 13 Regional Water Partnerships and 87 Country Water Partnerships worldwide. Since 2000, GWP holds inter-governmental status (Global Water Partnership Organisation). For more information: www.gwp.org

The Global Water Partnership – Mediterranean (GWP-Med) is responsible for the Mediterranean region, covering countries of the Near East, North Africa, Southeastern Europe and the European Union. GWP-Med is legally represented by the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), holding non-governmental organization (NGO) status, based on a Host Institute Agreement between GWPO and MIO-ECSDE. GWP-Med is serviced by the GWP-Med Secretariat. For more information: www.gwpmed.org

1. Application procedure

Applicants are requested to study carefully the Terms of Reference provided in Annex I.

Interested candidates can apply by sending **not later than 14 January 2019, 16h Athens Time:**

A. an e-mail to the attention of **Ms. Sarra Touzi (sarra*@gwpmed.org)*** with the indication **''NWSAS- Development & Draft selected sections of the 'Nexus Assessment Report' related to modernizing and increasing the value and viability of agriculture"** in the subject, attaching the following documents:

- **A Cover letter** explaining why they are a suitable candidate for the advertised position, describing their experience, qualifications and competencies responding to the position's needs. Contents should focus on the background and experience relative to the position's requirements. The cover letter should be 1 page max.
- **Their detailed CV,** using the model CV form provided in Annex B., including past experience in similar projects and contact details of referees

B. by **registered post** their Financial Offer to the GWP-Med address at 12, Kyrristou str. with the indication in the envelop: ***Financial Offer for 'NWSAS- Development & Draft selected sections of the 'Nexus Assessment Report' related to modernizing and increasing the value and viability of agriculture".*** Their Financial Offer specifying a total lump sum amount (Annex C.). The maximum available budget for this contract is 6.250 Euro, including all foreign taxes and the 20% Greek tax when non-double taxation is applicable.

Incomplete applications will not be considered. Please make sure you have provided all requested information.

The application may include the CVs of more than one expert who will be involved in delivering the study. However, the contract will be signed with the expert who will be designated explicitly in the application as the team leader. The team leader will be the vis à vis of GWP-Med technically and contractually.

2. Evaluation Procedure

Applications will be examined by an evaluation committee as follows:

Evaluation Procedure Applications will be examined by an evaluation committee as follows:

A) The Committee will examine the applications and accompanying CVs and the cover letter received in relation to the qualifications listed in the TORs. Applications which do not meet the required qualifications will be excluded from further evaluation. The remaining applications will be further evaluated by the Evaluation Committee, concluding with a short list.
B) The Evaluation Committee may decide to hold personal interviews with the short-listed applicants. Applicants called to an interview may be requested to submit in printed format prior to their interview all documentation supporting their declared qualifications.
C) The final evaluation will be based on an analysis of qualifications and competencies. The candidate to be selected will be the one evaluated and determined as:
    - Responsive to the procedure described herein;
    - Compliant to the ToR of the post;
    - Having received the highest score out of a pre-determined set of weighted criteria (see below)

Criteria - max. 100 points:

- Criteria A – Academic Qualifications/Education as indicated under the ToR section entitled "Qualification and Experience" (max points: 20)
- Criteria B – Required Experience as indicated under the ToR section entitled "Qualification and Experience", and evaluation of the motivation letter (max points: 30).
- Criteria C – Key competencies as indicated under the ToR section entitled "Qualification and Experience" (max points: 50)

The Final Score of each one of the offers received will be calculated after including also the Financial Offer and by using the following simple formula: **Sx=Cx/Ex**, where:

- **Cx** is the amount of the Financial Offer
- **Ex** is the total sum of the evaluation criteria points
- **Sx** is the final score round it up to the first digit.

The selected offer will be the one with the smaller Sx .

For further information or clarification please contact: secretariat@gwpmed.org

Athens 27 December 2018

The Chairman of GWP-Med

Prof. Michael Scoullos

ANNEX A.

Terms of reference: Development & Draft selected sections of the "Nexus Assessment Report" related to modernizing and increasing the value and viability of agriculture

In the framework of:

'Making Water Cooperation Happen in the Mediterranean' Project

December 2018

A. Introduction

The North-Western Sahara Aquifer System (NWSAS) covers a total area of one million km^2. It is shared between Algeria (700 000 km^2), Libya (250 000 km^2) and Tunisia (80 000 km^2). It has an estimated water potential of 60 000 billion m^3 but most of this reserve is non-renewable water. The recharge is estimated to only 1 billion m^3/year. Water withdrawals from the NWSAS increased from 1 billion m^3 in 1980 to around 2.8 billion m^3 in 2012; leading to a considerable decrease of the water table and an increase of the water salinity.

Aiming to improve scientific knowledge about the aquifer and inform the decision making towards a sustainable use of the shared water resources, a NWSAS Consultation Mechanism (NWSAS CM) was established in 2002 serviced by the Sahara and Sahel Observatory (OSS) for its secretariat, while a Coordination Unit is directed by a coordinator designated by the countries in a rotation of 2 years.

The project ‘’Making Water Cooperation happen in the Mediterranean” aims at making tangible advancements on priority issues of sustainable water resources management, at regional and transboundary levels in the Mediterranean with a focus on the MENA region, as means for enhanced regional cooperation among countries and towards meeting sustainable development objectives and strengthening regional stability and peace.

The Project is structured around two Components:

- Component 1: Enhance Transboundary Water Cooperation
- Component 2: Assist Regional Climate Change Policy

The NWSAS related activities are included under Component 1, more specifically, these activities will:

a) Facilitate the enhancement of coordinated and integrated management of shared waters in the region and catalyse action at the level of basins/aquifers towards their sustainable management. It will do so by introducing the Water, Energy, Food and Ecosystems Nexus approach, analysing the institutional and legal framework and facilitating the establishment of a new institutional arrangement that will enable the long-term sustainable management of the NWSAS at transboundary level and facilitate dialogue, knowledge exchange and cross-fertilisation among stakeholders.
b) Facilitate the sustainable management of the North-West Sahara Aquifer System (NWSAS). It will do so by strengthening the knowledge base with solid technical work and by enhancing the policy process and developing of a long term (20 years) Strategic Shared Vision (SSV) for the management of the NWSAS reflecting the needs and aspirations of stakeholders of different sectors.

The Project is funded by the Swedish International Development Cooperation Agency (SIDA). The Global Water Partnership-Mediterranean (GWP-Med) is responsible for the overall coordination and management of the Project. For the NWSAS sub-component, the Project will be implemented in cooperation with the Sahara and Sahel Observatory (OSS), the United Nations Economic Commission for Europe (UNECE), and the Royal Institute of Technology (KTH, Stockholm).

The **Steering Committee for the specific NWSAS sub-component (SC)** is composed of the: focal points, designated representatives of the 3 countries sharing the NWSAS (Algeria,

Tunisia, Libya); members of the Permanent Technical Committee of the NWSAS Consultation Mechanism; and representatives of the project partners (GWP-Med, UNECE, OSS, KTH).

Algeria, Libya and Tunisia are the beneficiary countries of the NWSAS related sub-component.

The NWSAS sub-component includes an activity for the development of a 'Nexus Assessment Report'. As part of this activity, GWP-Med will undertake to hire an expert to development & draft selected sections of the "Nexus Assessment Report" related to **modernizing and increasing the value and viability of agriculture** in close collaboration and coordination with UNECE. The Procurement Regulations of GWP-Med/MIO-ECSDE dated 2012 and the procurement procedure shall apply.

A GIS-Python based model is being developed by KTH to allow stakeholders to access the impact of various agriculture-water-energy nexus interactions in the NWSAS. A hydrogeological model has been developed by OSS to assist decision-makers in evaluation the impacts of water withdrawals on the aquifer. Also, a Hydro-economic model has been tested by OSS to support decision-makers in the design of agricultural development policies with a view to increasing agricultural revenue.

As part of the participatory process supporting the nexus assessment, one transboundary workshop was organized in Algiers in June 2018, and national consultations will take place in Tunisia and Algeria in early 2019 to discuss potential solutions.

B. The Study

1. Background

The "*Development of the Nexus Assessment Report*" activity will entail the development of Water, Energy, Food and Ecosystems Nexus Assessment report to assess the status of the linkages/benefits/trade-offs and challenges across the sectors of water, energy, food, ecosystems and develop/analyze solutions in the NWSAS basin and riparian countries. The report will be divided in two sections (A) and (B). Section (A) will be mainly dedicated to present the nexus challenges and solutions with summary description of the NWSAS basin and riparian countries in terms of: i) Geography, resources and climate; ii) Governance analysis and iii) Socioeconomic situation and the main resource uses. The three issues mentioned above will be developed and presented in three separate detailed chapters in section (B). An annotated outline of sections (A) and (B) and the related chapters is already developed and approved. The annotated outline of the report is provided in Annex I.

2. Objectives of the Assignment and Requested Services

The objective of the assignment is to contribute to the nexus assessment by providing input, review and analysis of **land resources** and the **need to modernize and increase the value and viability of agriculture in the NWSAS basin[1] and riparian countries**. The development of Chapter A.4.1 can be considered the core of the assignment: Part B should provide all relevant background information for it, and the chapters on Benefits and Conclusions should build on its findings. The contribution of the Expert to the "Nexus Assessment Report" is detailed below.

[1] The NWSAS basin is the projection to the surface of the Complex Terminal, the Continental Intercalaire and the Djeffara aquifers.

The Expert will:

1. **Collect data, provide information, develop and draft Section B 1.5 (about 10 pages)** "Land Resources" based on the Desk Study of the NWSAS already drafted by KTH and expert input from OSS.

2. **Develop, collect data, provide information, analyze and draft Section A 4.1** (about 20 pages) Modernizing and increasing the value and viability of agriculture" of the assessment report.

   The development of Section A 4.1 should include the following main contents:

   i- Description of the challenges: A set of challenges have emerged from the comprehensive review of documentation available and the nexus dialogue in the first transboundary workshop. These challenges are briefly described in section A 4.1 of the annotated outline of the nexus assessment report provided in Annex I. The expert is required to review these challenges, add to the list if needed (based on his/her knowledge of the issue of the agricultural sector in the region), and develop a detailed description of them. **The implications on water, energy, food and ecosystem sectors at the national level and the basin level should be assessed for each challenge and clearly explained.** The expert is expected to provide technical information and indicators as appropriate.

   ii- Selected solutions: After describing the issues, a set of selected solutions (across sectors) should be identified, presented and analysed. The identified solutions should include ideas harvested from the dialogue (notably during the participatory workshops) and should be guided by the good practice examples from the region and from international experience. The project partners will present and discuss these solutions with the local officers and stakeholders during the consultations workshops. The conclusions of these consultations will be communicated to the expert to refine the solutions. The proposed general direction of action is presented in the nexus assessment report provided in Annex I.

   Packages of solutions to address the identified issues should be developed according to the '5Is' approach described in the UNECE methodology document. Examples of solutions are: i) modernize and improve sustainability of agricultural infrastructure and production; ii) improve access to markets; iii) valorise ecosystem links by appropriate placement of agricultural activities so that they benefit from protection of natural vegetation and from natural land improvement and nutrients deriving from animal husbandry; and/or iv) develop related capacities as well as review the relevant policy frameworks and financing arrangements.

   iii- Relevant considerations related to the implementation of the selected solutions: While relatively general, this section will include considerations such as resource requirements, capacities for implementation and what actions the aquifer sharing countries already are taking. Considerations on the benefits brought by these selected solutions should be qualitatively and where relevant quantitatively described (which will inform Chapter A5). Explicit considerations on possible investment strategies should be included. These considerations will be presented and discussed by the

project partners with the officials and key stakeholders during the consultation workshops, and the conclusions will be communicated to the expert to be incorporated on the final version of the deliverables.

The implications on water, energy, food and ecosystem sectors at the national level and the basin level that may result from the specific solutions (to be developed and detailed) should be assessed**.** For these solutions to result pertinent and implementable in the local governance context, it is important that the expert liaise directly with the governance analyst. GWP-Med will arrange the contact with the governance analyst immediately after the contract signature.

