Strategy studies and strategic planning meeting minutes

Mercure Hotel, Alexandria

3-4 May, 2009

Plenary Session:

1.1 Welcome speech by Dr. Khaled AbuZeid

Dr. AbuZeid, Regional Water Resources Program Manager, CEDARE, welcomed all participants and gave a brief description of the SWITCH project, assuring that its main purpose is to produce an integrated urban water resources plan that could be applicable till the year 2037. He also focused on one of the side activities of the project which is the demonstration site of Maawa Alsayadeen. Dr. AbuZeid summarized what have been done in the project so far and stressed on the importance of the strategic studies to be discussed as well as the strategic planning that will have a huge influence on the 2037 plan. The five specific studies are as follows:

1) Storm water management
2) Groundwater management
3) Wastewater management and reuse
4) System modeling and decision support
5) Water demand management

Dr. AbuZeid has also indicated that there are other important studies that will be considered in the very near future such as: desalination, institutional mapping, financial sustainability, and social inclusion.

1.2 Welcome speech by Eng. Mohamed Abd ElZaher

Eng. Abd ElZaher , the secretary general of the governorate of Alexandria welcomed all participants to Alexandria, conveyed the governor's greetings to all participants and appreciation to the efforts exerted in the project. He also emphasized the importance of the 2037 IUWM plan to the governorate of Alexandria.

1.3 Welcome speech by Eng. Nadia Abdou

Eng. Nadia, Head of the Alexandria Water supply Company (AWCO), welcomed all participants, highlighted the achievements of the Alexandria water supply company, she elaborated on the expanded water supply coverage in the last few years. She also noted that the SWITCH demo site Maawa Alsayadeen is one of the few troubled sites in Alexandria because it suffers from many water supply problems including the lack of meters and equipment. Eng. Nadia also thanked SWITCH for working on the IUWM plan. Among the achievements that she mentioned was the establishment of a GIS unit in the company.

1.4 Welcome speech by Eng. Mohamed Bahgat

The head of the Alexandria wastewater company welcomed all participants and expressed his gratitude for the attention devoted to Maawa Alsayadeen, claiming that it is the only official informal settlement left in Alexandria.. He highlighted two of the huge projects that the company is planning, namely, the huge Agami project and the huge Aameriya project. He also emphasized the importance of the IUWM plan.

1.5 Presentation by Dr. Peter Van Der Steen

Dr. Van Der Steen made a brief presentation on the main purposes and objectives of the strategic planning and the strategy studies, along with the objective of this particular meeting as one of the steps of the strategic planning process. He also referred to previous international studies related to strategic planning in Alexandria, mainly, the one performed by the World Bank. As he described the various future scenarios expected for Alexandria, he pointed out the difference between a strategy and a scenario. A strategy is the mitigation measure for an imposed scenario. He referred to the visioning workshop scenarios: a worst case scenario, a best case scenario, and business as usual. He concluded by clarifying the main purpose of the meeting which is writing the TORs for the strategy studies and preparing an action plan for the strategic planning team.

1.6 Presentation by Dr. Dionysis Assimacopolous

Dr. Assimacopolous introduced the audience to the Aquacycle and Citywater models as significant tools in the integrated urban water management plan. He has also clarified the difference between Aquacycle and Citywater, proposing scenarios and relevant strategies could only be done in Citywater, therefore the application of Citywater depends on the success of Aquacycle. Dr. Assimacopolous then explained the different modules of Citywater which are Citywater drain, Citywater risk and Citywater economics, along with the different inputs and outputs of Citywater and the five different levels of modeling. A case study in Athens, Greece was then presented, it featured wastewater reuse and sludge removal. Dr. Assimacopolous has then browsed through the input parameters for Aquacycle, and showed some of the important information that might enhance the development of a future model for Alexandria such as the fact that the daily water consumption is 450 liters per capita. As Dr. Assimacopolous reached that point in his presentation, many thoughts were verbally expressed by the audience, Dr. Mohamed Bahaa Saad of MWRI claimed that future projections are usually not precise, he set an example by the projected amounts needed for drinking water in 2017 as estimated in the national water resources plan (8 billion cubic meters), which is already outnumbered in 2009. Dr. Assimacopolous has also explained the level of friendliness between Aquacycle/Citywater and GIS applications, he mentioned that it is possible to divide the city by topologies.
Eng. Nadia Abdou made a comment about the weight given to stormwater in Aquacycle, claiming that rainfall rates have been deteriorating in Alexandria in the last years, which was commented on by some of the audience as not being an indicator of a permenant phenomenon. Dr. Assimacopolous concluded the presentation by discussing some of the scenarios expected in the future, most of these scenarios focus around future city expansion.

Parallel Sessions:

1) Waste Water Reuse study:

Team:

International Coordinator: Dr. Peter Van Der Steen
Local Specialist 1: Dr. Hellali Hellali
Dr. Sama Zaki
Dr. Inas Elqirsh
Local Specialist 2: Dr. Ahmed Kassem
CEDARE staff: Eng. Mohamed Elrawady

The session commenced with a brainstorming where every participant elaborated for his/her vision of Alexandria beyond 2030, the ideal vision featured 100% treated wastewater as well as 100% water supply and sanitation coverage. As for the effluent quality, the ideal vision assumes zero effluent. The same idealistic vision also applies to treatment plants where sludge can be sold as fertilizer.

The TOR's for the two primary investigators will be as follows:

- To perform a desk study, based on secondary data available in reports or upon request from sector organizations. Primary data collection is not part of the study. Whenever data is not available, estimates are based on (international) literature.
- Prepare the document 'New Strategies for Wastewater Management and Reuse in Alexandria in 2037', as outlined in Annex 1.
- Actively participate in the start meeting of the study team (2 days, preliminary planned for 3rd and 4th of May 2009 in Alexandria – Training Centre Water Company).
- Present the study (objectives and preliminary results) to the LA, during the above mentioned start meeting.
- Send a progress report to the international coordinator[1] 1 and 2 months after the start meeting, respectively.
- Send a draft full report to the international coordinator 3 months after the start meeting.
- Adjust the draft report, based on comments made by the international coordinator.
- Actively participate in the evaluation meeting of the study team (2 days, preliminary planned for September 2009).
- To submit the final report (in Word and PDF format) to the international coordinator within 4 months after the start-meeting, or at least 10 days before the evaluation meeting (whatever date is earlier).

