



**Activity Report 142**

“Making Cities Work”

The Greater Cairo Healthy  
Neighborhood Program

An Urban Environmental Health  
Initiative in Egypt

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This report is dedicated to  
the residents of Ezbet el Nawar  
and the staff of the  
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# Abbreviations

AMBRIC	American British Consultants
ANE	Asia Near-east Bureau for United States Agency for International Development
CABU	Coptic Association for Brotherhood of the Underprivileged
CDA	Community Development Agency or community-based organization
CDC	US Center for Disease Control and Prevention
CDM	Camp Dresser McKee, International Inc.
CEOSS	Coptic Evangelical Organization for Social Services
CHNP	Cairo Healthy Neighborhood Program
CWO	Cairo Wastewater Organization
DHS	Demographic and Health Survey
ECRED	Experimental Center for Recycling and Environmental Development
EEN	Ezbet el Nawar
EGAT	USAID Bureau of Economic Growth, Agriculture and Trade
EHP	Environmental Health Project
GALAE	General Authority for Literacy and Adult Education
GCMA	Greater Cairo Metropolitan Area including Cairo and Giza Governorates and Shoubra el Khaima City
GOSD	Cairo General Organization for Sanitary Drainage
JSI	John Snow International
LE	Egyptian pound currency
LGU	Local Government Unit
M <sup>3</sup>	cubic meters or 10,000 liters
mm	millimeters or 1/1000 meter
MCW	Making Cities Work Project
MoHP	Ministry of Health and Population
NGO	Non-governmental organization

NOPWSD	National Organization for Potable Water and Sanitary Drainage
O&M	Operations and maintenance
PHC	Primary Health Care
PHN	Population, Health and Nutrition Program of USAID
SA	Situational Analysis
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
UV	Ultraviolet radiation
WG	Working Group for water and wastewater
WHO	World Health Organization
WTP	Water Treatment Plant for potable water production
WWTP	Wastewater Treatment Plant for sewage

# Executive Summary

Rapid and uncontrolled urban expansion is common in major cities throughout the world. The rural poor are drawn to metropolitan areas by the lure of jobs, family and perhaps a better life. Often they congregate on the peripheries of cities in overcrowded, unplanned urban slums which expand without the structure or controls necessary for planning land use and density, security, social and health services or the physical infrastructure of roads, sewer, water, electricity and telecommunications. Such is the case of Ezbet el Nawar (EEN), an informal slum neighborhood located on the boundary between Cairo and Qalyubeya Governorates in the Arab Republic of Egypt.

The Making Cities Work/Greater Cairo Healthy Neighborhood Program (CHNP) was carried out in Ezbet el Nawar from October 2003 to August 2004. This program was funded by the United States Agency for International Development (USAID), Making Cities Work program and implemented by the Environmental Health Project (EHP) and the Experimental Center for Recycling and Environmental Development (ECRED) in EEN.

The project goal was to design, promote and implement affordable, feasible and replicable improvements in household and community sanitation, drinking water and other environmental health technologies. Activities included an engineering assessment of sewer and water systems, analyses of 75 water samples from private wells and the municipal filtered water system, a neighborhood health and environment survey of 510 households, preparation of digital base maps and a local plan of action, and implementation of water and sewer improvements. Activities to develop evidence and support for future interventions were designed to involve stakeholders in Ezbet el Nawar.

## Existing conditions in Ezbet el Nawar

### Hygiene and water supply

Infants less than 3 years old were most at risk for both diarrhea and acute respiratory infections. Combined morbidity of the two broad classes of ailments approached 42% for 170 infants. The rate for the next age group, 4-7 years, was nearly half at 24.3%.

No full-service MoHP medical clinic is available in EEN although a mobile clinic visits the family planning clinic on Tarat El Tawala Street every two weeks. Small private clinics provide emergency first aid at ECRED and the Salam Center. The MoHP also has opened a small family planning clinic in an office next to ECRED.

The household survey checked for knowledge on when to wash hands. About 76% of respondents said that one should wash before eating. Only 46% mentioned

handwashing after defecating. Slightly more than half could list at least one critical time when it was important to wash hands either before or after the activity but only 28% mentioned two. Some (8%) did not list any of the critical times for handwashing.

Municipal water supply is erratic. Most people (>65%) experience water cuts daily and receive water only between midnight and 6:00 am. Less than 15% of the basic water need for EEN is met by potable filtered water from an approved municipal source. The remainder comes from hundreds of small private wells which draw from contaminated shallow aquifers. Few controls exist for construction of additions and new buildings so water demand is escalating.