The three sections of Chapter A.4 ("Slowing down depletion of the groundwater resource and rationalizing water use", "Modernizing and increasing the value and viability of agriculture", and "Sustainable energy for water management and economic development in the NWSAS") complement each other: for instance, improving water efficiency will also have energy saving benefits as less groundwater needs to be pumped, conveyed and distributed; the sustainable management of groundwater reserves will increase agricultural profitability in the long term. In order to ensure the consideration of potential complementarities between chapters, a consultation with the authors of the other sections is foreseen. This should happen in three stages: an initial consultation during the drafting stage, a revision of the draft chapters A 4.2 and A 4.3 (see point 3 and checking of the coherence of information on agriculture throughout Nexus assessment report.

3. **Revision/validation of draft Sections A 4.2 and A 4.3 and of draft Chapters A.4.5 (Benefits)**:
   The consultant is expected to review the work by the other experts and comment on the draft chapters, respond to questions addressed to him/her, fill specific gaps (e.g. about the national or local conditions of implementation of solutions).

4. **Incorporate comments by project manager, partners and the expert team to Section A 4.1 and develop related conclusions and recommendations (1-2 pages) for Chapter A 4.6** on the way forward to modernize and add value to the agricultural sector in the NWSAS region and riparian countries, taking into account the management of energy and water as well as environment protection.

The activity will be delivered under the lead and guidance of UNECE and deep coordination with the GWP-Med project manager and the designated partners involved in the development and preparation of the Nexus Assessment Report.

The Expert is expected to use elements of the modelling exercise to substantiate the description of challenges and solutions, as appropriate.

3. Contract Price

1. The contract price is indicted in the call.
2. All payments shall be upon reception and acceptance/verification of the deliverables, as laid out in the table below.

The expert may be asked to travel to participate in working and/or consultation meetings related to the project implementation activities. Travel arrangements will be made by GWP-Med and travel costs to participate in meetings will be covered separately by GWP-Med.

The expert will be paid a fixed amount and payments will be made based on deliveries (see below). Claims for payment will be made through an Invoice accompanied by proof of delivery.

The consultancy will commence work on 16th January 2019 and continue until completion but no later than 30th June 2019.

4. Schedule of Activities, Deliverables and Payment

Task	Deliverables	Deadline	Payment
Task 1 and 2) Developing and drafting Section B 1.5 and A4.1	Final drafts of Section B 1.5 and Section A 4.1	15 February 2019	70%
Task 3) Review of Chapter A.4	Reviewed/Validated Chapter A.4 (Sections A 4.2 and A 4.3) and A.5	28 February 2019	
Task 4) Incorporate conclusions of the national and regional consultations and comments by project manager, partners and the expert team and contribute to Chapter A 6	Final Sections A 4.1, B 1.5, and contribution to A.6	30 June 2019	30 %

5. Duration of the Contract

The overall duration of the contract will be 5.5 months (part-time).

6. Location and Language of the Assignment

The location of the assignment will be the location that the Consultant lives.
The language for all documents and reports as well as for all communication is English (preferably) or French. Bad quality of English/French in the report will provide grounds for the final payment not to be made.

7. Qualification and Experience

a. Education

A university degree is required, ideally in agriculture or possibly in policy with focus on agriculture, land resources, soil sciences, etc.

b. Work Experience

The Consultant is required to have:

- Minimum 6 years of professional experience in agriculture/land management (viability, analysis, planning, development, management or policy) and/or collection and management of information and data related to Land/Agriculture/Food.

- Knowledge about natural resources, including water, agriculture or protection of the environment

- Work experience on Water-Energy-Food-Ecosystems Nexus is an advantage

c. Key Competencies

The Consultant is required to have the following competencies and skills:

- Good understanding of and analytical skills on technical and policy issues related to Land/Agriculture/Food resources and their viability, development and use, as well as their requirements on water and impacts on the environment.

- Good knowledge about the agriculture/food strategies/policies /practices in the NWSAS countries

- Excellent written and spoken English and/or French.

Annex I

Reconciling resource uses: assessment of the water-food-energy-ecosystems nexus in the North-West Sahara Aquifer System (NWSAS)

Annotated Outline

DRAFT 2017

TABLE OF CONTENTS

1.4.2 Water resources in the NWSAS

1.4.3 Water quality in the NWSAS

1.4.4. Data and Monitoring

1.4.5 Trends in quantity, quality of water in the NWSAS and their implications.

1.5 Land resources

1.5.1 Land use and land cover types

1.5.2 Land and soil quality

1.6 Energy Resources

1.6.1 Fossil fuel resources and reserves

1.6.2 Renewable energy resource

1.6.3 Energy resources in the NWSAS

1.6.4 Electricity generation System

1.7 Environment and ecosystem services

1.7.1 Bio-geographic characteristic

1.7.2 Ecosystems and habitats

1.7.3 Biodiversity and important species in the NWSAS

1.7.4 Protected Areas

Chapter B 2: Governance analysis

2.1 Norms and institutions for governance on the national level

2.1.1. Intersectoral coordination on the national level

2.2 Transboundary Nexus Governance

2.2.1. Relevant global standards and regional regimes

2.2.2. State acceptance of the above – ratification of instruments, reporting, implementation

2.2.3. Guidance to the state level - including examples of initiatives and projects related to the above

2.2.4. NWSAS-level governance (and, if relevant, surface water basins)

2.2.5. International relations between the aquifer sharing countries (bilateral/multilateral)

Chapter B 3 Socioeconomic situation and the main resource uses in the NWSAS

3.1 Population

3.2 Settlements and households

3.3 Agriculture

3.4 Other important economic activities

3.5 Socio-economic trends

3.6 The importance of ecosystem services for economic activities and impacts of human activities on the ecosystems

Part A: The Nexus Assessment

Chapter A1
Introduction

The introductory chapter will describe the project under which this work is being undertaken and the actors involved.

It will recall some major challenges of resource management in transboundary settings: Coordination between the water, energy, food and environment sectors is fraught with difficulties even at the national level, but the complexity increases substantially in transboundary basins where the impacts spread from one country to another.

This chapter will summarise the main transboundary challenges in the North Western Sahara Aquifer system (NWSAS)

The “nexus approach” to managing interlinked resources has emerged as a way to enhance water, energy and food security by increasing efficiency, reducing trade-offs, building synergies and improving governance, while protecting ecosystems.

The present draft has been developed on the basis of a desk study for the preparation of the assessment of the water-food-energy-ecosystems nexus in the North-West Sahara Aquifer. The mapping of intersectoral issues was refined in group works at the First Regional Consultation Workshop: Assessing the Water-Food-Energy-Ecosystems Nexus in the North-Western Sahara Aquifer (18 - 19 July 2017, Algiers, Algeria). The jointly identified intersectoral issues were refined in the discussions and through presentations. The identified main challenges are being detailed by the project team, to be supported by additional expertise, and possible solutions to address the challenges are being explored, including from good practices in the countries as well as international and regional experience. The focus of the quantitative analysis, presently in early stages, is possible energy solutions to respond to the needs of water management, treatment and supply in the NWSAS region. Attention is also devoted to the impacts of the aquifer’s degradation on dependent economic activities, including agriculture and rural development.

Comments from the representatives of the aquifer sharing countries, in the first stage the NWSAS nexus project’s Steering Committee, and in the later stages other key stakeholders, will help validate as well as direct and detail further the issues.

1.1 Aim, Objective and Targeted audience

The general objectives of the nexus assessments in the framework of the Convention on the Protection and Use of the Transboundary Watercourses and International Lakes (Water Convention) are the following:

- To foster transboundary cooperation by identifying intersectoral synergies that could be further explored and utilized, and by determining policy measures and actions that could alleviate tensions or conflict related to the multiple uses of and needs for common resources;

- To assist countries in optimizing their use of resources, to increase efficiency and to ensure greater policy coherence and co-management;

-To build capacity to assess and address intersectoral impacts

As part of the project “Making Water Cooperation Happen in the Mediterranean” (the Project), this nexus assessment contributes to enhancing the policy-related process and facilitate the reinforcement of cooperation arrangements that will advance the transboundary management of NWSAS.

The Nexus Assessment of the North-West Sahara Aquifer System specifically has the following objectives:

- i. Map the characteristics of the sectors/resources (e.g. for agriculture its water and energy intensity, local versus export orientation, mechanisation etc.)
- ii. Assess the current status of the linkages/benefits/trade-offs across the sectors of water, energy, food, ecosystems.
- iii. Map the existing relevant policies of individual sectors concerned and assess their integration and coherence.

In the framework of the work to support the empowerment cooperation among the NWSAS countries the Nexus Assessment will be providing input for the development of the following with the support of the Project under the coordination of the Consultation Mechanism:

1. preparation of the study on the various options for a Coordinative Body with an enhanced mandate in comparison with that of the NWSAS Consultation Mechanism;
2. process for the development of a Shared Vision for the management of the NWSAS.

1.2 Why the NWSAS

This section will highlight the importance of the aquifer and the need for improved management of the resources (water, energy, land, ecosystem services) in the aquifer area for development, improving livelihoods and sustaining the groundwater resources on which these depend. This would be mentioned on both national and transboundary levels.

1.3 Assessment process

Detailed description of the 'Nexus' assessment methodology[2] applied, which was specifically developed for transboundary basins under the Water Convention (and already applied in five transboundary basins in the Caucasus, Central Asia and Southern Europe). This section introduces the steps of the methodology (listed below) as well as the inputs and outputs of each step. It will also give a brief synthesis of the workshops' outputs and how they are integrated into the other steps of the analysis.

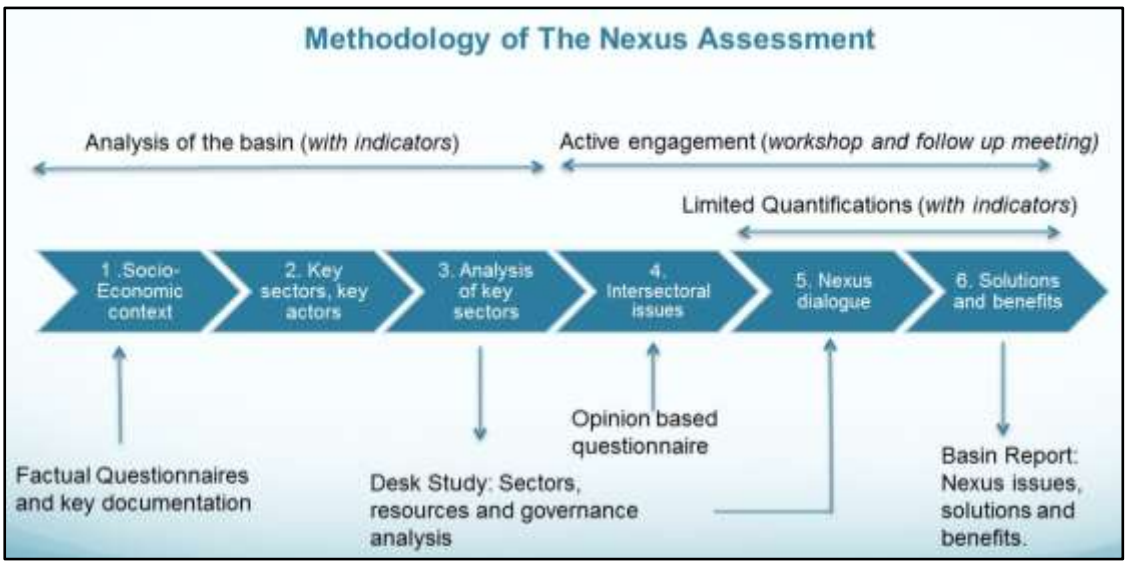


Figure 1: The nexus assessment methodology

[2] For details of the methodology, this publication can be referred to: UNECE, Reconciling resource uses in transboundary basins: assessment of the water-food-energy-ecosystems nexus (United Nations 2015). Available http://www.unece.org/index.php?id=41427

The following six steps of the methodology comprise of defined tasks that are either carried out by analysts in desk studies and analysis or by the authorities and stakeholders during workshops and consultations.