And the tasks related to the report writing were divided as follows:

New Strategies for Wastewater Management and Reuse in Alexandria in 2037 [70 pages]

A. ***Dr. Helaly***
B. ***Dr. Kassem***

Executive summary [3 pages] B

Chapter 0 Introduction [1 page] A
Background, objectives.

Chapter 1 Description and assessment of current wastewater system [24 pages] A

Information on the Governarate of Alexandria (in AutoCad, ArcGIS or similar software
whenever possible): [15 pages]

- Land use (residential, commercial, industrial and agriculture areas; population per city section, population density,) B
- Areas covered by a sewer system, type of sewer system, connection rate per area. A
- Areas and population relying on on-site sanitation forms. Type of on-site sanitation. B
- Main sewer lines, pumping stations. A
- Location, capacity (current and planned), type of technology, points of discharge of all WWTPs. A
- Monitoring data (quality, quantity) for municipal WWTPs (influent and effluent) and surface water. A
- The irrigation and drainage canal network within the Governorate. A
- Points of industrial effluents discharge (quality, quantity). A
- Sludge generation (location, quantity, quality), processing and disposal. A

Overview of the institutions involved in wastewater management in the city (mandate, operations) [2 pages] A

Overview of relevant legislation and policies. [2 pages] A

An overview of the various projects on wastewater management in the city (Alexandria City Development Strategy; Alexandria Development Project; etc.) [2 pages] B

Assessment of the wastewater system in terms of: public health, environmental pollution, implementation of legislation and policies, financing, equity. [3 pages] A

Chapter 2 A Vision for a future wastewater system [4 pages] A

A description of a sustainable urban water system in Alexandria in 2037. Include the objectives that should be met in order to arrive at sustainability. Refer to the LAs

vision for Alexandria's urban water system and the general SWITCH Vision and Strategy. [4 pages]

Chapter 3 Scenarios affecting the wastewater system [8 pages] B

The scenarios developed in this study should be based on the general scenarios identified during the LA workshop in July 2007, and worked out specifically for the wastewater system.

GENERAL FUTURE SCENARIOS

Worst case scenario

In 2037, Alexandria is a city characterized by:

- continued explosive population growth (summer population 12 million)
- A weak and stagnant economy
- Low availability of Nile water which is 40% less than in 2007 (due to increased national water demand and/or climate change)
- increased risk of flooding (due to sea level rise)
- Poor availability of financial resources.

Best case scenario

In 2037, Alexandria is a city which:

- Has a population which has largely stabilised (at 8 million)
- Is benefiting from a dynamic and fast growing economy
- Has a guaranteed allocation of Nile water similar to that of 2007
- Has a positive scenario related to climate change (with sea level rise minimum and increased rainfall)
- Benefits from the new vitality of the Egyptian economy which means that financial resources are readily available.

Business as usual

In 2037, Alexandria continues to be a city dealing with considerable uncertainty:

- Population is 10 million, and continues to grow.
- National allocation of Nile water is 20% less than in 2007
- Economic growth has been steady but unspectacular
- Rising sea levels are starting to threaten some parts of the city.

Expand the general scenarios into 3 scenarios specific for the wastewater system and include the following issues (and others if deemed necessary):

- Population growth (low, medium high), city expansion (in which areas the city will expand) and wastewater flows (water use, sewer connection rate). [2 pages] B

- Wastewater composition (dependent on water consumption, priority pollutants such as medicines and endocrine disruptors), industrial discharges and the enforced effluent standards (for disposal and reuse). [1 page] A

- Demand for effluent (industrial, urban and agricultural reuse; location, required qualities and potential quantities) [4 pages] A

- Intrusion of saline water into the sewer system (effect of potential sea level rise). [1 page] B

Chapter 4 Potential strategies to achieve a sustainable urban wastewater system [25 pages] B

Describe the following strategies for Alexandria:

Strategy 1: Conventional collection and treatment for disposal [2 pages][2] A
Full coverage with combined sewer system, activated sludge systems (secondary, tertiary treatment). Effluent is discharged into Lake Mariout and/or the Mediterranean. Identify suitable disposal points in terms of capacity of receiving water to absorb remaining pollution. Discuss the advantages and disadvantages of secondary and tertiary treatment.

Strategy 2: Conventional collection and treatment for centralised agricultural reuse [10 pages] A
Full coverage with combined sewer system, activated sludge systems (secondary, tertiary, disinfection). Effluent is reused in agriculture, either in new and/or old agricultural lands. Also consider mixing effluent with agricultural drainage water to improve water quality of drainage water and allow reuse. Describe possible ways to transport effluents to point of reuse. Summarise and evaluate the relevant parts of the WRC study 'Alexandria Effluent and Sludge Reuse Study', including the layout of the Effluent Conveyance system and costs [B for costs].

Strategy 3: Mix of on-site sanitation and sewerage [2 pages] B
Full coverage of the city with sewerage may be unaffordable. This strategy is therefore based on a mix of on-site sanitation and sewerage. Evaluate the affordability of sewer systems for the lower income areas. Propose which city sections are to be connected to the sewer system and in which city-sections on-site sanitation is more feasible.

Strategy 4: Direct Urban non-potable reuse [5 pages] B
Effluent from central and/or decentralised treatment systems is reused for urban landscaping, toilet flushing and other non-potable reuse purposes. Identify areas in the existing city with high potential for effluent reuse (include "Samooha", Sporting, Allajon, Acasia and Jardinia). Consider proximity of wastewater treatment plants to potential reuse sites. Include reuse of grey water, after some treatment, for toilet flushing, irrigation, etc. Identify the required degree of treatment for various purposes.

