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Environmental and Social Impact Assesment for Rural Clusters Under Phase 2 of ISSIP II-

Executive Summary

Sohag Governorate

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EXECUTIVE SUMMARY

1. INTRODUCTION

While fresh drinking water is now regularly supplied to rural regions across Egypt, appropriate sanitation services do not have the same coverage. Wastewater services systems have been implemented in most cities and towns, however, small rural villages have been largely overlooked. This is because their remote locations and small populations make sanitation infrastructure especially costly for the government.

Households in rural villages collect their sewage in cesspits and then evacuate the collected sewage into waterways or empty lands. The lack of sanitation in rural households is causing severe health, hygiene and environmental concerns. Sewage cesspits often leak into the surrounding environment and groundwater creating a significant health hazard, especially in areas where people rely on groundwater for drinking. In addition, the sewage discharged into watercourses has contributed to a noticeable degradation of freshwater resources, especially in Lower Egypt and the Nile Delta region. The increased in organic and pathogenic contamination poses a risk to soil and crops.

In response to this situation the Government of Egypt (GoE) has initiated an ambitious plan for providing sanitation services to rural areas in the country. According to the National Rural Sanitation Strategy issued in 2008, the government aims to expand coverage of sanitation services to all villages in Egypt by the year 2022.

In January 2009, the HCWW, with support from the World Bank (WB), launched the Integrated Sanitation and Sewerage Infrastructure Project (ISSIP). The purpose of the project is to extend basic sanitation services to rural areas and reduce pollution in irrigation and drainage canals to improve surface water quality and combat related health hazards. Based on the size of the population being served – two main types of sanitation systems can be provided:

- For settlements with more than 5000 inhabitants, a centralized system will be installed whereby sewage collection networks will be connected to a nearby Waste Water Treatment Plant (WWTP)
- For settlements with less than 5000 inhabitants and do not have a nearby WWTP, a decentralized system that discharges into a simple treatment facility will be installed.

The first phase of ISSIP targeted unserved villages in the governorates of Gharbeya, Beheira and Kafr EI Sheikh. Centralized sanitation systems were implemented in about 222 villages and decentralized systems in about 120 villages. In order to widen the coverage areas of the ISSIP and to increase number of beneficiaries, the HCWW created a second phase known as ISSIP II in which the geographic coverage of the project was extended to Menoufeya and Sharkeya Governorates in Lower Egypt and Assuit and Sohag Governorates in Upper Egypt.

ISSIP II has been further divided into two phases so far. Under the first phase of ISSIP II the project area encompassed

- the villages of Al Nawawra, Al Etmania and Wadi Al Sheih in the Badari District of Assuit
- the villages of Beit Dawood, Al Kuraan, Nagaa Kweez, and Nagaa Maklad in the Gerga District of Sohag

In the second (and current) phase of ISSIP II the project area encompasses:

<u>Markaz</u>	<u>Village</u>
<u>Sohag Governorate</u>	
<u>Sohag</u>	<u>Al Muhamda Al Bahriya</u>
	<u>Dmno</u>
	<u>Al Mazalu</u>
<u>Balyana</u>	<u>Nag' Ragh</u>
	<u>Al Ghounamiya</u>
	<u>Al Samta</u>
	<u>Al Halafy</u>
<u>Tema</u>	<u>Um Duma</u>
	<u>Al Halaky</u>
<u>Assuit Governorate</u>	
<u>Assuit</u>	<u>Refa</u>
	<u>Deir Refa</u>
	<u>Al Zawya</u>
	<u>Shutb</u>
	<u>Musha</u>
<u>Bedary</u>	<u>Al Nawamis</u>

Table 1 Scope of ISSIP II phase 2 in Sohag and Assuit Governorates

EcoConServ has been commissioned by the HCWW to complete the required ESIA for the activities included in the second phase of ISSIP II. This report presents the executive summary of the ESIA for Sohag governorate.

2. ESIA OBJECTIVES AND PURPOSE OF THE REPORT

Assessment of the environmental and social impacts is a prerequisite for implementing developmental projects both by the Egyptian Environmental Affairs Agency (EEAA) and the WB. Accordingly this study has been prepared for performing an Environmental and Social Impact Assessment (ESIA), following Terms of Reference (ToRs) prepared by HCWW, aiming at providing a detailed analysis of the anticipated environmental and social safeguard issues associated with the second phase of ISSIP II; and to develop an environmental management and monitoring plan to be implemented during the construction and operation of the project.

According to the EIA guidelines and procedures manual published by the Ministry of Environment – EEAA January 2009 (amended in October 2010). The ISSIP II project falls under category B projects.