- Step 1 (through a desk study and analysis of existing data): The current and if possible projected needs of the population in the basin as well as the national needs that rely on the basin are identified. This is done by looking e.g. at the water, energy and land uses in relation as well as the uses of associated resources. This develops an understanding of the basins socioeconomic context, its resource base and the governance context.
- Step 2 (through a desk study and analysis of existing data): The identified needs are associated to sectors and institutions. Hence the key sectors and stakeholders are identified. They can contribute with their knowledge and power to take action.
- Step 3 (through a desk study and analysis of existing data as well as input from officials and stakeholders during a workshop): The key sectors are analysed applying the Drivers-Pressures-State-Impacts-Response framework. The analysis is further refined in the first workshop.
- Step 4 (with input from officials and stakeholders during a workshop): In the first workshop, officials and other key stakeholders identify and detail issues between sectors while considering the sectoral strategies and development plans and linkages to other sectors. This includes material presented by experts, officials or stakeholders.
- Step 5 (with input from stakeholders during the first workshop as well as through a desk study and analysis of additional data): Nexus diagrams about the main interlinkages are reviewed, complemented and validated collectively with the stakeholders (including through group works). It includes the nexus components water, food, energy, ecosystems and the significant linkages identified. Further analysis by experts using additional data refines and details the linkages.
- Step 6 (with the assistance of stakeholders during a workshop as well as by analysis through a desk study and analysis of additional data): Possible solutions to the most pressing intersectoral issues are identified, such as, land use management, cooperation agreements, policy solutions, infrastructure projects or economic instruments. These are discussed in the national workshops and in the second transboundary workshop. These workshops serve, in general, validation and refinement of the findings, to be completed by a review of the assessment report by the national authorities and other key stakeholders.

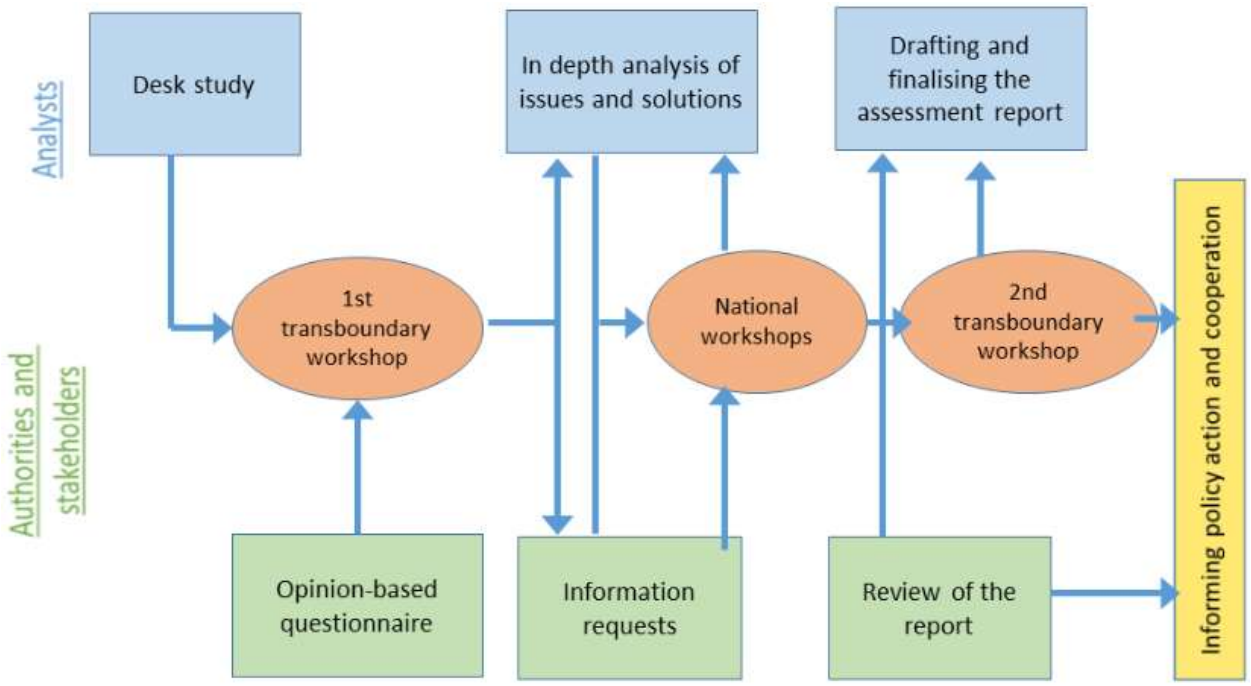


Figure 2. The assessment process and information flow in the NWSAS

1.4 Structure of the Report

This section gives an overview of the report by

a) Introducing the different chapters;
b) Describing the main scope and contents of each chapter;
c) How the chapters are linked to each other.

Chapter A2
Overview of the resources, their use and governance

This chapter will provide a synthetic presentation of the resources in the NWSAS area and (more generally) in the aquifer sharing countries: water resources, land, energy and ecosystems, together chapters in part B. The respective sections of part B are meant to provide details.

2.1 Geography, resources and climate

The chapter provides an overview of the following: Climate and climate trends (B 1.2), a hydrogeological description of the NWSAS aquifer system including (Terminal Complex (TC), the Intercalary Continental (IC)) and the Dejffara (B 1.3), water resources, including related data and monitoring aspects as well as trends (2.4); land resources, including land use and land cover types, land and soil quality (B 1.5); energy resources covering both fossil fuels and renewable energy, the electricity generation system (B 1.6); environment and ecosystem services including bio-geographic characteristics, ecosystems and habitats, biodiversity, protected areas (B 1.7).

2.2 Governance

This section synthesizes the governance landscape at sub-national, national, basin/transboundary and regional levels, with a particular attention to intersectoral and international cooperation mechanisms. It will also show in a graphical form a map of the organizations and actors in different sectors and countries, and highlight some salient points from a stakeholder analysis (B 2.1-2.2).

2.3 Socioeconomic situation and the main resource uses in the NWSAS

This section will provide an overview of the main socioeconomic characteristics, including the population, settlements and main economic activities, summarizing the more detailed information in chapter B 3.

Chapter A3
Nexus in the NWSAS

Based in the analysis introduced in the previous sections and based on the nexus dialogue, this section will identify nexus interlinkages in the NWSAS. The following figure shows general overview of the interlinkages identified on the basis of the desk study and in the first assessment workshop.

3.1 Nexus inter-linkages in the NWSAS Basin

The main interlinkages refined with input from the officials and stakeholders at the workshop can be found in annex 1.

3.2 Mapping the intersectoral resources use

This section will map the significant inter-linkages among water, land/agriculture, energy and ecosystem components of the nexus. The current mutual water, land/food, energy and ecosystem use at the NWSAS level will be summarized in matrix form.

	Water	Energy	Land/Agriculture	Ecosystem services
Water		*Energy (ENE) to Water (WAT) 1 * ENE to WAT 2 Etc.	* Land/Agriculture (AGR) to WAT 1 * AGR to WAT 2 Etc.	*Ecosystem (ECO) to WAT 1 Etc.
Energy	*WAT to ENE 1 * WAT to ENE 2 Etc.		* AGR to ENE 1 Etc.	*ECO to ENE 1 Etc.
Land/Agriculture	*WAT to AGR 1 * WAT to AGR 2 .	*ENE to AGR 1 * ENE to AGR 2		*ECO to AGR 1 * ECO to AGR 2
Ecosystem services	*WAT to ECO 1 * WAT to ECO 2	* ENE to ECO 1 Etc.	* AGR to ECO 1 * AGR to ECO 2 Etc.	

Figure 2: Representation of the nexus issues in the NWSAS region. The arrow indicates the direction of the impact; that is, the principal impacts of the sectors/resources at the top of the graphic on other sectors/resources, indicated in the beginning of each row, can be read in the corresponding cells.

The interlinkages summarized in the matrix are described in the following sections by interface of nexus sectors/resources, substantiating with data and figures to the degree possible. A limited and the number of issues by interlinkage may vary.

Water to Energy

- WAT to ENE Issue 1, 2, etc.

Water to Land/Agriculture

- WAT to AGR Issue 1, 2, etc.

Water to Ecosystem

- WAT to ECO Issue 1, 2, etc.

Energy to Water

- ENE to WAT Issue 1, 2, etc.

Energy to Land/Agriculture

- ENE to AGR Issue 1, 2, etc.

Energy to Ecosystems

- ENE to ECO Issue 1, 2, etc.

Land/Agriculture to Water

- AGR to WATER Issue 1, 2, etc.

Land/Agriculture to Energy

- AGR to ENE Issue 1, 2, etc.

Land/Agriculture to Ecosystems

- AGR to ECO Issue 1, 2, etc.

Ecosystems to Water

- ECO to WAT Issue 1, 2, etc.

Ecosystems to Energy

- ECO to ENE Issue 1, 2, etc.

Ecosystems Land/Agriculture

- ECO to AGR Issue 1, 2, etc.

Chapter A4
Challenges - clusters of intersectoral issues and selected solutions

The priority interlinkages from the point of view of management trade-offs and impacts on the aquifer region's resources are described in the following sections (4.1 to 4.3), organized as clusters of challenges. These challenges in turn provide the focus for identification of intersectoral (nexus) solutions, also described in the respective chapters. There may also be need for measures across challenges, notably in relation to capacity development.

4.1 Modernizing and increasing the value and viability of agriculture

4.1.1 Description of the challenges

In this section, the challenges related to the viability of agriculture will be addressed. The implication on the national level and the basin level will be assessed. These challenges emerged from the comprehensive review of documentation available and the nexus dialogue in the first transboundary workshop. These will be substantiated and detailed in a further analysis. The sections on the challenges are followed by a description of a corresponding package of proposed solutions.

Challenge 1: High irrigation water losses due to inefficient irrigation systems

The water consumption per hectare per farmer reaches about 13,520 m^3/ha in Algeria, 9,134 m^3/ha in Libya and about 13,266 m^3/ha in Tunisia. Water tariffs do not motivate rational use and access to water though private boreholes contribute to increasing water consumption. Irrigation in the NWSAS is not only a main water consumer, it is also where the current inefficiency wasting valuable water resources: Less than half of the irrigated water supply being utilized and the rest is being wasted due to inefficient irrigation systems which have an average efficiency of 42.4% in the region and can go up to 60% in some parts of the region. In terms of volume, the estimated losses reach about 2,500 m^3/ha.[3] These large water losses in the irrigation system and the distribution network to the farms indicate that there are serious deficiencies in resource management and irrigation is poorly valued[4].

Challenge 2: Degradation of the groundwater resource affecting agriculture

The large extension of the NWSAS system and the thickness of its layers allows for the accumulation of considerable water reserves, 40 000 billion m3. However, these formations are weakly replenished/recharged due to the climatic conditions of the Sahara region and the geologic characteristics of the aquifer. The groundwater recharge is estimated to be 1.4 billion m^3/year, however the use of the NWSAS increased significantly from 1 billion m3/year in 1980 to reach about 2.7 - 2.8 billion m^3/year in 2012. [5]

[3] WACDEP, Integration Of Climate Change Impacts In The NWSAS Water Resources Management. Report of phase A: Definition of the baseline and choice of climatic scenarios. (Programme Eau, Climat et Développement pour l'Afrique, 2015)

[4] OSS 2014. "Agricultural demonstration pilot in the SASS basin. Towards a Sustainable and Profitable Agriculture in the Sahara". Available at: http://www.oss-online.org/sites/default/files/fichier/PDA-SASS-En.pdf

[5] WACDEP, Integration Of Climate Change Impacts In The Nwsas Water Resources Management. Report of phase A: Definition of the baseline and choice of climatic scenarios. (Programme Eau, Climat et Développement pour l'Afrique, 2015)

This heavy exploitation, which comes from agricultural activities mainly, causes significant stress on water resources and increases the risk that outlets dry up and natural springs get depleted as a result of lowering water tables.

In addition, the water table decrease causes inversion of flows near the chotts and increases the risks of the salinization of the aquifer.

Challenge 3: Water and Soil salinization due to high use

Excessive irrigation in a high evaporation environment and inadequate management of drainage is responsible for significant amount of soluble salt estimated to about 1.2 – 4.4 million ton per year and average of 2 g/l. Soil salinization has a significant impact on soil productivity and consequently yields in agricultural production as it reduces the effectiveness of irrigation and agricultural products such as nutrients and fertilizers. Shallow aquifers of high salinity form where adequate drainage systems are lacking, aggravating the salinization issue.

4.1.2 Selected solutions

After describing the issues, the second section of the chapter will highlight selected solutions (across sectors). Again, these selected solutions emerged from the nexus dialogue, especially after the first transboundary workshop. The ideas harvested from the dialogue will be developed and complemented by the technical analysis and the study of governance and will involve evaluating the relevance of good practice examples from the region and from international experience. They will be refined in consultation with the local officers and stakeholders.