Strategy 5: Indirect urban potable/non-potable reuse by SAT and ARR [4 pages] B

[2] For this chapter; including the pages used for the evaluation of the strategy

Effluent from central and/or decentralised treatment systems is further treated by SAT (Soil Aquifer Treatment), recovered and reused for urban landscaping, toilet flushing and other non-potable reuse purposes or potable reuse. Evaluate option of ARR (Aquifer Recharge and Recovery).

Strategy 6: Wetlands and aquaculture [2 pages] A
Effluent from central and/or decentralised treatment systems is polished in natural treatment systems (wetlands) and used as nutrient source for aquaculture production systems. Also consider direct treatment in decentralised constructed wetlands. Refer to Lake Mariout Integrated Management Plan.

The 3 strategies should be evaluated:

Firstly, in a general sense:

- Potential to achieve the vision (in terms of meeting the objectives of the vision)
- Effect of scenarios on potential to achieve the vision

Secondly, based on the following indicators:

- Public health effects (transfer of diseases due to contamination in residential areas, due to contamination of Lake Mariout, due to contamination of crops; distinguish microbiological and chemical pollution)
- Environmental pollution (discharge of pollutants into Lake Mariout/Mediterranean, impacts on fisheries, groundwater pollution, pollution of agricultural fields)
- Energy consumption (identify points of energy consumption, such as pumping stations or treatment plants)
- Compatibility with (current) legislation, policies, strategies, and plans
    - Law for industrial wastewater disposal into sewage networks, Egyptian Ministry of Housing
    - Law 48 for the protection of water bodies
    - Wastewater Reuse Code, Ministry of Housing
    - FAO guidelines
    - National Water Resources Plan 2017
    - National Sustainable Agriculture Development Strategy 2030
    - Alexandria Wastewater Master Plan for 2037
- Cost estimates (investment and operation & maintenance), potential for cost recovery and funding. Evaluate cost reduction through substitution of fresh water by effluents.
- Equity (assess whether there are groups in society that do not (fully) benefit from the proposed strategy)

The description of the effect of the strategies on the indicators should be summarised in overview tables with estimated scores [range 1 to 5; with 5 being the best score], as follows:

Scenario x				
	Indicators			
Strategy	**1**	**2**	**3**	**Total score**
1				
2				
3				

Chapter 5 Wastewater management and IUWM [3 pages] B

Describe how the various strategies would affect (or is affected by) the topics of the other studies (Water Demand Management, Groundwater management, Stormwater management, Modelling and Decision Support, Institutional mapping)

Chapter 6 Conclusions and recommendations [2 pages] A

References

Annexes

2) <u>Water Demand Management Study:</u>

A) Structure of the report

Strategies for Water Demand Management in Alexandria in 2037 [70 pages plus Annexes] – DRAFT2

Note: It is not necessary to include general information on the water supply system in the Governorate of Alexandria, which should be included in the Aquacycle study team's report. This report will concentrate on demand management.

Executive summary

Chapter 0 Introduction [1 pages]
Background, objectives.

Chapter 1 Description and assessment of current Water Demand Management activities and responsibilities

Overview of the institutions involved in water demand management in the city (mandate, operations)

Overview of relevant legislation and policies.

An overview of the various projects on water demand management in the city

Chapter 2 A Vision for water demand management in a sustainable urban water supply system

A description of a sustainable urban water system. What objectives should be met in order to arrive at sustainability. Refer to the LAs vision for Alexandria's urban water system and the general SWITCH Vision and Strategy.

Chapter 3 Scenarios affecting the water distribution system, focusing on water demand management

Describe 3 possible scenarios for the future. Include discussion of the following issues:

- Population growth (low, medium high)
- Changes in household appliances and behaviour
- Growth / change in the industrial and commercial sectors
- Other relevant strategic decisions e.g. on water allocation, standards of service and tariffs

Chapter 4 Potential strategies to achieve a sustainable urban water distribution system through demand management

Describe the following strategies for Alexandria:

0. Regular detailed monitoring of production, transfers to other areas, demands and losses

1. Minimise physical losses from pipe networks

2. Minimise commercial losses from pipe networks

3. Maximise/optimise household water use efficiency
    - including use of tools like awareness programmes and tariffs

4. Maximise/optimise water use efficiency in commercial premises and offices
    - including use of tools like awareness programmes and tariffs

5. Maximise/optimise industrial water use efficiency
    - including use of tools like awareness programmes and tariffs

6. Use alternative sources for some water uses

7. Develop capacity of Alexandria Water Company in WDM and partnerships with other organisations to reduce physical and commercial losses and increase end-use efficiency

Evaluate the strategies, based on:

- Innovative approaches
- Potential to achieve the vision (in terms of meeting the objectives)

- Effect of scenarios on potential to achieve the vision
- Potential to reduce water consumption or losses
- Energy consumption
- Compatibility with (current) legislation and policies
- Outline costs and benefits of each strategy, financial sustainability.
- Equity
- Feasibility

Chapter 5 Water demand management and IUWM

Describe how the various strategies would affect (or by affected by) the topics of the other studies (Wastewater reuse, Groundwater management, Stormwater management, Modelling and Decision Support, Institutional mapping)

Chapter 6 Conclusions and recommendations

References

Annexes

B) TORs

Strategic Planning process in Alexandria
Strategy study on Water Demand Management

ToRs for Eng Hanan Taha

Background

Objective
To formulate different innovative strategies[3] for water demand management in Alexandria, aimed at achieving a sustainable urban water system by the year 2037. The strategies will take into account different scenarios[4].

Product
See ToC, Strategies for Water Demand Management in Alexandria in 2037.