This ESIA report has been compiled as part of the EIA process in accordance with Egyptian environmental Law number 4 for the year 1994 amended by law number 9 for the year 2009 and Law 105 for the year 2015. It has taken into account the environmental regulations and requirements of funding institutions including the WB safeguard policies. The ESIA report will be submitted to the Egyptian Environmental Affairs Agency (EEAA) after reviewing and acceptance from HCWW and the funding institutions in order to seek environmental approval for the proposed project. The report includes the identification and evaluation of the potential environmental impacts due to the construction and operation of different components of the project. It also includes proposed mitigation and monitoring measures to control/minimize the effects of the identified negative impacts.

The detailed findings included in this ESIA study will provide decision makers with the needed information in order to minimize the unfavorable impacts and develop the best compensation strategy, if needed.

3. APPROACH AND METHODOLOGY

The ESIA is a systematic process where the potential negative and positive impacts of the project on the bio-physical and socio-economic environment are identified, assessed and – if avoidance is not feasible - mitigated. The following sections include the methodologies that were adopted by the Consultant during the different stages of the ESIA process.

Environmental Impact Assessment phase

General Methodology

The methodology that the Consultant used for the impact assessment was a semi-quantitative process, based on scores. The overall score for the significance of the impacts was evaluated taking into accounts the following four factors:

- A. Probability of occurrence
- B. Spatial scale
- C. Temporal scale
- D. Intensity of the impact (which also considers the sensitivity of the receptors)

Impact Parameters				Overall Score		
Spatial Scale	Temporal Scale	Impact intensity	Probability of occurrence		Score range	Impact Significance
Site [1]	Short-term [1]	Negligible [1]	1	1	1-8	Minor
Limited [2]	medium-term [2]	Low [2]	1	8		
Area [3]	Long-term [3]	Medium [3]	1	27	9-27	Moderate
Regional [4]	permanent [4]	High [4]	1	64	28-64	Major

Table 2 Impact intensity criterion adopted for the impact assessment

Social Impact Assessment

EcoConServ has adopted a multistage analysis strategy, several data collection methods and tools were applied using the Participatory Rapid Appraisal approach. This approach ensures that local community groups participated to the study. Data was collected in coordination with relevant stakeholders including local administration units (district and village levels) and the local NGO's.

A number of quantitative and qualitative data collection tools were applied to ensure different community groups participated to the study. The consultant has also reviewed relevant secondary data sources such as: studies, reports and previous literature. The research team has conducted several field visits to assess the baseline conditions. The applied methodology in the social impact assessment can be summarized as follows:

A. Secondary data:

The consultant has reviewed previous studies, reports, data sources and information available on the internet, in addition to data provided by HCWW, such as the ESIAF for ISSIP project as well as the ESIA's for the first phase of ISSIP II. The consultant has also reviewed several data sources such as: the Human Development Report 2010, the Annual Statistical Yearbook, the 2006 National Census data, and the Description of Egypt by information in addition to statistical data available at the district and village information centers.

B. Primary data:

Primary data was collected using different methods such as in depth interviews and focus group discussions (FGDs). Primary data sources are an important source for information that the consultant has used to provide deep understanding of the surrounding community as well as identify potential impacts related to the project.

C. Field Observation

The consultant has also applied the field observation data collection tool to support the findings at the current stage. Transect walks around the proposed construction sites were organized in coordination with the local community leaders and informants. An observation sheet was designed and completed by the survey team in addition to a group of photos to document the current situation.

D. Stakeholder's Analysis:

Stakeholder's analysis is one of the tools that helped the consultant identify relevant groups of stakeholders and their interest in the project as which may facilitate different project activities. Stakeholder's analysis is an important tool at the initial stages of the project which might contribute to define and mitigate several negative impacts at an early stage. Stakeholder's can help enhance the social benefits related to the project at the local community level.

Analysis of collected data

Data from the interviews and data sheets was carefully recorded. The consultant has reviewed the raw data for concluding experiences / sentences / lessons learnt to be added to the qualitative analysis of the data.

4. SUMMARY OF THE NATIONAL LEGISLATION PERTINENT TO THE PROJECT

The legislations listed below represent the national legislation pertinent to the project:

Egyptian legislation related to environmental aspects

- Law 4 for Year 1994 for the environmental protection , amended by Law 9/2009 and Law 105/2015
- Executive Regulation(ER) No 338 for Year 1995 and the amended regulation No 1741 for Year 2005, amended with ministerial decree No 1095/2011, ministerial decree No 710/2012, and ministerial decree No 964/2015
- Law No 93 for Year 1962 for discharge on the public sewer network and protection and treatment of wastewater wastes and safe discard methods of the treatment by products, amended with Decree No 44 for Year 2000.
- Law No 48 for Year 1982 for the protection of the Nile river , agricultural drains, ponds and aquifer from pollution , and the ER amended with Decree No 92 for Year 2013.
- Law No 12 for Year 2003 for the protection , occupational health and safety for the workers, which is amending Law 137 for Year 1981 and its executive decrees.
- Law No 102 for Year 1983 for natural habitats.
- Law No 38 for Year 1968 for the public cleanliness , which is amended by Law No 31 for Year 1976.
- Guidelines of Principles and Procedures for “*Environmental Impact Assessment*” 2nd Edition EEAA, January 2009 and its amended Lists in October 2010.