The proposed general direction of action:

Modernize and improve sustainability of agricultural infrastructure and production, and increase the value and viability of agriculture. Improve access to markets. Valorize ecosystem links by appropriate placement of agricultural activities so that they benefit from protection of natural vegetation and from natural land improvement and nutrients deriving from animal husbandry. Develop related capacities as well as review the relevant policy frameworks and financing arrangements.

Specific solutions (to be developed and detailed) will be categorised according to the '5Is' approach and some generic examples of the possible solutions are given below:

- INSTITUTIONS

The most common "institutional solutions" include clarifying roles and responsibilities of organizations and developing mechanisms to identify and incorporate the wider intersectoral impacts, as well as identifying opportunities related to multi-sectorality in sector based policy development.

- INFORMATION

The "informational solutions" may include e.g. improving the monitoring of a basin's/aquifer's resources, data management and forecasting to ensure the resilience of agricultural production activities. They could also include awareness-raising on relevant topics such as integrating animal husbandry to cultivation (for ensuring fertilizers) or sustainable agriculture and land management techniques (e.g.permaculture; to promote synergies with natural ecosystems).

Such solutions may also be aimed at the right information being made available for policymaking and planning across sectors for analysing policy implementation issues, such as barriers to the adoption of new irrigation technologies.

- INSTRUMENTS

Solutions related to policy and economic instruments may include mapping the policy instruments in place and analysing their impacts, promoting well-adapted crop varieties, commercialization of products and Promoting resource demand management instruments. Economic instruments such as subsidies for performant irrigation techniques, Tariffs adjustments, etc. can be considered.

- INFRASTRUCTURE

"Infrastructure solutions" relate to building, modernizing, operating and financing built infrastructure but also possibly the use of "green" infrastructure i.e. nature based solutions. Solutions in this category include protection of the oasis and foggaras , repairing and renovating irrigation systems, increasing water use efficiency, use of salt resistant varieties, facilitating transport, and extending treatment of wastewater and disposal of waste to reduce pollution.

- INTERNATIONAL COORDINATION AND COOPERATION

Solutions in this area may relate to cooperation and coordination in knowledge management and planning processes, but also to development of regional markets to optimize resource use, or development of joint objectives or guidelines for specific aspects resource management or environment protection.

4.1.3 Implementation of the 'solutions package'

Selected solutions will be further studied to assess the implications of the implementation of such solutions and provide economic sense to the level possible. This might include quantification and modelling outcomes.

4.2: Slowing down depletion of the groundwater resource and rationalizing water use

4.2.1 Description of the challenges

In this section, the challenges related to the (solution package 2) will be addressed. The implication on the national level and the basin level will be assessed. These challenges emerged from the review of available documentation and the nexus dialogue.

Challenge 1: Vulnerability and dependency of economic activities on groundwater resources

Inefficiency in water use implies higher capacities and volumes distributed than necessary. Many activities rely on significant amounts of water. Agriculture, which is the main activity in the NWSAS aquifer area especially in the oases, faces several challenges. Among others, the structural shortage of water supply to cultivated areas causes a real threat to the sustainability of irrigation[6], agriculture and have negative impact on farmer's revenues which are heavily relying on this economic activity. The markets for specific products may not be well-developed or the situation may change, or the transport network and other infrastructure may limit commercialization opportunities. In the example of the Ksar Ait Sidi Messaoud oasis in Algeria, the farmers were forced by circumstances to diversify their income following the collapse of the oasis agricultural system.[7] It will be instructive to draw lessons from successful transitions.

Challenge 2: Increased risk of saline intrusion from *chotts*

[6] OSS 2014. "Agricultural demonstration pilot in the SASS basin. Towards a Sustainable and Profitable Agriculture in the Sahara". Available at: http://www.oss-online.org/sites/default/files/fichier/PDA-SASS-En.pdf

[7] OSS 2014.

In the steady state the water flows from the aquifer and accumulate in the chott (salt lakes typical of the Maghreb region that remain dry for most of the year). However, in the unsteady state when the withdrawal from the aquifer increase and the water level decrease below the chott level, inverse flow from the chott to the aquifer occurs. Since the salinity level in the chott is high, the inverse flow causes high risk of saline intrusion to the aquifer and cause irreversible deterioration of the quality of water resources. Salinization of water of will accordingly lead to soil salinization, which in turn will impact the ecosystem in the NWSAS.[8]

Challenge 3: Degradation of biodiversity due to aquifer overexploitation

The overexploitation is already leading to the degradation of water resources in the aquifer, which severely affects ecosystems and related biodiversity. The NWSAS aquifer domain includes many groundwater dependent ecosystems such as: Sebkhas, national parks, wadies, springs etc. and 7 RAMSAR accredited wetlands.

4.2.2 Selected solutions

After describing the issues, the second section of the chapter will highlight selected solutions. Again these selected solutions emerged from the nexus dialogue, especially after the first transboundary workshop.

The proposed orientation for action:

Rationalizing water use and reducing gradually abstraction of groundwater from the aquifers by improve efficiency in different water uses, reducing waste (assessing techniques like managed aquifer recharge, water-efficient technology), strategically developing and exploring the potential of alternative water sources (including water reuse especially for purposes which do not require the highest quality, desalinization). Control new abstraction from the aquifers, develop permitting and enforcement. Protect and manage sustainably the ecosystems for ensuring recharge and limiting land degradation. To be most effective, the solutions should be developed jointly between the aquifer sharing countries, consulting the different sectors and interests concerned, and implemented in a coordinated fashion. The jointly developed solutions and benefits from such actions may provide elements for development of a Shared Vision for management of the NWSAS.

Examples:

- Support to economic development for higher productivity and diversification, job creation Explore non-conventional water sources: reuse of wastewater and drainage waters
- Increasing the efficiency of irrigation infrastructure (drip irrigation etc.) and water supply networks; extend irrigation with brackish waters
- Review of policy and economic instruments, tarification
- Develop an enabling policy environment, governance setting
- Improving resilience to climate change and extremes
- Advance technological development, research, piloting
- Promote partnerships: grouping and cooperation between businesses, associations

Specific solutions will be categorised according to the '5Is' approach and some generic examples of the possible solutions are given below (please see section 6.2 of the outline for descriptions of the categories):

- INSTITUTIONS
- INFORMATION
- INSTRUMENTS

[8] UNEP 2010 .

- INFRASTRUCTURE
- INTERNATIONAL COORDINATION AND COOPERATION

4.2.3 Implementation of the 'solutions package'

Selected solutions will be further studied to assess the implications of the implementation of such solutions and provide economic sense to the level possible.

4.3: Sustainable energy for water management and economic development in the NWSAS

4.3.1 Description of the challenges

In this section the challenges related to the (solution package 3) will be addressed. The implication on the national level and the basin level will be assessed. These challenges emerged from the comprehensive review of strategic documents and the nexus dialogue.

Challenge 1: Increasing pumping demand

As mentioned earlier, the intensive use of the water resources in the NWSAS over the past decades, resulted in significant drawdown of the two water tables, reduced piezometric head and caused depletion of shallow wells and "Foggaras" (Ancient type of structure for water supply). In order to overcome this obstacle, people tend to drill deeper wells, which means higher pumping head and higher energy bill for pumping.[9] Also the use of inefficient pumping systems causes energy losses.

Challenge 2: Energy for demineralization units

To ensure safety and suitability of groundwater for uses requiring high-quality water, notably for drinking, treatment and/or demineralization is required. Increasing water treatment need entails additional energy requirements which will need to be met, and from which sources and how this will be done has implications for the energy systems, cost implications as well as environmental impacts (with increased desalination/demineralization, need to dispose of saline brines increases). In Algeria 2 brackish water demineralization units are operational in the NWSAS. In Tunisia, as part of the National Program for Water Quality Improvement, more than 10 brackish water desalination plants are to be installed in Tunisia, of which 6 units are under progress. Many of those units are to be located within or close to the border of the NWSAS[10]. The desalination/demineralization technology for the new plants will be either Reverse Osmosis (RO) or Reverse Electro Dialysis (RED). Average electricity consumption by brackish water RO plants is in the range of 0.5-2.5 kWh/m^3.

There is also an increasing need to treat wastewaters and drainage waters. Shortcomings in their management may result in water quality degradation or have health impacts on the population. With appropriate technology (notably anaerobic treatment) there may be energy releases (methane) that can potentially be beneficially used.

Challenge 3: Intermittent electricity supply in rural areas

[9] OSS, 2015. "For a Better Valorization of Irrigation Water in the SASS Basin". Available at: http://www.oss-online.org/sites/default/files/fichier/Synthese-SASS-En.pdf

[10] Information provided by the group discussion in the first transboundary nexus workshop. Algiers, july 2017. https://www.unece.org/info/media/presscurrent-press-h/environment/2017/assessment-launched-to-reinforce-cooperation-between-algeria-libya-and-tunisia-in-managing-shared-groundwater-resources/doc.html

Despite the high electrification rate in the three countries sharing the NWSAS aquifer, the rural areas are still lacking sufficient electrification throughout the day. In the case of Algeria and due to the large country area the national grid is concentrated in the northern part of the country (which has higher population density) and the southern rural areas are usually supplied by diesel generators[11] or using local mini grids[12] to supply the demand of each willaya. With the growing population and increasing energy use, the stress on electricity supply is becoming more significant. The energy systems and policy frameworks may need to be reinforced to respond to the challenges.

Challenge 4: Access to energy and new drilling technologies increased the number of wells

The availability of the modern drilling technologies and increasing water demand caused significantly increase in the number of wells in the NWSAS. The number of wells jumped from few wells in the 1960s to about 18,000 wells in 2012. The distribution of wells also expanded, from being condensed in the northern area to spread throughout the whole area of the aquifer. Moreover, the drilling has become difficult to regulate, control and monitor in the region.

4.3.2 Selected solutions

After describing the issues, the second section of the chapter will highlight selected solutions.,

The proposed orientation for action:

To support the sustainable development of the NWSAS region and to meet the growing energy needs; the "Sustainable Energy" solution packages extends over a range of actions. Improving the energy efficiency as one of the pillars for reducing energy demand and releasing the stress on energy suppliers; at the same time reducing energy bills, hence contribute to the well-being of the NWSAS population (especially if energy subsidy scheme is expected to change in the future). Another dimension of the sustainable energy direction is to improve the resilience and reliability of the energy supply system to improve quality of life and to make use of the advantages of renewable energy resources. Exploring the potential of such measures and related decisions will need to be based on an up-to-date and comprehensive data covering different sectors for evidence-based policy-making process. Identify potential constraints for beneficial use of treated wastewater and sustainable management of drainage waters. Explore good practices in treatment technology for wastewaters and drainage waters (also for potential energy benefits).

Examples:

- Diversification of energy sources, and development of grids to integrate them
- Promoting energy efficiency and demand management
- Improvement of information and data access across sectors to support policy and decision-making (including broadening database at the NWSAS level)
- Further development of regulation, control and monitoring of well drilling

The selected solutions will be categorised according to the '5Is' approach (please see section 6.2 of the outline for descriptions of the categories):

- INSTITUTIONS
- INFORMATION

[11] Kausaa et all. 2011. *Hybrid Options Analysis for Power Systems for Rural Electrification in Algeria*. DOI: 10.1016/j.egypro.2011.05.085

[12] Information provided by the group discussion in the first transboundary nexus workshop. Algiers, july 2017.

- INSTRUMENTS
- INFRASTRUCTURE
- INTERNATIONAL COORDINATION AND COOPERATION

4.3.3 Implementation of the 'solutions package'

Selected solutions will be further studied and discussed with officials and key stakeholders to provide an outlook to their implementation. While relatively general, this section will include considerations such as resource requirements, capacities for implementation and what actions the aquifer sharing countries already are taking. The solutions in the different areas complement each other: Improving water efficiency will also have energy saving benefits as less groundwater needs to be pumped, conveyed and distributed.

For some of the selected solution, notably related to the water-energy part of the nexus, the implications of the implementation of such solutions will be assessed quantitatively, with modelling outcomes, also to provide economic sense to the level possible.