Tasks
- To perform and report on desk studies as listed below, based on secondary data available in reports or upon request from sector organizations. Primary data collection will be for sample areas. Whenever data is not available, estimates are based on (international) literature.
    - From billed consumption records assess consumption by different sectors

[3] A strategy is defined as a combination of activities (both hardware and software) aimed at achieving a vision. The vision for Alexandria has been formulated by the LA.

[4] A scenario is defined as a future change that is not controlled or affected by urban water managers, such as climate change or energy costs.

- Compare water production records and billed consumption records to produce a water balance and estimate Non Revenue Water (jointly with Dr Hossam)
- Study potential of zoning, leak detection and pressure management for reducing physical losses
- Study potential of accelerating repairs and improving asset management, for reducing physical losses
- Study potential of improving metering and billing and reducing water theft
- End-use household survey using questionnaires, focusing on appliances, behaviour and willingness to change (jointly with Dr Hossam)
- Assessment of options for efficient water allocation (jointly with Dr Hossam)
- Study potential of capacity building of Water Company and of partnerships with other organisations to reduce physical and commercial losses and increase end-use efficiency

- Prepare the document 'Strategies for Water Demand Management in Alexandria in 2037', as outlined in Annex 1 (jointly with Dr Hossam).
- Actively participate in the start meeting of the study team (2 days, 3rd and 4th of May 2009 in Alexandria).
- Send a progress report to the international coordinator 1, 2 and 3 months after the start meeting, respectively.
- Present the objectives and preliminary results of the study to the LA, in a meeting, organized by CEDARE in Alexandria
- Actively participate in the evaluation meeting of the study team (2 days, preliminary planned for September 2009).
- To submit the final report (in Word and PDF format) to the international coordinator within 4 months after the start-meeting, or at least 10 days before the evaluation meeting (whatever date is earlier).

ToRs for Dr Ahmed Hossam

Background

Objective
To formulate different innovative strategies[5] for water demand management in Alexandria, aimed at achieving a sustainable urban water system by the year 2037. The strategies will take into account different scenarios[6].

Product
See ToC, Strategies for Water Demand Management in Alexandria in 2037.

Tasks
- To perform and report on desk studies as listed below, based on secondary data available in reports or upon request from sector organizations. Primary data

[5] A strategy is defined as a combination of activities (both hardware and software) aimed at achieving a vision. The vision for Alexandria has been formulated by the LA.

[6] A scenario is defined as a future change that is not controlled or affected by urban water managers, such as climate change or energy costs.

collection will be for sample areas. Whenever data is not available, estimates are based on (international) literature.
    - Compare water production records and billed consumption records to produce a water balance and estimate Non Revenue Water (jointly with Eng Hanan)
    - End-use survey of commercial premises, offices etc using questionnaires, identifying major uses of water and scope for savings
    - End-use survey of industry using questionnaires, identifying major uses of water and scope for savings
    - End-use household survey using questionnaires, focusing on appliances, behaviour and willingness to change (jointly with Eng Hanan)
    - Assessment of options for efficient water allocation (jointly with Eng Hanan)
- Prepare the document 'Strategies for Water Demand Management in Alexandria in 2037', as outlined in Annex 1 (jointly with Eng Hanan).
- Actively participate in the start meeting of the study team (2 days, 3rd and 4th of May 2009 in Alexandria).
- Send a progress report to the international coordinator 1, 2 and 3 months after the start meeting, respectively.
- Present the objectives and preliminary results of the study to the LA, in a meeting, organized by CEDARE in Alexandria
- Actively participate in the evaluation meeting of the study team (2 days, preliminary planned for September 2009).
- To submit the final report (in Word and PDF format) to the international coordinator within 4 months after the start-meeting, or at least 10 days before the evaluation meeting (whatever date is earlier).

3) Whole of system modeling and decision support:

Objective

The main objective of the study is to develop a representation of the current urban water management system of Alexandria, using the Aquacycle software package. The aim of the study is to prepare the ground for the application of the CityWater suite of tools (and especially the CityWater Balance model) for simulating alternative scenarios and strategies that will be developed for the city. The study will be based on the basic work already undertaken by the NTUA, which will be validated, refined and enhanced on the basis of collected data and additional modeling assumptions, so as to arrive to a more comprehensive and accurate representation of the current urban water system of Alexandria.

Products

The products of this study will be:

- A report describing in depth modeling and data used for developing a model of the urban water system of Alexandria;
- A fully referenced dataset for use with the Aquacycle software.

Meeting overview

The Aquacycle Study Team meeting was structured in three sessions:

- Session 1 (3rd May, Morning Session) involved the following presentations and discussions:
    - Introduction to the aims and scope of the study, by Prof. Dionysis Assimacopoulos (Part I - Introduction to the Alex UW Modelling Study - attached ppt file)
    - Presentation of the work already undertaken by the NTUA for modeling the urban system of Alexandria (Part II - Aquacycle Strategy Study- Modeling – Data, attached ppt file);
    - Discussions on the modeling approach, data requirements and data gaps.
- Session 2 (3rd May, Afternoon Session) involved a hands-on training session on the use of the Aquacycle software.
- Session 3 (4th May, Morning Session), involved:
    - Discussion among participants on potential sources of data and activities for data collection;
    - Discussion on overall planning and detailed allocation of work among the Task members, which is summarized in the corresponding NTUA presentation (Part III - Planning the Next Steps; attached ppt file).