Egyptian legislation related to social aspects

- EEAA guidelines related to the Public Consultation; Guidelines of Principles and Procedures for “*Environmental Impact Assessment*” 2nd Edition January 2009
 - Paragraph 6.4.3 Requirements for Public Consultation
 - Paragraph 6.4.3.1 Scope of Public Consultation
 - Paragraph 6.4.3.2 Methodology of Public Consultation
 - Paragraph 6.4.3.3 Documentation of the Consultation Results
 - Paragraph 7 Requirement and Scope of the Public Disclosure
- Land acquisition and involuntary resettlement (The project will not result in resettlement activities.)
 - Law 94/2003 on the National Council for Human Rights (NCHR)
 - The Constitution (1971, amended in year 1980)
 - Constitutional Declaration 30th of March 2011
 - Law 10/1990 on property expropriation for public benefit
 - Other laws governing expropriation
- Protection of human rights
- Law no. 94/2003 on establishing the National Council for Human Rights
- Unified structure Law No 119 of year 2008
- Presidential Decree No. 135 of year 2004 related to the establishment of WWHC

International requirements

The WB has identified ten environmental and social safeguard policies that should be considered in its financed projects. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. WB Safeguards policy and their applicability to the ISSIP II project were investigated in the ESIA report. The key investigated safeguards policies and procedures during the preparation of Sohag ESIA are:

- Environmental Assessment (OP/BP 4.01)
- Involuntary Resettlement (OP/BP 4.12)
- BP 17.50 Bank Disclosure Policy

5. PROJECT DESCRIPTION

The project area in Sohag governorate includes three distinct village clusters within the districts or *Marakez* of Sohag, Balyana and Tahta. See the table below.

Markaz	Village	Number of Pump Stations	Wastewater Treatment Plant WWTP
Sohag Governorate			
Sohag	Al Muhamda Al Bahriya	1	Existing Sohag West WWTP
	Dmno	1	
	Al Mazalu	1	
Balyana	Nag' Ragh	1	Existing Balyana WWTP
	Al Ghounamiya		
	Al Samta	1	
	Al Halafy	1	
Tema	Um Duma	1	Existing Tema WWTP
	Al Halaky	1	

Table 3 project components and their locations in Sohag governorate

The Second phase of the ISSIP II Project in Sohag governorate will involve providing sewerage collection and treatment services for the three clusters as demonstrated in the above table.

Sewage will be collected in each village through a network of gravity sewers which ends at the main pump station (PS). A new PS will be established in each village to pump the collected sewage to WWTPs. The collected sewage will then be pumped through the force-mains (FMs) pressurized pipeline - directly to the existing WWTPs in each Markaz which are located in desert areas.

Markaz Tema:

Two new PS will be established in Um Duma and Al Halaky villages to pump the collected sewage to Tema WWTPs as demonstrated in the following Figure.