Quantification:

The development of the techno-economic optimization of the least cost electricity generation technologies to support the development in the NWSAS:

This assessment focuses on addressing the aforementioned energy-water nexus challenges/issues by developing a Geographic Information Systems (GIS)-based methodology to inform sustainable development of the NWSAS. The methodology identifies the optimal mix of electricity supply options, ranging from grid extensions to mini-grid and off-grid solutions using the Open Source Spatial Electrification Tool (OnSSET). The optimization is influenced by a range of parameters, the first parameter is the electricity demand which is derived by the following factors:

1. ***Population growth and electricity intensity evolution***: This will be based on the different electricity intensity tiers defined by World Bank's Multi-tier framework[13].
2. ***Electricity demand for Agriculture***: The second part of electricity demand comes from the agriculture sector. Increasing pumping demand to meet increasing irrigation requirements and reduced water table level in the aquifer.
3. ***Electricity demand for brackish water demineralization***: Several plans are being placed for new demineralization/desalination units in the NWSAS region to supply the population with drinking water and irrigation water (in some cases).

Other parameters will also be taken in consideration in the optimization; like existing and planned transmission networks and power plants, tariffs for grid-based electricity, technology costs for mini-grid and off-grid systems, efficiency of water pumping and irrigation techniques and fuel costs for consumers.

[13] Global Tracking Framework, 2015: http://gtf.esmap.org/about-us

Chapter A5
Benefits of cooperation

5.1 The conceptual framework and the typology of the potential benefits of transboundary

5.2 Identifying the benefits of cooperation in the NWSAS area

5.2.1 The benefits of past cooperation

A perspective from Algeria

A perspective from Libya

A perspective from Tunisia

5.2.2 The potential benefits of future cooperation

5.2.3 The potential economic, social and environmental benefits of stronger cooperation

The content of this section could describe the benefits of cooperating on topics such as protecting the quality of groundwater resources, reducing water use, or in developing and applying technology for powering pumping and treatment of water.

5.2.4 The broader benefits of cooperation: regional economic integration benefits, geopolitical benefits, governance and financing.

5.4 Assessing the potential future benefits of cooperation

Examples can be included detailing the benefits related to selected nexus solutions.

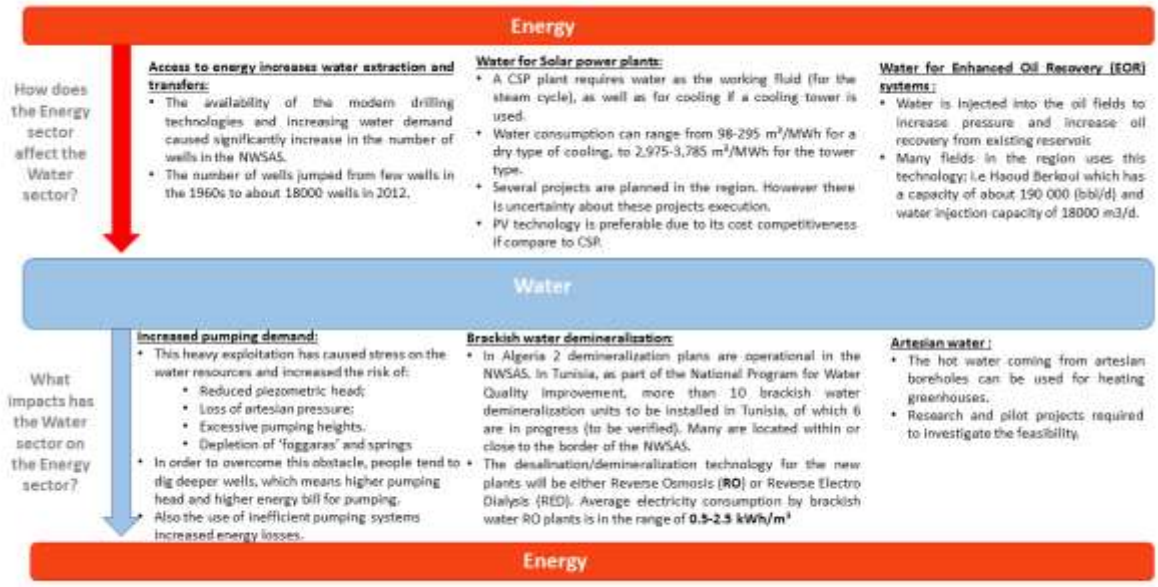
([optional] Towards a quantitative assessment (ideas about further work))

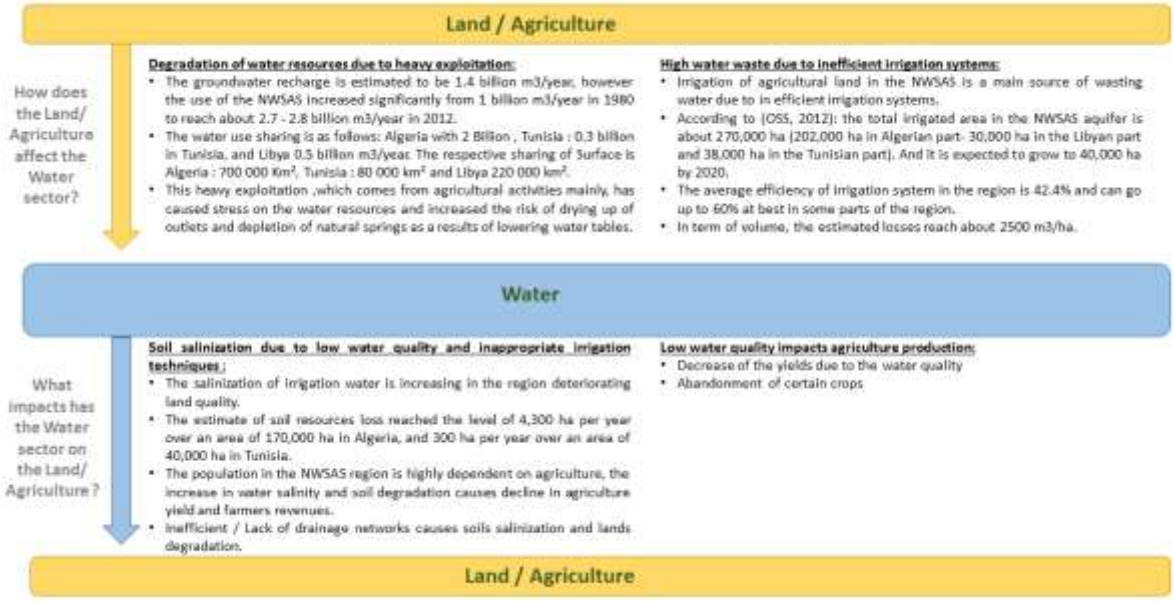
5.5 Communicating the benefits of cooperation

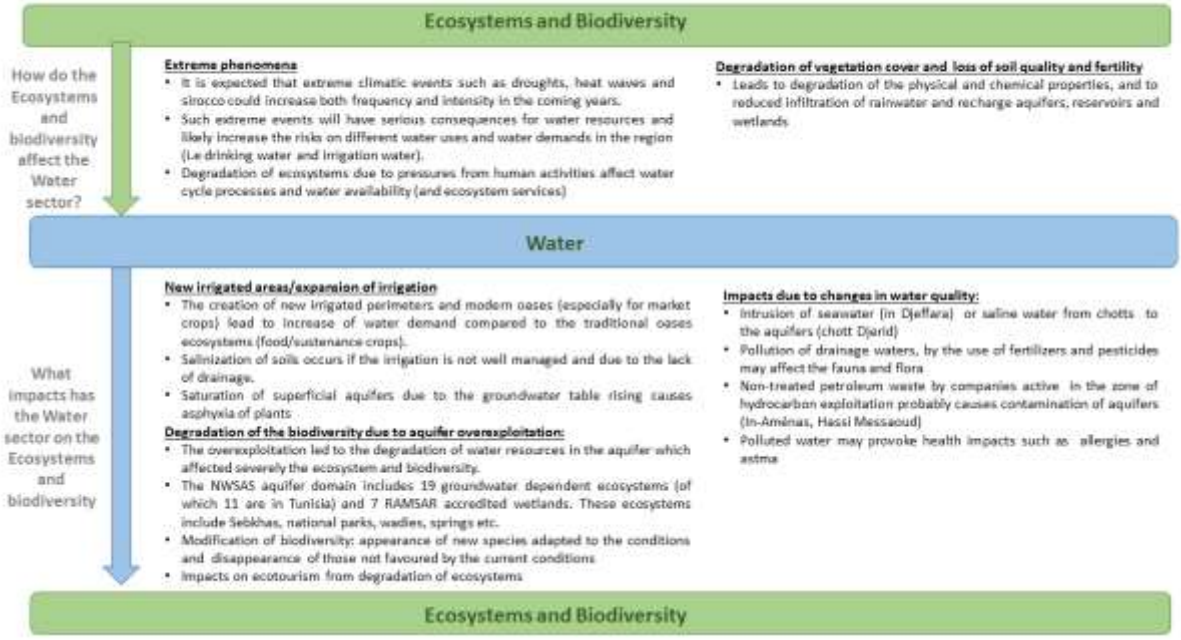
Chapter A6
Conclusions and recommendations

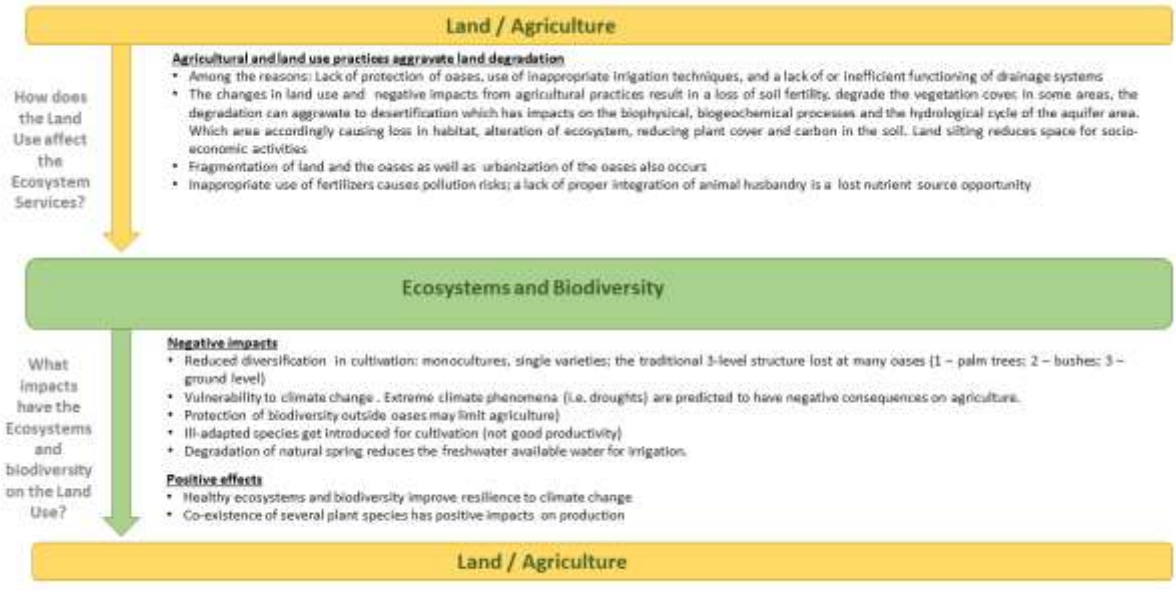
Final concluding remarks of the overall nexus assessment and any recommendations made on that basis. The chapter will highlight the lessons learned and the main findings from the assessment, stating the study limitations and the recommending some next steps. The emphasis will be on how strengthened transboundary cooperation and improved intersectoral coordination can improve sustainability in managing the resources of the NW Sahara Aquifer System's region. Attention will be drawn to practical application of the nexus approach in the region, and suggestions will be made about further development and support needs . Some possible areas where further focused quantification of issues and solutions would be beneficial for informing policy development and cooperation are also foreseen to be identified. The conclusions are also expected to touch upon the level and possible modalities for effective involvement of key stakeholders in managing the NWSAS.