Meeting material and documents distributed to the Task Team

1. Preparation work for the meeting by NTUA
    a. Modeling Alex WS with Aquacycle, version 3
    b. Data files (attached zipped directory)
2. Presentations during the meeting by NTUA
    a. 1st day: Part I - Introduction to the Alex UW Modelling Study (attached ppt file)
    b. 2nd day: Part II - Aquacycle Strategy Study- Modeling – Data (attached ppt file)
    c. 2nd day: Part III - Planning the Next Steps (attached ppt file)
3. Documents prepared for the Task Team
    a. Draft report on "Modelling the urban water system of Alexandria"
    b. ToR Aquacycle Study (attached doc file)
    c. List of Contents for Reporting on Aquacycle Strategy Study (attached doc file)

Tasks

The **local consultant** will be responsible for:

- Actively participating in the start meeting of the study team (2 days, 3rd and 4th of May 2009 in Alexandria).
- Reviewing the work done so far by the NTUA for developing a "baseline" representation of the urban water system of Alexandria, in collaboration with specialists from AWCO and WWDC;
- Developing a more detailed model for the urban water system under study, based on secondary data available in reports and additional data provided by AWCO and WWDC. The work will involve:
    - Validation and refinement of the current representation of the system in clusters;
    - Collection and processing of the relevant cluster data with regard to: (a) water use, (b) network connections (water supply and wastewater), (c) land use characteristics, in order to refine the preliminary modeling approach and develop a more accurate representation of the urban water system under study.
    - Use of the Aquacycle software for simulating the current situation of the urban water system;
    - Verification of the representation of the current system and calibration of the model.
- Preparing and submitting to the international coordinator two progress reports (June 30th 2009 and August 25th 2009)
- Drafting of a report presenting in detail all data, assumptions and results concerning the model on the urban water system of Alexandria by September 15th 2009.
- Adjusting this report, on the basis of comments made by the international coordinator.
- Actively participating in the evaluation meeting of the study team (2 days, preliminary planned for September 2009).
- Submitting the final report (in Word and PDF format) to the international coordinator within 4 months after the start-meeting, or at least 10 days before the evaluation meeting (whatever date is earlier).

The **local specialist from AWCO** is responsible for:

- Actively participating in the start meeting of the study team (2 days, 3rd and 4th of May 2009 in Alexandria).
- Reviewing the work done so far by the NTUA for developing a "baseline" representation of the urban water system of Alexandria, in collaboration with the local consultant and specialists from Alexandria Waste Water Company(AWWCO);
- Providing data concerning water supply and use for the urban water system of Alexandria to the local consultant on:
    - Location, served areas, capacity and daily production from water treatment plants;
    - Water used by different sectors (industrial, residential, tourism, other) in the different cluster areas;

    - Water use profile for the different cluster areas, based on random samples from each cluster;
    - Network connections and water supply per cluster.
- Reviewing the work undertaken by the local consultant for modeling the urban water system.
- Actively participating in the evaluation meeting of the study team (2 days, preliminary planned for September 2009).

The **local specialist from AWWCO** will be responsible for:
- Actively participating in the start meeting of the study team (2 days, 3rd and 4th of May 2009 in Alexandria);
- Reviewing the work done so far by the NTUA for developing a "baseline" representation of the urban water system of Alexandria, in collaboration with the local consultant and the specialists from AWCO;
- Providing data concerning wastewater production and stormwater discharge for the urban water system of Alexandria to the local consultant on:
    - Wastewater plants (locations, capacity, type of treatment and daily inflows);
    - Wastewater reuse (quantity and quality)
    - Industrial wastewater discharged to sewerage network per cluster area;
    - Wastewater and drainage network connections and production per cluster area;
- Reviewing the work undertaken by the local consultant for modeling the urban water system.
- Actively participating in the evaluation meeting of the study team (2 days, preliminary planned for September 2009).

The **local coordinator from CEDARE** will be responsible for:
- Ensuring data flow, maintaining interfaces and coordinating local meetings between local groups from different studies, to ensure that there are no discrepancies between data used in the different groups;
- Establishing an interface between the Aquacycle Study Group and the Urban Planning Department of Alexandria, in order to obtain additional information and data on: (a) the expansion plan (b) land use and cluster characteristics for the Alexandria Metropolitan Area.

The **International Coordinators from the NTUA** will be responsible for:
- Providing an overview of the work already undertaken by the NTUA for modeling the current urban water system of Alexandria;
- Chairing the start meeting of the study team in Alexandria;
- Prepare a ToR (for 2 months of work) for the local specialists;
- Providing support to the local specialists by email/telephone during the study;
- Reviewing and commenting on the draft report provided by the local consultant and experts;
- Chairing the evaluation meeting of the study team in Alexandria;
- Identifying conclusions and lessons learned and preparing an overall report of the study (on the basis of the final report by the expert local group).

Contents for the Draft Report "Modelling the urban system of Alexandria[7]"

Executive Summary

1 Introduction [1 page]

[Background, objectives]

2 Overview of the modelling approach for the Alexandria UWS [15 pages in total]

- Description of modelling requirements
- Description of the modelled system (include map with the boundaries, and basic information on the system, e.g. Total population, total water supply, total wastewater production, on the basis of data obtained by AWCO and WWDC)
- Methodology for cluster definition (description of the methodology and premises for defining clusters)
- Modelling of water use sectors (Residential, industrial, agricultural, commercial, tourist) – Description of main modelling assumptions.

3 Detailed presentation of the modelled UWS [30 pages in total]

- Description per cluster of unit block characteristics and cluster characteristics
- Interconnections between clusters (stormwater and wastewater)
- Other input data (profile for indoor water usage, meteorological data)
- Assumed values for calibration parameters
- Data used for model verification and calibration

4 Discussion - Model results and conclusions [4 pages in total]

- Presentation of main model results
- Discussion of discrepancies between model results and data on water supply/wastewater production in the modelled area
- Comment on potential future scenarios concerning expansion of the current system and how these could be modelled through Aquacycle

Annexes

- Data files for use with the Aquacycle software
- Presentation of data provided by AWCO:
  - Location, served areas, capacity and daily production from water treatment plants;

[7] Please also consult the document prepared by the NTUA ("Working document on modelling the urban system of Alexandria")

- Water used by different sectors (industrial, residential, tourism, other) in the different cluster areas;
- Water use profile for the different cluster areas, based on random samples from each cluster;
- Network connections and water supply per cluster.