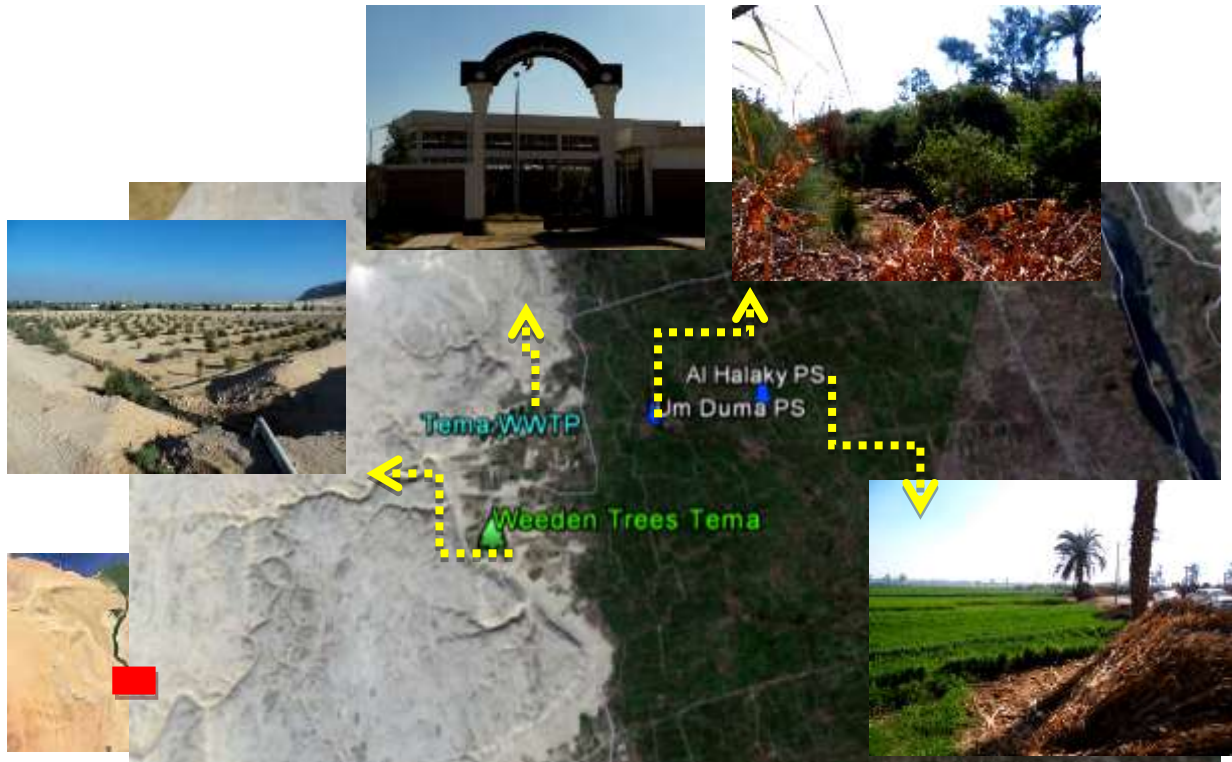


Figure1 Locations of PSs in Tema Cluster, Tema WWTP and Wooden trees

Markaz Sohag:

1. Al Muhamda Al Bahriya

The PS will be constructed at Al Muhamda Al Bahriya village at a site that is a public owned land. The land has already been allocated by decree number 1429/2014 for the benefit of Sohag Water Company to establish the PS.



Figure2 PS location in Al Muhamda Al Bahriya Village

2. Dmno village

The PS will be constructed at a cultivated area, currently the location is surrounded by agricultural land. The following figure shows the location of the PS:



Figure 3 PS location in Dmno Village

3. Al Mazalu village

The PS location is surrounded by cultivated plots near a residential area. The following figure shows the location of the PS:

Discharged water from the three villages will be pumped to the existing West Sohag Treatment Plant. The sewage water will be treated using oxidization ponds. The treated water will be discharged to the wooden trees at the treatment plant.



Figure 4 PS location in Al Mazalu Village

Markaz Balyana:

Three new PSs will be established in Al Ghounamiya, Al Samta, and Al Halafy villages to pump the collected sewage to Tema WWTPs as demonstrated in the following Figure.