Annex A1


Energy
How does the Energy sector affect the Water sector?
Access to energy increases water extraction and transfers:
• The availability of the modern drilling technologies and increasing water demand caused significantly increase in the number of wells in the NWSAS.
• The number of wells jumped from few wells in the 1960s to about 18000 wells in 2012.
Water for Solar power plants:
• A CSP plant requires water as the working fluid (for the steam cycle), as well as for cooling if a cooling tower is used.
• Water consumption can range from 98-295 m³/MWh for a dry type of cooling, to 2,975-3,785 m³/MWh for the tower type.
• Several projects are planned in the region. However there is uncertainty about these projects execution.
• PV technology is preferable due to its cost competitiveness if compare to CSP.
Water for Enhanced Oil Recovery (EOR) systems :
• Water is injected into the oil fields to increase pressure and increase oil recovery from existing reservoir.
• Many fields in the region uses this technology; i.e Haoud Berkaoi which has a capacity of about 190 000 (bbl/d) and water injection capacity of 18000 m3/d.
Water
What impacts has the Water sector on the Energy sector?
Increased pumping demand:
• This heavy exploitation has caused stress on the water resources and increased the risk of:
  • Reduced piezometric head;
  • Loss of artesian pressure;
  • Excessive pumping heights.
  • Depletion of 'foggaras' and springs
• In order to overcome this obstacle, people tend to dig deeper wells, which means higher pumping head and higher energy bill for pumping.
• Also the use of inefficient pumping systems increased energy losses.
Brackish water demineralization:
• In Algeria 2 demineralization plans are operational in the NWSAS. In Tunisia, as part of the National Program for Water Quality Improvement, more than 10 brackish water demineralization units to be installed in Tunisia, of which 6 are in progress (to be verified). Many are located within or close to the border of the NWSAS.
• The desalination/demineralization technology for the new plants will be either Reverse Osmosis (RO) or Reverse Electro Dialysis (RED). Average electricity consumption by brackish water RO plants is in the range of 0.5-2.5 kWh/m³
Artesian water :
• The hot water coming from artesian boreholes can be used for heating greenhouses.
• Research and pilot projects required to investigate the feasibility.
Energy


Land / Agriculture
How does the Land/ Agriculture affect the Water sector?
Degradation of water resources due to heavy exploitation:
• The groundwater recharge is estimated to be 1.4 billion m3/year, however the use of the NWSAS increased significantly from 1 billion m3/year in 1980 to reach about 2.7 - 2.8 billion m3/year in 2012.
• The water use sharing is as follows: Algeria with 2 Billion , Tunisia : 0.3 billion in Tunisia, and Libya 0.5 billion m3/year. The respective sharing of Surface is Algeria : 700 000 Km², Tunisia : 80 000 km² and Libya 220 000 km².
• This heavy exploitation ,which comes from agricultural activities mainly, has caused stress on the water resources and increased the risk of drying up of outlets and depletion of natural springs as a results of lowering water tables.
High water waste due to inefficient irrigation systems:
• Irrigation of agricultural land in the NWSAS is a main source of wasting water due to in efficient irrigation systems.
• According to (OSS, 2012): the total irrigated area in the NWSAS aquifer is about 270,000 ha (202,000 ha in Algerian part- 30,000 ha in the Libyan part and 38,000 ha in the Tunisian part). And it is expected to grow to 40,000 ha by 2020.
• The average efficiency of irrigation system in the region is 42.4% and can go up to 60% at best in some parts of the region.
• In term of volume, the estimated losses reach about 2500 m3/ha.
Water
What impacts has the Water sector on the Land/ Agriculture ?
Soil salinization due to low water quality and inappropriate irrigation techniques :
• The salinization of irrigation water is increasing in the region deteriorating land quality.
• The estimate of soil resources loss reached the level of 4,300 ha per year over an area of 170,000 ha in Algeria, and 300 ha per year over an area of 40,000 ha in Tunisia.
• The population in the NWSAS region is highly dependent on agriculture, the increase in water salinity and soil degradation causes decline in agriculture yield and farmers revenues.
• Inefficient / Lack of drainage networks causes soils salinization and lands degradation.
Low water quality impacts agriculture production:
• Decrease of the yields due to the water quality
• Abandonment of certain crops
Land / Agriculture


Ecosystems and Biodiversity
How do the Ecosystems and biodiversity affect the Water sector?
Extreme phenomena
• It is expected that extreme climatic events such as droughts, heat waves and sirocco could increase both frequency and intensity in the coming years.
• Such extreme events will have serious consequences for water resources and likely increase the risks on different water uses and water demands in the region (i.e drinking water and irrigation water).
• Degradation of ecosystems due to pressures from human activities affect water cycle processes and water availability (and ecosystem services)
Degradation of vegetation cover and loss of soil quality and fertility
• Leads to degradation of the physical and chemical properties, and to reduced infiltration of rainwater and recharge aquifers, reservoirs and wetlands
Water
What impacts has the Water sector on the Ecosystems and biodiversity
New irrigated areas/expansion of irrigation
• The creation of new irrigated perimeters and modern oases (especially for market crops) lead to increase of water demand compared to the traditional oases ecosystems (food/sustenance crops).
• Salinization of soils occurs if the irrigation is not well managed and due to the lack of drainage.
• Saturation of superficial aquifers due to the groundwater table rising causes asphyxia of plants
Degradation of the biodiversity due to aquifer overexploitation:
• The overexploitation led to the degradation of water resources in the aquifer which affected severely the ecosystem and biodiversity.
• The NWSAS aquifer domain includes 19 groundwater dependent ecosystems (of which 11 are in Tunisia) and 7 RAMSAR accredited wetlands. These ecosystems include Sebkhas, national parks, wadies, springs etc.
• Modification of biodiversity: appearance of new species adapted to the conditions and disappearance of those not favoured by the current conditions
• Impacts on ecotourism from degradation of ecosystems
Impacts due to changes in water quality:
• Intrusion of seawater (in Djeffara) or saline water from chotts to the aquifers (chott Djarid)
• Pollution of drainage waters, by the use of fertilizers and pesticides may affect the fauna and flora
• Non-treated petroleum waste by companies active in the zone of hydrocarbon exploitation probably causes contamination of aquifers (In-Aménas, Hassi Messaoud)
• Polluted water may provoke health impacts such as allergies and astma
Ecosystems and Biodiversity


Land / Agriculture
How does the Land Use affect the Ecosystem Services?
Agricultural and land use practices aggravate land degradation
• Among the reasons: Lack of protection of oases, use of inappropriate irrigation techniques, and a lack of or inefficient functioning of drainage systems
• The changes in land use and negative impacts from agricultural practices result in a loss of soil fertility, degrade the vegetation cover. In some areas, the degradation can aggravate to desertification which has impacts on the biophysical, biogeochemical processes and the hydrological cycle of the aquifer area. Which area accordingly causing loss in habitat, alteration of ecosystem, reducing plant cover and carbon in the soil. Land silting reduces space for socio-economic activities
• Fragmentation of land and the oases as well as urbanization of the oases also occurs
• Inappropriate use of fertilizers causes pollution risks; a lack of proper integration of animal husbandry is a lost nutrient source opportunity
Ecosystems and Biodiversity
What impacts have the Ecosystems and biodiversity on the Land Use?
Negative impacts
• Reduced diversification in cultivation: monocultures, single varieties; the traditional 3-level structure lost at many oases (1 – palm trees; 2 – bushes; 3 – ground level)
• Vulnerability to climate change . Extreme climate phenomena (i.e. droughts) are predicted to have negative consequences on agriculture.
• Protection of biodiversity outside oases may limit agriculture)
• Ill-adapted species get introduced for cultivation (not good productivity)
• Degradation of natural spring reduces the freshwater available water for irrigation.
Positive effects
• Healthy ecosystems and biodiversity improve resilience to climate change
• Co-existence of several plant species has positive impacts on production
Land / Agriculture

Part B: The resources, their use and governance

Chapter B0
Introduction

This part of the report provides more detailed information about the climate, the water, land, energy and environmental resources in the NWSAS and the aquifer sharing countries; the governance; and the socioeconomic situation and the main resource uses in the NWSAS. Part B provides the basis for the overview presented in part A as Introduction.

Chapter B1
Geography, resources and climate

The North Western Sahara Aquifer System (NWSAS) will be described in terms of its geography, natural resources (water, energy, land, ecosystems and climate). The presentation of information progresses from a general overview comprising the three countries to the specific features of the aquifer.

1.1 Location and Extension

An overview of the NWSAS aquifer location, its total area and the share of each riparian country.

Table 1: Extension of the NWSAS

	Algeria	Tunisia	Libya
Country area (km^2) [14]	2,381,741	163,610	1,759,540
Country area in the basin (km^2) [15]	700,000	80,000	250,000
Share of national territory in the NWSAS (%)	29	49	14
Share of NWSAS (%)	68	8	24

1.2 Climate and Climate trends

2.2.1 Describing the climate in each of the three riparian countries and the NWSAS basin.

2.2.2 The predicted future climate change trends affecting the region (related to rainfall, ambient temperature, evapotranspiration etc).

1.3 NWSAS aquifers' hydrogeological description

This section will focus on the description of the NWSAS aquifer system, more specifically it will describe the following, at a level sufficient to give an overview:

a) Aquifers' delineation (Terminal Complex (TC), the Intercalary Continental (IC)) and the Dejffara, and their main geological characteristics.
b) Hydrogeological characteristics of the groundwater aquifers including hydraulic conductivity and porosity, also as relevant to the recharge level
c) Stratification characteristics within the aquifers, including vertical and lateral variation
d) The general character of the overlying strata in the catchment area from which the groundwater aquifers receive their recharge; Vulnerability of groundwater (intrinsic);

Vulnerability of aquifers to land-based pollution and salinization.

1.4 Water resources

This section will start with giving a general overview about the water resources in the three countries, including hydrography. Then it zooms-in to provide detailed description of the water resources in the NWSAS aquifer.

[14] Worldstat info, (Algeria, Tunisia and Libya). URL: http://en.worldstat.info
[15] OSS, 2016: The North Western Sahara Aquifer System – SASS. URL: http://sass.oss-online.org/en/north-western-sahara-aquifer-system-%E2%80%93-sass

1.4.1 Overview of the water resource in the three countries:

This includes:

a) renewable water resources: surface water and groundwater
b) non-renewable water resources
c) Non-conventional water resources: water reuse (treated, drainage), managed aquifer recharge, desalination (general, to give a sense of the extent of the use)

1.4.2 Water resources in the NWSAS

In this section, the annual and seasonal water availability of surface water and groundwater will be described, as well as the relevant natural processes and their variability.

a) Groundwater resources

This section will give information on the distribution of the groundwater reserves and water resources in the NWSAS across the countries. This includes reviewing information about the long term average rate of overall recharge and its distribution between the aquifer sharing countries.

This section should also describe the shallow aquifer formations, which some of them are formed by drainage discharges.

b) Surface water resources

Despite the fact that surface water resources are very limited in the basin, it is relevant to indicate them in order to have first a complete picture of the situation in the basin.

c) Non-conventional water resources in the NWSAS region

Desalination, demineralization of brackish waters

Capacity, desalination units, main technologies and their energy requirements, future plans

Water reuse (treated and drainage water)

Managed aquifer recharge in the Djeffara (MAR)

The extent to which MAR is employed e.g. in managing abstracted thermal waters or treated drainage waters, or in seasonal storage

1.4.3 Water quality in the NWSAS

a) Chemical composition and degree of mineralization

The distribution of salinization areally and with depth.

b) Pollution

a. Pollution levels (different parameters should be looked at) of water in different parts of the water body.
b. Pollution sources (hazards to groundwater)
i. Diffuse pollution
ii. Point source pollution

c) Water treatment

Present extent of (ground) water treatment. Quality requirements of the different water uses.

1.4.4. Data and Monitoring

Description of the groundwater quality and quantity monitoring system including the following aspects:

- Data availability (possible differences between the countries, does the data available give an up-to-date and representative picture situation of the status of the aquifer)
- Monitoring stations, their number and distribution and possible development plans and needs
- Parameters monitored, frequency of sampling
- Legal requirements

1.4.5 Trends in quantity, quality of water in the NWSAS and their implications.

Assessment of the water use trends in the NWSAS and implications on water resources.

This section should make a reference to the observed historical decrease of the groundwater levels and the general depth distribution of the current abstraction wells explaining the reasons of this effect. The evolution of salinity in relation to depletion.

The section will include the evaluation of climate change impacts directly in the water resource and indirectly in the water use.[16]

1.5 Land resources

This section studies land resources in the NWSAS countries providing information and data on:

1.5.1 Land use and land cover types

Providing information on the share of each type of land resources in the three countries as shown in the example table 2:

Table 2: Summary of the land use in the countries sharing the NWSAS aquifer (% of country total)[a].