Water was analyzed from private wells and from taps supplied by municipal sources. The majority of the 75 samples (75%) did not meet the minimum acceptable standards for drinking water in Egypt. The water samples (both wells and municipal) most commonly exceeded standards for nitrite, manganese and coliform bacteria. Heavy metals do not appear to occur at excessive levels.

The water testing by MoHP suggests that contaminated well water mixes with clean filtered water in the municipal distribution system. Visual inspections confirm that multiple cross connections exist between wells and the municipal system thus contaminating the municipal system.

Options for getting additional treated water are limited. Khesous Water Treatment Plant (WTP), the only alternative Qalyubeya source, operates at less than 50% capacity due to equipment breakdowns and poor maintenance. Obtaining water from Cairo sources like Al Marg or Mustorod WTP is unlikely because there is insufficient production from Cairo and no administrative arrangements to pay for services across governorate boundaries. Money is collected to maintain the water system through individual water meters, but the tariff rate is set too low and does not cover the costs of producing and distributing potable water. In addition, fees are forwarded to the central government fund and an insufficient amount is returned to pay for routine local O&M costs.

The water distribution network is poorly structured and lacks zone control valves and outlets for cleaning the lines. The lack of a looped system design requires higher pressures in order to provide water to the ends of the lines. This increases the chance of bursting pipes. Ruptures of both the water and wastewater networks are common in EEN. Their close proximity to each other makes cross contamination of the potable water by sewage a possibility.

## Existing conditions for sanitary sewage disposal

Nearly all households have flushing toilets and are connected to a mix of public and private trunk-mains and lateral collectors. Many lines discharge directly to open drains and nearby low-lying areas. Meanwhile Ministry of Water Resources and Irrigation is considering the imminent closure of the Khesous drain, which presently receives large quantities of sewage from EEN.

Most households (from 65% to 80%) report problems with pooling sewage around either their own home or that of their neighbor. A huge problem is the delayed construction of a key pumping station in EEN to inject sewage into the main interceptors going to Gabal Asfar Wastewater Treatment Plant. The temporary pump units in place are prone to failure which quickly floods major parts of the collection system and community.

The poor quality of materials and installation make the collection network subject to blockage, breakage and leakage. For example, the main collector in El Sheikh Mansour Street has subsided. Partially blocked, it needs replacement or maintenance. The collection system also is not adequately protected against entry of large objects that can cause clogging, including household trash and debris from plastic recycling operations.

New connections and additional flow into the system are increasing due to lack of controls by Local Unit or GOSD on building construction or renovations. In addition, significant sections of adjacent Cairo neighborhoods drain into EEN but provide no funds to Qalyubeya Governorate or Khesous for O&M. The additional flows come from the south (Arab El Tawaila) and the east (El Zohour and El Marg towns).

The responsibility for maintaining the sewers is shared informally between LGU and Gamiya. Both lack staff and technical resources to adequately supervise performance and so must rely on private contractors. The LGU budget for sewer maintenance is inadequate. Fees are collected to maintain the sewer system as part of the water tariff, but little is returned to pay for local sewer O&M costs.

## Recommended actions for improving environmental infrastructure

Multiple recommendations were developed based on the results of the different assessment activities and discussion with the water and sewer working group.

### Water supply

Project water testing confirms the difficulty to determine water sources and quality at the household tap. Residents should treat/disinfect by boiling, filtering, adding disinfecting solutions (0.5 to 1% Na hypochlorite solution) (*EHP promotes CDC's SWS water disinfection using 0.5 to 1% Na hypochlorite*) or by solar disinfection (UV). Simple disinfection of the water significantly lowers the risk of bacteriological infections but does not remove nitrite/nitrate or other chemical compounds.

Babies less than 6 months old should not use groundwater in EEN for drinking purposes unless it comes from an approved source. Infants consuming EEN water with excessive nitrite and nitrate concentrations may suffer from anemia. Infants should breast feed and receive commercially bottled water from approved sources or water from an approved municipal water source after disinfection.

Repair and maintain the existing Khesous water treatment plant to increase the amount of good potable water available for EEN.

Cooperate with Cairo so that future renovation work at Al Marg WTP can provide additional capacity sufficient to meet needs of EEN. This would require coordinating the system for water billing to share costs between Cairo and Qalyubeya.

Upgrade and maintain the distribution network infrastructure by replacing some existing mains with larger pipes, installing control valves and flushing points, adding loops to connect the dead-ends of lines, adding auxiliary booster pumps along the mains to maintain network operational pressure and developing a maintenance program.