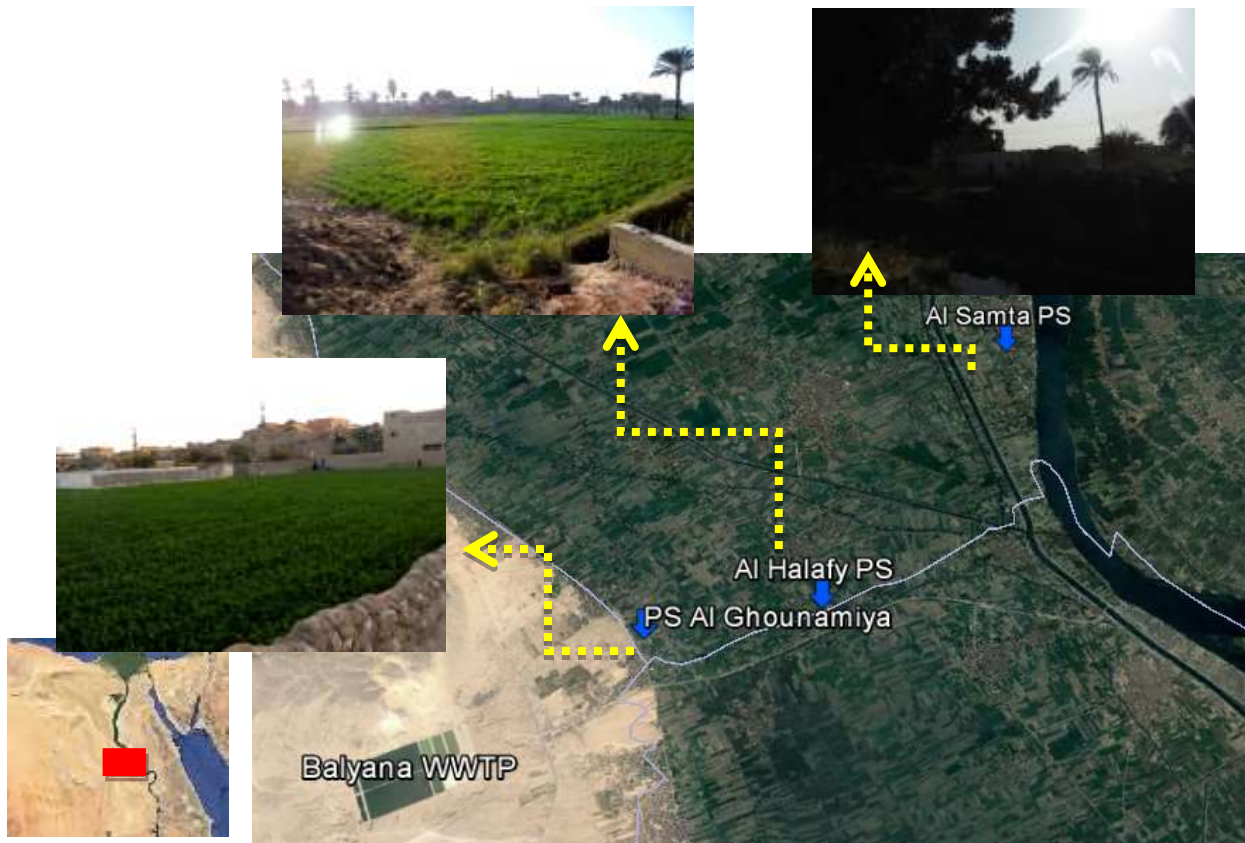


Figure5 Locations of PSs in Balyana Cluster and Tema WWTP

6. BASELINE CONDITIONS

Environmental and Social Baseline conditions were studied in the project different areas. The following sections provide the main characteristics of the environmental and social conditions.

Water resources

Sohag receives water supply from the River Nile, through the main irrigation canals, which are Nagaa Hamadi el Gharbeya and Nagaa Hamadi el Sharkeya. These two canals extend with a

length of 130 to 150 km respectively; they are fed directly from the Nile at Nagaa Hamadi barrages.

There are several other irrigation channels west of the Nile, which are fed from Nagaa Hamadi el Gharbeya canal. These canals are El Balina, El Kasra, El Gergawya and El Tahtaweya, with lengths as follows: 60, 50, 45, and 60 km respectively. In addition to these, there are a number of small irrigation channels, canals and drains distributed along the cultivated areas. Irrigation canals and drains at Sohag cover an area of about 85 km² (223 feddans). The amount of surface water that runs through the main irrigation canals at Sohag is 1950000 m³/month. This amount varies across months, the highest flow is between June and August, where the amount of water reaches up to 250000 m³/month.

Sohag can be divided into four areas based on the availability of ground water, its amounts and quality as shown in the table below.

The area	The distance to the river	The depth to ground water surface	TDS
First area	Close to the river	3:8 m	<500 m
The second area	<500 m	8:20 m	500:1000ppm
The third area	<1000 m	20:40 m	>1500 ppm
The fourth area	>1000 m	No ground water	-

Table 4 shows the depth of groundwater and concentrations of soluble elements

Usually groundwater quality at the Nile valley is suitable for irrigation and domestic purposes. The percentage of Total dissolved solids (TDS) ranges between 260 to 1280 ppm. Water salinity increases at the open parts of the groundwater aquifer. This happens as a result of the filtration during the water flow from the semi closed aquifer to the open aquifer.

Climate

The year is divided into two seasons in terms of climate conditions: winter - cold starting from November till April, and summer - hot starting from May till October. There is a large difference of temperature between the area and the Upper parts of Egypt, a result of the strong variation in the ground surface levels. The temperature can increase in summer during day time to 60 °C, sometimes temperature decreases during winter to reach below zero. The lowest recorded temperature is 2 °C in February, while the highest recorded degree is 45 during the month of June, the hottest month of the year. The weather at Upper Egypt is characterized by Desert weather.

The annual amount of rainfall is one mm equivalent to 0.4 inch, but varies. Sometimes reaching 2 mms are recorded and sometimes reaching 6 mm of rain in some years, during short periods of strong rainfall during winter. Some other years are dry with no rainfall.

Average humidity percentage is about 60%, and decreases during winter to less than 30%. Climate has an impact on the potential for development, sometimes there is a need for cooling or heating systems during different times of the year. It also has an impact on health as it also determines the levels of some health infections.

Air quality

Sohag is characterized by rural climate devoid from pollutants, the area is mainly an agriculture area with scarce industrialization activities. The field team has conducted a survey for the different areas to measure air quality. Some areas were carefully selected to represent all locations, based on the analysis of the available data and information before conducting the field work and the data collected from the field work. Among the most important negative observation was the

foul odours at some streets, as a result of the septic tanks especially during evacuation, in addition to some emissions from burning waste at open areas.

Air Quality monitoring conducted by the research team:

The areas where the project will be established are rural areas free from sources of air pollution. This was noted from the air quality of the collected sample by the field team. The measured elements include: SO₂, NO_x, NH₃, TSP, PM₁, PM₇, PM_{2.5} and PM₁₀. The results show that the air is free from the gaseous pollutants but the dust level is increase the ambient air quality standard limits in some areas.