	Algeria	Tunisia	Libya
Arable land (%)	3.1	18.4	1
permanent cropland (%)	0.4	14.6	0.2
permanent meadows and pastures (%)	13.9	31	7.6
Other land uses (%)	82.6	36	91.3

[a] Sources [17,18,19,20,21]

[16] Information from the WACDEP project will be used for developing this section.
[17] The World Bank. "World Development Indicators". [http://data.worldbank.org/indicator]
[18] FAO. "Seasonal Indicators – Tunisia". [http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=TUN]
[19] Tunisian Agency for the Promotion of Agricultural Investment. "Tunisian Agriculture". [http://www.apia.com.tn/lagriculture-tunisienne-investmenu-85]
[20] FAO. (2015). "AQUASTAT – Libya" [http://www.fao.org/nr/water/aquastat/countries_regions/lby/index.stm]
[21] FAO. "Seasonal Indicators – Libya". [http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=LBY]

Similar table will show the share of land use/land cover type in the NWSAS aquifer area.

In this section, as relevant, issues related to land ownership and its implications for land use and development will be described. Existence of a land register and application of land allocation schemes. Average plot size.

1.5.2 Land and soil quality

Characteristics of the superficial deposits and soils in the NWSAS from which the aquifers receive their recharge, including porosity, permeability and salinity levels. This would include discussing suitability and value for agricultural activity in the NWSAS.
The state of land resources will also be described, e.g. the degree to which it is affected by salinization, land degradation and desertification. Implications of the degradation of agricultural soil, using evidence from the basin area.

1.6 Energy Resources

The focus of this section is on the energy resources in the NWSAS with a general overview about the energy resources of the three riparian countries on the national level. The first two sections, containing information at national level, can be seen as an introduction to the third one, which focuses on the basin area.

This section will include:

1.6.1 Fossil fuel resources and reserves

Analysing the estimates of proved reserves (mainly oil and natural gas) in each country to map the available local energy resources.

1.6.2 Renewable energy resource

This section will briefly describe the renewable resources in the three countries (Solar, wind, hydro and Geothermal) providing estimates of the potential of each renewable resource and to the possible extent to provide information on the best locations for each resource in each country.

1.6.3 Energy resources in the NWSAS

This section will zoom-in to the NWSAS and map the available energy resources (both fossil and renewable resources) to highlight the importance of the region in this regard. Particular attention will be paid to solar power potential.

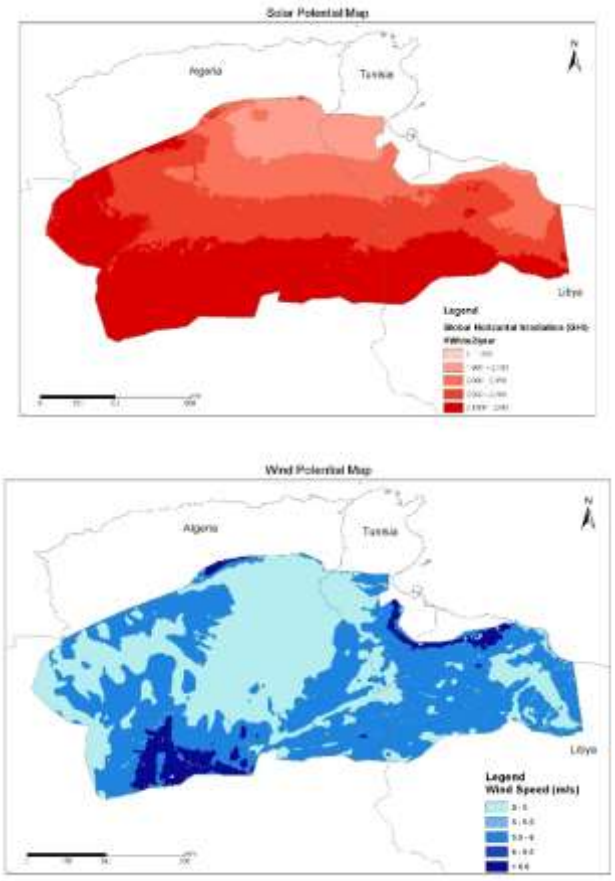


Figure 3: Maps of Solar and Wind potentials in the NWSAS

1.6.4 Electricity generation System

a) Installed capacities
b) Share of renewables
c) National strategic plans
d) Challenges

1.7 Environment and ecosystem services

This section describes the relevant ecosystems in the area including:

1.7.1 Bio-geographic characteristic

Mapping and characteristics of the eco-regions and description of the bio-geographic characteristics

1.7.2 Ecosystems and habitats

Description and list (depicted in maps -if available) of key ecosystems and habitats linked directly or indirectly with the NWSAS including freshwater, wetland and brackish ecosystems/habitats (Dryland and oases ecosystems, Wetlands, Coastal/Marine ecosystems (?))

1.7.3 Biodiversity and important species in the NWSAS

List of species (as per available information) in the area including list of vulnerable and threatened species of national, regional and global importance (in accordance to national legal system and IUCN categorization); effort should be made to associate these to the identified habitats and grouped/presented accordingly.

[lists to be given in Annexes except for the lists of endangered species that will be given in a table]

1.7.4 Protected Areas

Tables (including name of area, areal extend, designation status, management authority, existence of management plan) and map(s) of existing protected areas for area shall be given including: short description of the management settings including the reference on the existence of a management authority; description of the management status including the zoning system (in GIS format), financing of management, implementation of legislation and enforcement of law etc.;

Maps of protected areas should be included here.

Chapter B2
Governance analysis

The governance analysis of a nexus assessment looks at the legislative, institutional and policy framework relevant to the aquifer at the national and the regional/NWSAS level by analysing:

a) The institutional structure of water, energy, agriculture/land management and environmental protection at the local, national, basin, transboundary and regional levels (responsibilities, possible gaps, compatibility of sectoral objectives etc.);
b) The legislative and regulatory framework;
c) Measures and policy instruments to implement sectoral strategies at the national level;
d) Economic instruments;
e) The level of coordination and coherence among sectors and countries. The scope of transboundary cooperation in relation to resource management and use in the basin.

This chapter describes the governance landscape at sub-national, national, basin/transboundary and regional levels, with a particular attention to intersectoral and international cooperation mechanisms. A part of the content is also a mapping of the organizations and actors in different sectors and countries from a stakeholder analysis.

2.1. Norms and institutions for governance on the national level

2.1.1 Organizations and key stakeholders

This part will provide an overview of the NWSAS stakeholders –groups and organizations in particular - that could influence/affect or be influenced/affected by decisions for the management of the NWSAS, drawing upon the Stakeholder Analysis carried out.22 A map of the stakeholders at the national and transboundary levels; complemented by a general identification of their competences and stakes in relation to the management of the NWSAS.

2.1.2. Intersectoral coordination on the national level

This may include, as appropriate, mechanisms for integrated policymaking and decision-making such as interministerial working groups or coordination arrangements. Reference will be made to the different organizations and their relevant competencies in the previous section. The Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), poverty and social impact analysis, or other integrated assessment processes and integrated permitting also serve intersectoral coordination. Processes for implementation of strategies or action plans for adaptation to climate change, or coordination arrangements for monitoring progress towards the Sustainable Development Goals are also reviewed in this section.

2.1.3. Sectoral analysis

The scope and focus of this section reflects the relevance of the different sectors in the NWSAS context but would likely include energy (e.g., renewable energy/energy mix, power sector development plans); water (e.g., climate change scenario planning,

[22] An initial mapping was carried out together with the stakeholders that participated in the first transboundary nexus assessment workshop in Algiers in July 2017.

abstraction scenarios; agriculture (e.g., investments and productivity increases/rural development plans, farmer-based organizations); tourism (e.g., sustainable tourism policies/plans); land use/spatial planning; environment (e.g., forestry/nature management plans)

Overview of Nexus-related institutional frameworks (map of organizations, based on the stakeholder analysis)

Policy instruments and planning cycles – this includes a discussion of relevant administrative practices and considerations such as the subsidiarity principle

Economic instruments (Environmental taxes (notably for pollution), fees for the use of resources (if applicable), subsidies etc.)

Governance cultures in individual sectors – e.g., civil society engagement. Issues such as gender are also to be considered.

Implementation and enforcement of laws and regulations (general)

Capacities, administrative and other

2.2. Transboundary Nexus Governance

2.2.1. Relevant global standards and regional regimes

Global standards for governance

E.g. 2030 Agenda for Sustainable Development, UN Framework Convention on Climate Change, Sendai Framework on Disaster Risk Reduction, 2015 Paris Agreement on climate change, 1992 Rio Declaration on Environment and Development, Ramsar Convention on Wetlands, UN Convention on Biological Diversity, UN Desertification Convention

Regional regimes for governance

E.g. League of Arab States, Mediterranean cooperation frameworks, Union of Arab Maghreb

Norms, institutions for governance on the NWSAS level

2.2.2. State acceptance of the above – ratification of instruments, reporting, implementation

2.2.3. Guidance to the state level - including examples of initiatives and projects related to the above

2.2.4. NWSAS-level governance (and, if relevant, surface water basins)

Water governance at the NWSAS level

Coordination Mechanism and its functioning (Based on the report of the institutional and legal framework analysis)

Cross-sectoral governance at the NWSAS level

2.2.5. International relations between the aquifer sharing countries (bilateral/multilateral)

Transboundary/Regional cooperation in the energy sector

Existing bilateral or multilateral trade agreements, joint investments, projects and other cooperation arrangements as well as regional coordination frameworks (as applicable) in the field of energy

Transboundary/Regional cooperation in the agriculture sector

Existing bilateral or multilateral trade agreements, joint investments, projects and other cooperation arrangements as well as regional coordination frameworks (as applicable) in the field of agriculture

Transboundary/Regional cooperation on environment

Existing bilateral or multilateral trade agreements, projects and other cooperation arrangements as well as regional coordination frameworks (as applicable) in the field of the environment

Transboundary/Regional cooperation on other relevant matters [transport, tourism, etc.]

Existing bilateral or multilateral trade agreements, joint investments and other cooperation arrangements as well as regional coordination frameworks (as applicable) in other relevant fields

Chapter B3
Socioeconomic situation and the main resource uses in the NWSAS

This chapter will provide an overview of the main socioeconomic characteristics, starting by describing the population, followed by settlements and main economic activities. This will be done using selected indicators (including indicators for progress towards Sustainable Development Goal targets, as relevant) and with a reference to the national context and on the aquifer context.

An integral part of this chapter will be information on the use of water, land, energy and environmental resources by sector or resource user in the aquifer area, or beyond in cases where uses extend further. In the case of water use, a distinction will be made between consumptive and non-consumptive uses (if any, e.g. aquaculture). The dependency of economic activities of ecosystem services will be discussed under a distinct heading.

The socioeconomic trends relevant to the aquifer and to the riparian countries will be discussed with the outlooks for development. Related challenges or key development issues will also be mentioned (livelihoods, security or others, as relevant).

3.1 Population

This section will consider the population in the aquifer area in relation to the national population (See example table 3) and its distribution, and will also study the significance of the basin in term of number of settlements, households and the main municipalities or local governments. Relevant issues related to demography will also be discussed.

Table 3: Population in the NWSAS

	Algeria	Tunisia	Libya
Basin Population	2,600,000	1,000,000	1,200,000
Total country population	39,666,519	11,107,800	6,278,438
Share of country population	7%	9%	19%
Share of basin population	54%	21%	25%

[Source to be added]

This section will give projections of the evolution of the population in the NWSAS area, also it will analyse the population characteristics: Labour force, unemployment, age, migration etc.

3.2 Settlements and households

This section will describe the use of resources, namely water, land, energy and ecosystem services, by settlements and households. As relevant, water and energy utilities and their service provision will be referred to.

Resource uses:

a) **Land use**/urbanization: Distribution of the settlements in the NWSAS per country

1 OSS, 2016: The North Western Sahara Aquifer System – SASS. URL: http://sass.oss-online.org/en/north-western-sahara-aquifer-system-%E2%80%93-sass

b) **Water use**: Access to water and sanitation, use rates, any time variation of demand, wastewater treatment in the countries. Pricing of water services.
c) **Energy use**: energy access level in each country and affordability of energy (if relevant, with information on 'energy poor households'). Energy uses and its possible time variability, energy efficiency. Energy prices, electricity tariffs.