- Presentation of data provided by WWDC
  - Wastewater plants (locations, capacity, type of treatment and daily inflows);
  - Wastewater reuse (quantity and quality)
  - Industrial wastewater discharged to sewerage network per cluster area;
  - Wastewater and drainage network connections and production per cluster area;
- Any other detail necessary

4) Groundwater Management Study:

The produced TOR was as follows:

- Investigate areas in Alexandria with groundwater potential based on earlier studies and reports.
- Compilation of all recorded groundwater wells (including industrial GW use).
- Survey of any additional groundwater wells (Well inventory within governorate boundaries).
- Plot of groundwater wells locations and existing pumping rates on a GIS map
- Plot potential groundwater-use green areas on GIS map
- Assess potential use of groundwater in irrigating green areas in Alexandria (e.g. public parks, landscapes, clubs of "Samooha", Sporting, Allajon, Acasia and Jardinia
- Assess Potential areas Artificial Recharge areas, amounts & costs
- Assess groundwater potential based on recharge and existing groundwater use in Alexandria
- Investigate methods of groundwater recharge enhancement such as pervious pavements and assess potential groundwater recharge increase and cost
- Provide indication of groundwater quality and suitability for different uses (e.g. irrigating green areas, drinking purposes)
- Assess possibility of salt water intrusion
- Assess safe pumping rates and depths
- Estimate the approximate costs associated with the potential groundwater use in Alexandria.
- Assess potential for GW Use in the industrial sector
- Assess cost of GW Use/pumping
- Provide digital input and output files for all processes including GIS analysis and/or archiving.

Team Members:

- International Coordinator: Dr. Khaled AbuZeid
- Local Specialist 1: Dr. Nahed El-Araby
- Local Specialist 2: Dr. Akram Fekry

- CEDARE staff: Eng. Mohamed Elrawady

Required maps:

- Geo-morphological Map
- Geological Map
- Well Location Map
- Piezometric Contour Map
- Groundwater Salinity Map
- Groundwater Potentiality Map
- Maps of Possible Agriculture Areas for GW-Use
- Areas of Potential Artificial Recharge

Table of Contents (Report):

A: Dr. Nahed ElAraby
B: Dr. Akram Fekry

- Executive Summary (3 pages) (B)
- Chapter 0 (Introduction) (1 page) (B)
- Chapter 1 Description and assessment of GW potential in Alexandria (24 pages) (A,B)
    - Detailed description of aquifer system (location, stratigraphy) (B)
    - Geographical assessment of groundwater potential and wells. (B)
    - Current recharge rates (A)
    - GW classification (renewable or nonrenewable) (A)
    - Abstraction records (B)
    - Current GW usage (sectors) and the possibility to include more sectors. (A)
    - Institutional authority over GW in Alexandria (A)
    - Possibility of salt water intrusion. (A).
- Chapter 2 (A vision for a Future GW System in Alexandria) (B)
    - A description of a sustainable GW system in Alexandria in 2037. Include the objectives that should be met in order to arrive at sustainability for renewable and non- renewable groundwater. Refer to the LAs vision for Alexandria's urban water system and the general SWITCH Vision and Strategy.

  N.B: References and documents will be either provided to consultants or published on CEDARE SWITCH website.

- Chapter 3 (Scenarios affecting GW System in Alexandria) as follows: (B)

GENERAL FUTURE SCENARIOS

Worst case scenario

In 2037, Alexandria is a city characterized by:

- continued explosive population growth (summer population 12 million)
- A weak and stagnant economy
- Low availability of Nile water which is 40% less than in 2007 (due to increased national water demand and/or climate change)
- increased risk of flooding (due to sea level rise)
- Poor availability of financial resources.

Best case scenario

In 2037, Alexandria is a city which:

- Has a population which has largely stabilised (at 8 million)
- Is benefiting from a dynamic and fast growing economy
- Has a guaranteed allocation of Nile water similar to that of 2007
- Has a positive scenario related to climate change (with sea level rise minimum and increased rainfall)
- Benefits from the new vitality of the Egyptian economy which means that financial resources are readily available.

Business as usual

In 2037, Alexandria continues to be a city dealing with considerable uncertainty:

- Population is 10 million, and continues to grow.
- National allocation of Nile water is 20% less than in 2007
- Economic growth has been steady but unspectacular
- Rising sea levels are starting to threaten some parts of the city.

- Chapter 4 (Potential Strategies to achieve a sustainable GW System) (25 pages) (A,B)
  - Strategy 1 (GW Use for Green Landscape in Alexandria) (A):
  - Strategy 2 (Artificial Recharge of Treated Wastewater and/or Stormwater) (B): includes investigating new methods for GW recharge enhancement such as pervious pavements.
  - Strategy 3 (GW Use for Parks and Sports Fields)(B)
  - Strategy 4 (GW Use for drinking purposes in selected areas)(A)
  - Strategy 5 (GW Desalination)(A)
  - Strategy 6 (GW Use for Agriculture to compensate for fresh water for drinking)(B)

All strategies should be evaluated:

Firstly, in a general sense:

- Potential to achieve the vision (in terms of meeting the objectives of the vision)
- Effect of scenarios on achieving the vision

Secondly, based on the following indicators:

- Public health effects (transfer of diseases due to contamination in residential areas, due to contamination of Lake Mariout, due to contamination of crops; distinguish microbiological and chemical pollution)
- Environmental pollution (discharge of pollutants into Lake Mariout/Mediterranean, impacts on fisheries, groundwater pollution, pollution of agricultural fields)
- Energy consumption (identify points of energy consumption, such as pumping stations or treatment plants)
- Compatibility with (current) legislation, policies, strategies, and plans
    - Law for industrial wastewater disposal into sewage networks, Egyptian Ministry of Housing
    - Law 48 for the protection of water bodies
    - Wastewater Reuse Code, Ministry of Housing
    - FAO guidelines
    - National Water Resources Plan 2017
    - National Sustainable Agriculture Development Strategy 2030
    - Alexandria Wastewater Master Plan for 2037
- Cost estimates (investment and operation & maintenance), potential for cost recovery and funding. Evaluate cost reduction through substitution of fresh water by effluents.
- Equity (assess whether there are groups in society that do not (fully) benefit from the proposed strategy)
- Potential annual abstraction from the resource and the corresponding estimated cost.
- Potential load on Nile Water and the corresponding estimated cost.