Noise

The area where the project will be constructed is characterized as a residential area surrounded by agriculture land. During the monitoring and evaluation of the site where the pump station and the sewage network will be constructed, it was noted that the main sources for noise are the movement of cars and operation of water pumps. Noise measurements were conducted at each PS location in all villages by a certified laboratory.

Flora

The plants in agriculture lands, Bank of the roads, bank of the canals and bank of drains are habite a wide range of habitats.

In Sohage governorate area includes a clay agriculture land with cultivated crops of the typical cash crops grown in the Egyptian agricultural areas. Corn, Cotton, maize, wheat, clover and beans are the common crops grown at different seasons in the agricultural land. The land in Sohage is fertile characterized by high yields. The bio-diversity of the plants stems from the different crops grown during the different agricultural cycles.

Three main groups of flora are found in Sohage according to their life span are perennials, biennials and annuals.

Seismic hazards

Egypt is located at the low risk areas (which represents a good opportunity for development. Yet it must be taken into consideration that the construction of the stations and the pipeline network must be conducted in compliance with the civil engineering codes. The codes take into consideration calculating the impacts related to seismic hazards on the station and network, in order to avoid any impacts caused by strong earth movements leading to leakage of sewage water and pollution to the groundwater aquifer.

Soil Quality

It is planned to construct the pipeline network and the pump stations at the villages of the three clusters which are all considered rural areas with limited soil pollution. No industrial activities exist in the area and no new treatment plant will be established. Only existing treatment plants will be used, treated water from the plant is used for irrigation of forest trees

Socio-economic profile

1. Sohag Governorate

Sohag is one of the governorates of Upper Egypt Region. The total area of Sohag is 11022 km². Sohag is divided into 11 Markaz, 11 cities and 3 districts, which includes 51 affiliated Local Government Units. The district has a total of 270 villages and 1788 Kafr and Ezbas. The total population of Sohag governorate is about 4 million inhabitants (Egypt Description by Information, 2010). The percentage of urban population at the governorate is 21.4% while the natural population increase is about 19.8 per thousand inhabitants.

Sohag is among the governorates that falls in the percentage of sewage service coverage. Most of the population depends on cesspits and evacuation services, in addition to a percentage of population that are not connected to any type of sewage service who depend on evacuating directly to the water surfaces or the groundwater aquifer. According to the latest data from Sohag Water Company in 2014, 21% of the total population in Sohag is connected to the sewage network. The total capacity of the sewage network in Sohag governorate is illustrated in the following table:

Sewage service total daily capacity at Sohag governorate (thousand m ³ /day)	Urban areas	3612.501
	Rural areas	972.05
	Total	4584.551

2. Target Districts (Tema – Sohag - Balyana)

The following section describes the main socio-economic characteristics of the target villages:

A. Markaz Sohag

The three target villages (Al Muhamda Al Bahriya – Dmno - Al Mazalu) are affiliated to Awlad Azaz Local Government Unit. Awlad Azaz is located about 7 kms west Sohag. It is surrounded by mountains at the west, Edfa village from the north, Nag Hamadi drain from the south and Nag Hamadi canal from the East. The Human Development indexes for the target villages can be summarized as follows:



Village	Area km ²	population	Number of enrolled students (Primary – preparatory - Azhar)	Number of enrolled students (illiteracy classes)	Poverty rate
Al Muhamda Al Bahriya	1.89	8788	1619	153	39.15
Dmno	1.86	7083	811	-	46.15
Al Mazalu	2.40	7364	1327	8	43.08

Historic sites: Awlad Azaz village: Anba Shnouda Monastery (White Monastery)

B. Markaz Tema

Village	Area km ²	population	Number of enrolled students (Primary – preparatory - Azhar)	Number of enrolled students (illiteracy classes)	Poverty rate
Um Duma	8.93	15503	2949	78	58.16
Al Halaky	2.13	6012	752	-	61.07

C. Markaz Balyana

The three target villages are affiliated to Beni Hemil Local Government Unit. Beni Hemil is located at the South of Balyana district and is surrounded by Awlad Elio, Orabet Abidos villages and Balyana city from the north, the desert areas from the west, River Nile from the east and Qena governorate from the south. The Human Development indexes for the target villages can be summarized as follows:

Village	Area km ²	population	Number of enrolled students (Primary – preparatory - Azhar)	Number of enrolled students (illiteracy classes)	Poverty rate
Al Ghounamiya (Nag' Ragh)	3	8224	1514	29	39.56
Al Samta	4.2	25251	4124	30	49.84
Al Halafy	4.3	13079	1514	43	45.97

Description of Sewage service at target villages

Results from the FGDs show that most of the population depend on traditional sewage methods such as cesspits and septic tanks as well as evacuation services. Population suffers from several adverse impacts as a result of the evacuation services, such as:

- Increased financial burden especially for poorer groups and female headed families.
- Spread of diseases especially among children such as gastrointestinal problems and kidney failures
- Increase of the groundwater level which has an impact on the foundations of the houses
- Spread of insects and stray animals
- Environmental risks related to discharge of sewage water in surface waterways and cultivated areas.
- Impacts on the pedestrians as a result the spread of groundwater (especially among women and special need groups)

7. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

The Consultant has assessed the environmental impacts of the different components of the ISSIP II project in Sohag governorate during both the construction and operation phases.