3.3 Agriculture

An overview of the agricultural activities as a main economic activity is to be given in this section. Type, main characteristics (extent of family farming, plot size etc.) and importance of the agro sector. It will provide information on the extent of trade in agricultural products and importance of the crops that are produced in the NWSAS at the national level. The description considers e.g. the following:

- Main crops (production of agricultural crops and yield): Production of dates, olives, fodder, cereal, and vegetable crops. The cultivation periods, volumes of production, extent of trade (local use, transport to cities, export) etc.
- Agricultural practices, (if relevant) processing of agricultural products
- Climate change impact on agriculture, especially as regards to resource demands

Resource uses:

a) **Land area** under cultivation or for animal husbandry; irrigated vs. rainfed area;
b) **Water use**: water use rates, distinguishing sources where possible; Irrigation techniques employed and their respective water requirements - Canals/flooding/sprinkling/drip irrigation etc.); Hectares under irrigation using the different techniques. Managing drainage waters. Water efficiency; age and condition of the irrigation networks (losses)
d) **Energy use**: energy carrier and electricity uses in the agriculture sector; energy sources (including e.g. solar powered pumping; energy intensity of production

3.4 Energy sector and industry

This section gives an overview of the energy sector activities and relevant industrial activity and their resource uses.

- Interconnectedness and energy trade: The interconnectedness and transmission capacities of the energy systems of the countries. Implications for the region, including demands for electricity and meeting demands.
- Oil and Gas industry: A description of these activities, including location and capacity.
- Other industrial activity: at least the important phosphate transformation industry in Gabes is to be mentioned.

Resource uses:

a) **Land area**: any significant land requirements or effects of these activities that may limit other land uses;
b) **Water use**: water use rates, distinguishing sources where possible; Irrigation techniques employed and their respective water requirements -; water management, water efficiency and reuse[23], and related technological progress.
c) **Energy use**:

[23] Apparently the phosphate company explored at pilot level the reuse of treated water and now they are moving for a large scale use of the treated water. Such information would be relevant to reflect..

3.5 Other important economic activities or functions supported by the aquifer/groundwater

This section will describe other relevant resource uses in the region of the aquifer or depending of its resources, e.g. industry or tourism,– analogously to the sections above. Functions (e.g. groundwater ensuring the stability ground, sustaining dependent ecosystems such as oases)

3.6 Socio-economic trends

This section of the report will focus on the socio-economic trends , to the degree possible focusing on the NWSAS region related to:

a) Demography and population
b) General economic development
c) Agriculture development plan
d) Energy development
e) Technological development
f) Environmental protection

Observed historical trends as well as projections about the future will be reviewed (the projections of the State ministries and agencies are given priority, if available). For example, this section will study if the population is migrating to the basin of out of the aquifer area and how this will impact the main activities in the basin in the future.

This section will involve describing/assessing water related pressures from economic activities, taking into account related tendencies

[Whether the following can be developed is subject to data] The section will also seek to assess the implications of water uses under scenarios [or at least conceptually develop and specify the related information requirements] drawn from the existing developmental strategies. In the absence of information or lack of adequate information regarding developmental strategies the experts should use scenarios based on dominant economic activities

3.7 The importance of ecosystem services for economic activities and impacts of human activities on the ecosystems

A rapid identification / description of ecosystem services (socio-economic, cultural, etc.) will be included here, including description of their importance for economic activities and impacts of human activities on the ecosystems. Further potential deterioration of the economic services as a result of the current practices of natural resources and the economic activities, will be assessed.

Annex B.

INSTRUCTIONS Please answer each question clearly and completely. Type or print in ink. Read carefully and follow all directions.	**CV TEMPATE**	PLEASE ATTACH A RECENT PHOTO

1. Family Name	First	Middle name

2. Date of Birth Da Mo Yr	3. Place of Birth	4. Nationality (ies) at birth	5. Present nationality (ies)	6. Sex

	7. Marital status
	Single ☐ Married ☐ Separated ☐ Widow ☐ Divorced ☐

8. Permanent address	9. Present Address (if different)	10. Office Telephone No.
Telephone No. Fax No.	Telephone No. Fax No.	Office Fax No. Office E-mail No.

11. KNOWLEDGE OF LANGUAGES. (• Fluent: The capacity to achieve most communicative goals and express oneself on a familiar range of topics. • Confident - The ability to communicate in a limited way in familiar situations and to deal in a general way with nonroutine information. • Basic - The ability to deal with simple, straightforward information)

What is your mother tongue?

OTHER LANGUAGES (add rows if necessary)	READ			WRITE			SPEAK			UNDERSTAND		
	Fluent	Confident	Basic	Fluent	Confident	Basic	Fluent	Confident	Basic	Fluent	Confident	Basic

•

12. EDUCATIONAL. Give full details - N.B. Please give exact titles or degree directly translated from the original language. Add rows if necessary.

A. UNIVERSITY OR EQUIVALENT Please do not translate or equate to other degrees.

NAME, PLACE AND COUNTRY	ATTENDED FROM/TO		DEGREES and ACADEMIC DISTINCTIONS OBTAINED	MAIN COURSE OF STUDY
	Mo./Year	Mo./Year		

13. LIST PROFESSIONAL SOCIETIES AND ACTIVITIES IN CIVIC, PUBLIC OR INTERNATIONAL AFFAIRS (add rows if necessary)

14. PLEASE LIST ALL SIGNIFICANT AND RELEVANT PUBLISHED BOOKS, ARTICLES, JOURNALS AND REPORTS THAT YOU HAVE WRITTEN (Do not attach. Add rows if necessary)

15. EMPLOYMENT RECORD: Starting with your present function, list in reverse order your major employments till today. Use a separate block for each FUNCTION. Duly complete all fields and indicate every employment including internships. In cases where you worked with one employer but held several positions, you must indicate every job title of each position held separately. If you need more space, add fields in section B below of the same size and content as under section A below.

A. PRESENT FUNCTION (LAST FUNCTION, IF NOT PRESENTLY IN EMPLOYMENT)

FROM MONTH/YEAR	TO MONTH/YEAR	EXACT TITLE OF YOUR FUNCTION (functional title at this employer):	DUTY STATION

NAME OF EMPLOYER:	TYPE OF BUSINESS (such as, Consulting, Government, International Organization, Non-Government Organization (NGO), Private Sector, Self-Employed and Services etc.):
ADDRESS OF EMPLOYER:	NAME OF SUPERVISOR:
	NO AND KIND (professionals administrative staff etc.) OF EMPLOYEES SUPERVISED BY YOU: / REASON FOR LEAVING:

DESCRIPTION OF YOUR DUTIES (max 2500 characters)

DESCRIPTION OF YOUR ACHIEVEMENTS (max 3500 characters)

B. PREVIOUS FUNCTION *(IN REVERSE ORDER)*

FROM MONTH/YEAR	TO MONTH/YEAR	EXACT TITLE OF YOUR FUNCTION (functional title at this employer):	DUTY STATION

NAME OF EMPLOYER:	TYPE OF BUSINESS (such as, Consulting, Government, International Organization, Non-Government Organization (NGO), Private Sector, Self-Employed and Services etc.):

ADDRESS OF EMPLOYER:	NAME OF SUPERVISOR:	
	NO AND KIND (professionals administrative staff etc.) OF EMPLOYEES SUPERVISED BY YOU:	REASON FOR LEAVING:

DESCRIPTION OF YOUR DUTIES (max 2500 characters)

DESCRIPTION OF YOUR ACHIEVEMENTS (max 3500 characters)

FROM	TO	EXACT TITLE OF YOUR FUNCTION (functional title at this employer):	DUTY STATION
MONTH/YEAR	MONTH/YEAR		

NAME OF EMPLOYER:	TYPE OF BUSINESS (such as, Consulting, Government, International Organization, Non-Government Organization (NGO), Private Sector, Self-Employed and Services etc.):

ADDRESS OF EMPLOYER:	NAME OF SUPERVISOR:	
	NO AND KIND (professionals administrative staff etc.) OF EMPLOYEES SUPERVISED BY YOU:	REASON FOR LEAVING:

DESCRIPTION OF YOUR DUTIES (max 2500 characters)

DESCRIPTION OF YOUR ACHIEVEMENTS (max 3500 characters)

FROM	TO	EXACT TITLE OF YOUR FUNCTION (functional title at this employer):	DUTY STATION
MONTH/YEAR	MONTH/YEAR		

NAME OF EMPLOYER:	TYPE OF BUSINESS (such as, Consulting, Government, International Organization, Non-Government Organization (NGO), Private Sector, Self-Employed and Services etc.):
ADDRESS OF EMPLOYER:	NAME OF SUPERVISOR:

NO AND KIND (professionals administrative staff etc.) OF EMPLOYEES SUPERVISED BY YOU:	REASON FOR LEAVING:

DESCRIPTION OF YOUR DUTIES (max 2500 characters)

DESCRIPTION OF YOUR ACHIEVEMENTS (max 3500 characters)

FROM	TO	EXACT TITLE OF YOUR FUNCTION (functional title at this employer):	DUTY STATION
MONTH/YEAR	MONTH/YEAR		

NAME OF EMPLOYER:	TYPE OF BUSINESS (such as, Consulting, Government, International Organization, Non-Government Organization (NGO), Private Sector, Self-Employed and Services etc.):
ADDRESS OF EMPLOYER:	NAME OF SUPERVISOR:

NO AND KIND (professionals administrative staff etc.) OF EMPLOYEES SUPERVISED BY YOU:	REASON FOR LEAVING:

DESCRIPTION OF YOUR DUTIES (max 2500 characters)

DESCRIPTION OF YOUR ACHIEVEMENTS (max 3500 characters)			
FROM MONTH/YEAR	TO MONTH/YEAR	EXACT TITLE OF YOUR FUNCTION (functional title at this employer):	DUTY STATION
NAME OF EMPLOYER:		TYPE OF BUSINESS (such as, Consulting, Government, International Organization, Non-Government Organization (NGO), Private Sector, Self-Employed and Services etc.):	
ADDRESS OF EMPLOYER:		NAME OF SUPERVISOR:	
		NO AND KIND (professionals administrative staff etc.) OF EMPLOYEES SUPERVISED BY YOU:	REASON FOR LEAVING:
DESCRIPTION OF YOUR DUTIES (max 2500 characters)			
DESCRIPTION OF YOUR ACHIEVEMENTS (max 3500 characters)			

16. DO YOU HAVE ANY OBJECTIONS TO OUR MAKING ENQUIRIES OF YOUR PRESENT EMPLOYER? YES ☐ NO ☐

DO YOU HAVE ANY OBJECTIONS TO OUR MAKING ENQUIRIES OF YOUR PAST EMPLOYER(S)? YES ☐ NO ☐

17. REFERENCES: List three persons, not related to you, who are familiar with your character and qualifications.

Do not repeat names of supervisors listed in item 23.

FULL NAME	FULL ADDRESS (including e-mail address and telephone number)	BUSINESS OR OCCUPATION

18. STATE ANY OTHER RELEVANT FACTS IN SUPPORT OF YOUR APPLICATION. INCLUDE ONLY INFORMATION THAT IS RELEVANT TO JOB YOUR ARE APPLYING FOR.

19. HAVE YOU BEEN ARRESTED, INDICTED, OR SUMMONED INTO COURT AS A DEFENDANT IN A CRIMINAL PROCEEDING, OR CONVICTED, FINED OR IMPRISONED FOR THE VIOLATION OF ANY LAW (excluding minor traffic violations)? YES ☐ NO ☐

If "yes", give full particulars of each case in an attached statement.

20. I certify that the statements made by me in answer to the foregoing questions are true, complete and correct to the best of my knowledge and belief. I understand that any misrepresentation or material omission made on the current CV form or other document requested by the Organization may result in my exclusion from the selection process, or the termination of the working relationship with GWP-Med, even if selected, without notice.

DATE: _____ SIGNATURE: _____

NB. You will be requested to supply documentary evidence which support the statements you have made above. Do not, however, send any documentary evidence until you have been asked to do so and, in any event, do not submit the original texts of references or testimonials.

ANNEX C.
Financial Offer

Price Table

	Total lump sum in € (Taxes included)
Expert Remuneration	