Create public awareness about water quality of EEN and importance of good hygiene practices to human health, and about methods for disinfecting water: boiling, chlorination, filtering and exposure to UV light (solar disinfection).

Remove cross-connections between raw groundwater sources and potable water in the municipal distribution system.

Institute tight controls on constructing new buildings and enlarging existing buildings to reduce demand for additional water supply and sewage disposal.

## Sewage disposal

The most important priority is to finish building the main interceptor pump station and to protect and improve the temporary pump station.

Improve and maintain the collection network in order to handle the additional sewage flows that are sure to occur as the potable water supply increases. Activities would include:

- Purchase cleaning rods and other tools like a drain bucket machine, rodding machines or high pressure water jetting machine
- Clean and widen outlets on El Khesous drain and on El Marg drain.
- Construct bypasses between several existing sewers to facilitate drainage in NE section. Install a pump on the line beside Princess Naamat Palace

Adopt a management system for construction and maintenance of the sewer system, including:

- Adopting a Sewer Protocol that assign responsibility for O&M of the new pumping station, the main collectors and lateral sewers between the LGU and Gamiya
- Developing a plan for the orderly rehabilitation of the entire private sewer network
- Training LGU and private contractors on making a routine maintenance plan

- Creating a registry for records and maps of the network maintenance plan
- Verifying that all discharges into drains have been closed in conformity with environmental conditions after providing for proper sewage drainage
- Coordinating with the Ministry of Water Resources and Irrigation to ensure an orderly process for covering or filling the El Marg and El Khesous drains.

Control construction of new buildings and additions to existing buildings to reduce demand for additional water supply and sewage disposal capacity. There will always be an overload of the sewer, water, solid waste disposal and other community services if new construction continues uncontrolled.

Create a long term administrative agreement between Cairo and Qalyubeya for water and sewer services. The agreement would include payment for water supply and maintenance of sewer mains network by Cairo.

## Activities implemented by project after assessment process

A project action plan was developed around several different activities following completion of the assessment and discussion with the Water and Sewer Working Group.

### Household level point-of-use water treatment

The inconsistent availability and quality of potable water in EEN's municipal water distribution system led the project to investigate household level interventions for water. The options included:

- Chlorination by addition of dilute (0.5-1%) sodium hypochlorite solution
- Physical filtration of the water using ceramic "candle" filters
- Solar disinfection using the ultraviolet wavelengths of the sun's rays

People were satisfied with the ceramic candle filters but felt they were too expensive. Solar disinfection was found to be cheap and acceptable from the stand point of water quality. Chlorine was not promoted as there were concerns in MoHP about self-application of chlorine solutions. A more concerted effort later may shift MoHP opinion in favor of a Safe Water Chlorination Project.

### Mother's Day hygiene education program for 250 women

During March 2004, over 250 women attended the information sessions held at ECRED in EEN. The sessions coincided with Egyptian Mother's Day. ECRED staff presented information about the water problems facing EEN residents. The local MoHP physician/manager discussed the diseases spread through poor water quality.

Songs and a small play depicted the problems of polluted water and parodied a number of unsanitary practices that could spread diarrheal disease. The play demonstrated correct handwashing and proper storage of clean water. Methods for treating water (boiling, chemical and solar disinfection and ceramic candle filters) their costs and effectiveness were described. Participants also described their own experiences with getting clean water.

## Improvements to the sewage collection and water distribution systems

*Water and Sewer Working Group:* A working group was created to help assess the water and sewer systems. The work group included the head of the Local Unit, water and sewage staff of the Local Unit, National Democratic Party representative, Gamiya chairman, sewer contractors and CHNP consultants. The Work Group wrote a performance protocol between the Local Unit and the Gamiya that defined the responsibility for sewer maintenance and managing sewer contractors.

Based on tender specifications and bid documents prepared by CHNP, the working group selected vendors for water valves, sewer cleaning rods, a rodding machine and the contractor renovating the WTP. The working group monitored performance of the plant renovation contractors and will oversee installation of the water valves. Renovations began Aug. 7, 2004 and finished on Sept. 14, 2004.

*Improvements to temporary sewage pump station:* CHNP engineering consultants advised the Local Unit about improvements for the temporary pump station. LGU took steps to:

- Place steel screening to ensure that debris did not clog pump intakes
- Improve the portable diesel powered pump, which later was replaced by an electric pump housed in a new secure brick pump house
- Develop the specifications for a pump in the northern quarter of EEN to temporarily drain the sewage system to Al Marg canal (The Gamiya is purchasing the pump with assistance from the LGU)

*Purchase of equipment:* CHNP purchased 400 hand-held clearing rods made of spring steel. These are the primary tools used by the local laborers and sewer contractors to clear blocked lines.