The description of the effect of the strategies on the indicators should be summarised in overview tables with estimated scores [range 1 to 5; with 5 being the best score], as follows:

Scenario x				
	Indicators			
Strategy	**1**	**2**	**3**	**Total score**
1				
2				
3				

The last table should be repeated for each scenario.

- Chapter 5 (GW & Integrated Urban Water Management) (A,B)
    - Describe how the various strategies would affect (or is affected by) the topics of the other studies (Water Demand Management, Groundwater management, Stormwater management, Modelling and Decision Support, Institutional mapping)
- Chapter 6 (Conclusions & Recommendations) (A,B)

Strategy Milestones:

- May 2009: Kick off Meeting
- 30 July 2009: Full Draft
- August 2009: Comments
- 19 September 2009: Draft Final
- 28 September 2009: Evaluation Workshop
- 9 October 2009: Revised Final Report

5) Strategic Planning Session:

- The meeting started with Dr/Khaled briefly indicating the role of the group and the meetings as well as the following hot issues:

  1- Additional areas that need to be served.

  2- Non-conventional water resources

- Prof/ Alaa emphasized on the importance of delivering accurate data to "Aqua Cycle" which was the primary suggestion of Eng.Nadia too.

- Dr/ Peter thinks that discussing the final product will pave the way and facilitate the steps and procedures for delivering such product.

- Eng/Nadia ensured that all data are available and should be used ,examples of these data are:

  1- Water produced quantity (daily-monthly-yearly).

  2- Produced water per Plant.

  3- Length of water pipes.

  4- Water Quality data from all canals and WTP.

- Dr/Beyalli suggested looking at the"Road Map" for Alex Governorate 2050 and consider it in future planning as it defines the future needs of Alexandria specially in the fields of urban expansion and planning for different sectors in Alex and also suggested setting "milestones" for the report to check on the progress

- It was suggested that the final IUWM plan should be divided into the following phases:

  - First Phase: up till 2017 (along with MWRI Plan)
  - Second phase up till 2037 (along with Master plans)
  - Third Phase up till 2050

- Dr/Hellali emphasized on the idea of dealing with ONE scenario based on the expected data from "National Plan of Water Resources"

- Prof/Alaa added that the scenarios are based on the water demand available as well as the effects of climate change and other effects, so we should also apply 3 different scenarios as it is easy to have different scenarios as long as we have the correct accurate data.

- Dr/Khaled stressed on the importance of differentiating between "strategy" and "Scenario", strategies are open for modification and adjustment.

- Dr/khaled specified the objectives of the meeting as follows

  1- Agree on terms of reference

  2- Agree on Schedule

  3- Specify deliverables and outcomes

- Dr/Mohamed saad added that we should also agree on the following:

  1- Alexandria water boundaries and administrative boundaries

  2- The 3 milestones

  3- Report content

- Eng/Nadia mentioned the following facts regarding the state of the administrative boundary of Alexandria :

  1- Minister of "local development" will finish the governorate boundaries in 3- months' and there is a suggested or expected extension for Alexandria governorate to reach "AL alamin" area at km100 on the north coast instead on "AL HAMAM" on km61 for now.

  2- If such area is dedicated to Alexandria governorate then she proposes to use the desalination process to produce sufficient water to the area.

  3- Dr/beyalli & Eng.Nadia & Prof..Alaa all agree to work on the current boundaries of Alexandria and use scenarios for future expansion in Alexandria.

- Dr/Khalid suggested taking the amount of water delivered to matrouh area as a constant input in Aqua cycle.

- Eng/Nadia suggested constructing a new WTP inside nubaria city at km80.

- Dr/beyalli suggested that we check Alexandria- matrouh- behera master plans to check for any double covered areas , he also mentioned that an Italian

consultant office is running an integrated master plan of all water and waste water companies in Egypt that could be useful.

- Dr/Khalid stressed on the need to measure the future outflow for behera and matrouh areas and also mentioned the fact that the master plans don't mention where the water comes from.

- Eng/Nadia replied that she knows where the future demand will come from and that she is sure that it would be available by means of co-operation with different sectors.

- Dr/Beyalli said that Egypt consumes 28,000,000 cubic meters per day and in 2020 it is expected to reach 33,000,000 cubic meters per day so we need an approximate increase of 300,000 cubic meters per year to overcome the shortages expected due to population growth.

- Dr/Khalid mentioned that we should also strongly consider usage of re used sewerage water for irrigation.

- Dr/Peter mentioned that we should also check the different scenarios specially in fields of "Energy costs and sustainable water balance"

- Prof/Alaa had a doubt towards the reuse of secondary treated water in harvests and preferred to use it only in wooden trees.

- Eng/Nadia emphasized on the focal point of decreasing the average usage of water per capita in Egypt as it is currently 350-400 lit/cap/day for the municipal sector and 500 lit/cap/day for the industrial sector.