The project's components covered in the ESIA assessment include:

1. House connections and gravity sewers;
2. PSs including all sub-components;
3. FMs
4. Existing WWTPs

The construction and operation of some/all of the components of the project listed above will also create additional activities/processes such as:

1. Solid hazardous and non-hazardous waste generation during both construction and operation phases.
2. Liquid waste generation during construction and treated effluent discharge during operation.
3. Development of on-site workers/staff workshops, offices and housing units during construction.

The consultant has assessed the impacts due to the construction and operation of the main four components listed above, in addition to those resulting from the aforementioned additional three activities/processes. The key receptors which the Consultant has considered include 1) air (air quality and ambient noise); 2) Soil (soil quality, erosion, landscape); 3) water (water quality and resource consumption); 4) Biological environment (Flora and Fauna); 5) Human environment (Occupational health & safety, Community safety, Visual impacts, Cultural heritage and Archaeology impacts, traffic impacts and the Socio-economic and Health impacts).

Environmental and Social impact during Construction phase:

Positive Impacts

Direct Impacts:

- Creating job opportunities for skilled and unskilled during construction of the project different components.
- Creating opportunities for companies working in contracting and construction of sewage networks.
- Reviving economic activities for shops supplying construction materials in the area, due to selling necessary construction material.
- Reviving some restaurants and small shops which sell meals for workers, especially where workers will be living in the villages.

Indirect impacts:

1. Benefiting from developing uninhabited land plots that are causing spread of rodents and insects.

Negative impacts:

- The need for some land plots to establish the PSs. These plots are currently used in agriculture or waste collection which may adversely affect the community. However, that required areas are limited and then this effect is limited.

- Noise generated during construction may have an inconvenient impact on the surrounding populations, especially that some plots are located near some sensitive receptors such as primary schools, youth centers and mosques (Muhamda El Bahrya) as well as other residential areas.
- Dust generated during excavation may have some health impacts especially on individuals who suffer from allergy
- Storing of construction materials and excavation waste on the streets may affect the traffic, especially that some streets may be less than 6 meters wide.
- Risks that accidents may occur as a result of failure to adhere to the safety and occupational health requirements among workers
- Accidents may occur at the excavation sites especially among children in case there is failure to implement safety measures

Environmental and Social impact during Operation phase:

Positive impacts

- Creating job opportunities for some engineers, labours and skilled workers at the PS
- Provision of sewage service to a wide sector of the population according to the national plans to increase access to sanitation services
- Diminishing the current problems related to sewage especially health problems
- Increasing the market value of houses that will be connected to the sewage service
- Other infrastructure services may be provided later to the community such as natural gas
- Improving health conditions among the local population, especially school children who suffer as a result of the current sanitation conditions
- Improving the quality of crops, as a result of increasing the quality of surface water which improves the health conditions among the local population
- Upgrading the socio-economic conditions among the population as a result of relieving the burden of excavation cost
- Improving the quality of surface water
- Improving groundwater quality in most of the project areas through the prevention of sewage leaking into groundwater.
- Although there may be limited impacts related to odours as a result of the PS or the WWTP, it is expected that positive impacts will lead to decreasing the odours and spread of insects significantly.
- Improving the living conditions at target areas as a result of upgrading the health conditions, reducing water – borne diseases, relieving psychological pressures related to spread of foul odores, stagnant waters and insects.

Negative impacts:

- Spread of some foul odors to the surrounding residential areas
- Noise related to the operation of the PS

Sewage networks

- Lack of regular maintenance may lead to technical problems that has an impact on the surrounding areas, such as sewage overflow
- If the households are not connected properly, adverse impacts may occur on the network.

Positive impacts on women and marginalized groups

- The project has several positive impacts on women and marginalized groups, the sanitation system will spare women the effort of carrying water and getting rid of it in the septic tanks or on the streets. The improved health conditions especially among children will relief social burdens imposed upon women in this sense as they take care of sick children and elderly groups.
- Provision of sewage services will benefit the mostly the poorest groups who suffer from financial burdens related to excavation. Poorest groups will also feel that the government is keen to improve their access to services.
- Students will benefit from the project especially that the Water Company will hold awareness raising events at schools.