*Valves to control water supply distribution:* The working group decided to improve control within the distribution system by placing gate valves at key locations in the distribution network. CHNP purchased 15 four inch valves and 5 six inch valves at a cost of 14,200 LE. The Gamiya agreed to provide 8000 LE for labor and materials to prepare the vaults for housing valves and later added another 4,000 LE. The LGU agreed to provide the parts, manhole covers and labor to make the valve connections.

*Renovation of Khesous Water Treatment Plant:* To increase production of water, CHNP contracted for improvements to two package water filtration systems which

were functioning at less than 50% capacity. The 81,000 LE contract includes rebuilding or replacement of key pumps and motors, refurbishing electrical panels and chlorination systems, installing a lighting system, and creating an inventory of key fuses, breakers and switches. The Governorate agreed to pay an additional 35,000 LE to install a chlorination system for disinfecting well water extracted at the same site.

*Training:* The project engineer held a three day training workshop for the Local Unit staff on how to operate and maintain the water treatment plant. A maintenance manual was prepared for the WTP. A separate manual was prepared for use at the main sewage pumping station after it comes on line.

## Future initiatives after the Cairo Healthy Neighborhood Program

The Cairo Healthy Neighborhood Program was a successful initiative that produced much more than a simple environmental assessment and action plan. The local and central government combined with ECREG and the Water and Sewer Working Group to document existing conditions and to enact specific infrastructure improvements. These achievements also serve as a starting point for future measures. In addition to the system-specific recommendations listed above, the community could plan on undertaking the following strategies:

- Initiate a process to “regularize” or incorporate EEN so that it can receive services and funds officially. EEN should determine whether to remain within the Khesous Local Unit or become an independent Local Unit and then seek recognition by the national government and Qalyubeya Governorate.
- The Japanese Development Agency, JICA, has shown interest to improve the EEN water system. The Local Unit should request technical assistance and infrastructure improvement funds to maintain its water production capacity and improve its distribution system. Construction of additional treatment capacity would reduce the present large deficit in the water budget for EEN and Khesous.
- Khesous and Qalyubeya Governorate should collaborate with Cairo Governorate in order to secure additional sewer and water services for Ezbet El Nawar before the design for the new El Marg water treatment plant is finalized. The cost to Cairo for providing water to EEN can be balanced against the LGU’s cost of handling Cairo’s sewage.
- Systems for water supply and disposal of sewage and solid waste require funds for operations and infrastructure maintenance. The Local Unit needs to raise additional funds to sustain operations. Most people indicated that they were willing to pay more money for better sewer and water services.
- A future project should investigate the practices of the Zeballeen community. How can they be better tied into the new waste handling paradigm that incorporates the large multi-national companies without reducing the Zeballeen to the level of mere laborers? Is there a way to sustain their high

- levels of resource recovery and recycling of materials from the waste stream of northern Cairo? Presently material collected by the multi-nationals goes straight to landfill with little resource recovery.
- A technical and economic feasibility study should look at placement of a solid waste transfer station in EEN. It could help to improve the sanitation of EEN by facilitating the end disposal of residue remaining after the valuable materials have been removed by the Zeballeen. Urban transfer stations can use small neighborhood facilities with locally available equipment that is sized to meet the local requirements.
  - A community hygiene program can raise awareness about the hazards of contaminated water and methods to treat water in the household. Developed by MoHP, it should include activities to remove connections between the municipal system and the wells after the quantity of potable water has increased.
  - A full service MoHP medical clinic is planned for construction on Tarat el Tawfeikeya Street, but the work is delayed by a boundary dispute between Cairo and Qalyubeya Governorates. Meanwhile squatters are rapidly usurping the land. Both governorates should intervene to facilitate the transfer of land from the Ministry of Water Resources and Irrigation to Qalyubeya Governorate Directorate of Health.

## Conclusion

The Greater Cairo Healthy Neighborhoods Program/Making Cities Work Project was implemented as an initiative with a modest budget. The challenge was to find cost-effective and creative approaches that demonstrate how targeted investments can have positive results. A key strategy was to look for partnerships and collaboration among groups that have some stake in the outcomes at the local level.

The challenge for any project is to identify the resources available and then look for synergism that can increase those resources. The project's efforts to identify challenges, determine opportunities and assign responsibility have heightened awareness among the different stakeholders about the problems and solutions for EEN. Some of the most difficult tasks were those sorting out how different entities can interact for the benefit of the community.