Then DR/Khalid mentioned the Different TOR for each member of the team

Table of Contents (Report):

- Acknowledgements (1 page)
- Forward (2 pages)
- Acronyms (1 page)
- Executive Summary (3 pages)
- Chapter 1 (Introduction) 8 pages
    - Alexandria's main water-related challenges
        - General description of change pressure
        - Alexandria and the challenges
    - Strategic planning for urban water management in Alexandria
        - Role of SWITCH in helping Alexandria meet water-related challenges
        - Description of SWITCH in a text box
        - Process being followed to develop an IUWM strategic plan
- Chapter 2 (A Changing World: A Changing City) 15 pages

- Physical Settings, Institutional, Water Resources, Water Services, Current WSS services, Projected WSS services, Scenarios

Basic facts about Alexandria:

- Physical features of the geographic area and demography
- Climatic conditions
- Socio-economic conditions/ Social Inclusion in Alexandria (taken from Situation Analysis report)
- General implementation approach (policy recommendations)
- Alexandria's Institutional Components
  - Institutional and policy context
  - If available, draw on the outputs from institutional mapping (work-package 6.1)
  - Decision-making processes
  - Alexandria Advisory Committee

- Chapter 3 (Options, Opportunities, and Strategies for IUWM)
  - WDM, Treated Wastewater, Groundwater, Storm Water, Desalination
  - Water Demand Management (WDM) Measures (7 pages): Options and alternatives to reduce water demand and leakages.
  - Desalination (7 pages)
  - Treated wastewater reuse (7 pages)
  - Groundwater development (7 pages)
  - Storm-water reuse & rainfall harvesting (7 pages)

- Chapter 4 (Thinking holistically – IUWM)
  - Meeting multiple objectives (How the Alex LA will use City-Water, DM tool, LCA and decision making framework etc)
  - Combination of options (3 pages)
  - Options and opportunities translated into Strategic directions (5 pages)

- Chapter 5 (A Strategic Direction: Starting the Journey) 3 pages
  - Roles and Responsibilities
  - Advisory Committee
  - Risks and Challenges Implementing the IUWM Strategy

- Chapter 6 (Monitoring and Evaluation) 3 pages
  - Indicators, Targets

SMART indicators of success

- Sustainable water supplies + indicators
- Sanitation for all + indicators
- Clean Water environment + indicators
- Good governance + indicators

TORs:

A) Water Company Chair:

- Participate in Strategic Planning Meetings
- Participate in the evaluation of Core Study results, reports, and workshops

- Provide information and data on existing services and projected future demand, plans and services
- Provide input on M&E indicators and targets
- Provide the 2037 Water Master Plan
- Continue to provide office Space
- To advocate and promote the awareness on the IUWM Plan and Implementation of the IUWM plan in the future
- Contribute to IUWM Plan write up

B) Wastewater Company Representative

- Participate in Strategic Planning Meetings
- Participate in the evaluation of Core Study results, reports, and workshops
- Provide information and data on existing services and projected future demand, plans and services
- Provide input on M&E indicators and targets
- Provide the 2037 Wastewater Master Plan
- To advocate and promote the awareness on the IUWM Plan and Implementation of the IUWM plan in the future
- Contribute to IUWM Plan write up

C) MWRI NWRP Representative:

- Participate in Strategic Planning Meetings
- Participate in the evaluation of Core Study results, reports, and workshops
- Provide information and data on the Water Resources (conventional & non-conventional) allocation and future potential for Alexandria
- Provide input on M&E indicators and targets
- Provide information on the update of the 2017 National Water Resources Plan
- To advocate and promote the awareness on the Alexandria IUWM Plan and Implementation of the IUWM plan in the future, and integrate in the updated NWRP
- To provide measures for water conservation based on the NWRP

D) Holding Company Representative:

- Participate in Strategic Planning Meetings
- Participate in the evaluation of Core Study results, reports, and workshops
- Provide information and data on existing services and projected future demand, plans and services
- Provide input on M&E indicators and targets
- Provide the 2037 Water & Wastewater Master Plans
- To advocate and promote the awareness on the IUWM Plan and Implementation of the IUWM plan in the future
- Provide information on the National Wastewater Reuse Strategy
- Provide the Wastewater Reuse Code

E) Senior Water Specialist

- Prepare the IUWM Plan document according to the identified table of contents
- Collect and integrate information from different groups
- Review and comment on the studies prepared by the study teams
- Prepare schedule for meetings of the strategic planning team and the different deliverables
- Determine the activities required towards the preparation of the IUWM plan
- Prepare Progress reports on constraints or problems facing the work progress
- Prepare a framework on M & E indicators and targets for the IUWM Strategic Plan
- Study alternate water sources for different uses
- Get Alexandria Urban, Industrial and other Development plans including Future Land Use Planning Maps

F) International Expert

- Support in promoting and monitoring the program
- Help develop a complete Workplan for the strategic planning team
- Liason with SWITCH management team through Peter
- Support on training needs
- Provide information on best practices from the international community
- Participate in the strategic planning and some LA meetings
- Support communication with International coordinators
- Assist in editing the IUWM Plan and/or core studies

G) Post Graduate Terms of Reference

- Collect data from Water Company, Wastewater Company, MWRI, MoA
- Study and Apply Aquacycle / City Water
- Assist in preparation or application on Alexandria on Aquacycle/City Water considering different scenarios and strategies
- Assist in drafting IUWM plan
- Assist in follow up on Strategic Studies
- Review SWITCH project output in Alexandria and other cities
- Assist in preparation of Strategic meeting, workshops, and LA meeting
- Prepare Primavera Schedule

H) Strategic Team Leader:

- Coordinate between Core Study Teams and Strategic planning team
- Assist in preparation of the IUWM Plan
- Prepare for the conduction of strategic planning and LA meetings
- Review and comment on the Core Studies
- Review and comment on the contributions of the Senior Water Specialist , strategic planning team members, and others to the IUWM plan
- Evaluate the Strategy selection methodology
- Contribute to the selection of indicators and targets

Maps&Charts Needed:

- Alexandria Water Balance (2008-2037)
- GW Use (Pumping/Recharge) Map (2008-2037)
- Wastewater Treatment/Pumping Plants (2008-2037)
- Drinking Water Treatment/Pumping Plants (2008-2037)
- Main Wastewater Conveyance Channels (2008-2037)
- Main Water Pipelines (2008-2037)
- Desalination Plants (2008-2037)

Milestones:

- May 2009: SP team start and preliminary evaluation meeting
- September 2009: Strategy workshop Output , basic strategy descriptions
- January 2010: Workshop meeting for multi Objectives
- June 2010: Workshop Implementation

Annex:

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