8. ANALYSIS OF ALTERNATIVES

The objective of analyzing different project alternatives is to evaluate the project options, which have been considered during the ISSIP II design phase, from the environmental perspective. This analysis of alternatives shall help in reaching/confirming optimum options for the project design from both the economical, social and environmental points of view.

No Project Alternative

The ISSIP II is expected to result in significant environmental improvement in the project areas. The existing situation, in which target areas are deprived from sanitation services, leads to major environmental and health problems to inhabitants. Even though there are some impacts associated with ISSIP II construction and operation as previously indicated, the overall environmental impacts are expected to be positive.

The ISSIP II institutional structure will have a Monitoring and Evaluation unit (M&E) to verify the expected improvements of ISSIP II to surface water quality. Operation of the ISSIP II will be designed to achieve maximum possible improvement, which will be continuously monitored by the M&E Unit.

Alternatives of house connections

Several alternatives exist for house connections, as follows:

- Using existing septic tanks as barriers to allowing objectionable materials to enter the networks.
- Using standard inspection chambers
- Using individual interceptors for each household to enable preliminary settlement and to discharge wastewater to the network through overflow.

The first alternative will reduce construction costs but is associated with risks of sewage infiltration to the groundwater. There are two reasons for this; the first is that these tanks are, in most cases, designed with an open bed to allow infiltration. The second is that some of these tanks may be leaking due to improper design or insufficient maintenance. Therefore, using existing cesspits and septic tanks should only be practiced after inspecting their quality and after ensuring there are no leakages or means of infiltration to the environment.

The third alternative achieves reduction of solids loads entering the sewerage system, leading to better treatment results and a better quality of final effluent. The interceptors should be frequently cleared from sludge to maintain their settling efficiency. However, the application of

interceptors has two disadvantages: the first is their extra cost, and the second is the risk associated with sludge disposal. Using the standard inspection chambers, is a conventional system with no foreseen environmental impacts. As compared with the interceptors solution, it will produce an effluent with a relatively lower quality. However, the PSs and WWTP are equipped with inlet screening chambers designed to handle an effluent of such typical quality.

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) presented in this section reflects the implementation procedures and mechanisms as well as the roles and responsibilities for the implementation of the mitigation measures and monitoring activities for the expected impacts.

The effectiveness of the proposed mitigation measures and environmental management plan will be monitored throughout the construction and operation phases of the project. Monitoring will be performed using calibrated equipment (where relevant) and standard techniques in order to ensure accuracy of the results. These results will be stored in an easy to access database and will be analyzed and corrective/additional actions shall be undertaken as necessary.

The following tables provide summary of the potential impact during construction and operation phases respectively.

Activities causing the impact Overall Impact significance	Overall Impact significance								
	Ambient noise	Air Quality	Soil & groundwater Quality	Surface Water Quality	Flora and Fauna	Occupational Health & Safety	Community Safety	Visual Impacts	Traffic Impacts
Construction of gravity sewers and house connections	Moderate	Minor	Moderate	Moderate	Minor	Moderate	Major	Minor	Moderate
Construction of PSs including all sub components	Moderate	Minor	Minor	N/A	Minor	Moderate	Moderate	Minor	Minor
Construction of FMs	Moderate	Minor	Moderate	Moderate	Minor	Moderate	Major	Minor	Moderate
Impacts due to non-hazardous waste generation	N/A	Minor	Minor	Minor	N/A	Minor	Moderate	Moderate	N/A
Impacts due to Hazardous Waste generation and hazardous substances handling	N/A	Moderate	Moderate	Moderate	N/A	Moderate	Moderate	Moderate	N/A

Table 5 Summary of Impacts assessment during Construction Phase

Activities causing the impact Overall Impact significance	Overall Impact significance							
	Ambient noise	Air Quality	Soil & groundwater Quality	Surface Water Quality	Flora and Fauna	Occupational Health & Safety	Community Safety	Visual Impacts
Operation of gravity sewers and house connections	N/A	Minor	Moderate	Moderate	Minor	N/A	Major	N/A
Operation of PSs including all sub-components	Minor	Minor	Minor	Minor	Minor	Moderate	Minor	Minor
Operation of FMs	N/A	Minor	Moderate	Moderate	Minor	N/A	Major	Minor
Impacts due to non-hazardous waste generation	N/A	Minor	Minor	Minor	N/A	Minor	Moderate	N/A
Impacts due to Hazardous Waste generation and hazardous substances handling	N/A	Moderate	Minor	Minor	Moderate	Moderate	Moderate	Minor
Impacts associated with the disposal and/or reuse of final treated Effluent	N/A	Minor	Moderate	Moderate	Minor	Moderate	Moderate	N/A

Table 6 Summary of Impacts assessment during Operation Phase