The steps taken in Ezbet el Nawar are the beginning of a process that needs to become more sustainable. Such sustainability can occur only through the partnerships derived when local and central governments, civil society groups and private sector companies all participate in creating a supportive environment at the local level.

Success in such a venture will be measured over the long-term. It will be measured by actual changes and improvements in the environmental conditions and quality of life for residents of Ezbet el Nawar. Against this measure, the Greater Cairo Healthy Neighborhoods/Making Cities Work Project is a successful starting point.

# 1. Introduction and Background

Rapid and uncontrolled urban expansion is a common phenomenon in major cities throughout the developing world. The rural poor are drawn to the metropolitan areas by the lure of jobs, family and the chance for perhaps a better life. Often they congregate on the peripheries of the developed cities in overcrowded, unplanned urban slums. The rapid growth of such neighborhoods occurs largely without the formal structure or controls necessary for planning of land use and density, security, social and health services or the physical infrastructure of roads, sewer, water, electricity and telecommunications. Such is the case of Ezbet el Nawar, an informal slum neighborhood located on the boundary between Cairo and Qalyubeya Governorates in the Arab Republic of Egypt.

This report will describe the activities of the Making Cities Work/Greater Cairo Healthy Neighborhood Program (CHNP) undertaken in Ezbet el Nawar during an eleven month period from October 2003 to August 2004. This program was funded through a grant from the United States Agency for International Development (USAID), Making Cities Work program and implemented by the Environmental Health Project (EHP). The activities included an environmental assessment of the sewer and water system, laboratory analyses of samples drawn from private wells and the municipal filtered water system, a neighborhood health and environment survey administered to 510 households, preparation of a local plan of action and implementation of water and sewer improvements.

This work builds on the USAID Urban Health Initiative and initial activities by others in early summer 2003 to conduct a rapid qualitative situation analysis and to convene stakeholder meetings for both local residents and government representatives. That initial work was described earlier by Boussen et al.<sup>1</sup> (2004) and summarized below.

## 1.1. USAID/ANE Urban Health Initiative

As the urban centers of Asia and the Near East continued their rapid growth, it became evident to USAID/ANE that their health programming had not kept pace with the growing needs of urban slum dwellers, particularly for children. Recognizing this trend, the ANE Population, Health and Nutrition (PHN) Team developed an initiative

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<sup>1</sup> Boussen, Carla, Gamal Bisada, Eman Eltahlawy, Elham Fateem, Maha Ghobashi and Maged H. Moawad. 2004. Activity Report 123: Cairo Healthy Neighborhood Program: Situation Analysis, with Literature Review and Stakeholder Meetings. Environmental Health Project. Washington DC. 86 pg.

designed to focus Agency attention and resources on the health conditions of urban slum dwellers. This Urban Health Initiative had three phases: literature reviews, demonstration activities, and capture of knowledge and lessons learned.

Phase I: A desk-top literature review improved USAID's knowledge and understanding of the health status and conditions in ANE urban slums and squatter settlements. The results were presented in EHP Activity Report 109<sup>2</sup>. The study confirmed the hypothesis that the health of children in urban slums is as bad as or worse than that of children in rural areas. The main childhood illnesses of rural areas also prevail in urban slum or squatter settings, including diarrheal disease, acute respiratory infections and vaccine preventable illnesses.

Phase II was initially conceived as an in-depth research activity to complement the literature review. This evolved into a program to demonstrate urban health activities such as the Cairo Healthy Neighborhood Program, as a means to increase USAID experience in planning, implementing and evaluating child and family health programs in urban slums and squatter settlements.

Phase III offers practical guidelines to PHN officers for programming in urban slums based on the accumulated knowledge and experiences of Phases I and II. Documentation and preparation of Activity Reports, such as this one is an example of the Phase III activities.

The ANE Region has entrusted the implementation of the initiative to the Environmental Health Project (EHP), which has successfully carried out urban slum environmental health improvement activities in various regions of the world over the past 15 years. Funds made available for the initiative are relatively modest and present a challenge to find cost-effective and creative approaches that demonstrate how targeted investments can have positive results.

## 1.2. Early interventions

The USAID/Egypt Mission responded favorably to a region-wide request to participate in Phase II. Doug Heisler, ANE-PHN Team Leader, traveled to Egypt in June 2002 to meet with the Egypt Mission. Together with Dr. Emad Yanni of USAID Egypt, they designed a demonstration child health program in two slums in greater Cairo. The Egyptian Ministry of Health and Population (MoHP) Director of Urban Programs welcomed the proposal for an urban slum program as it fits with a current MoHP initiative for expanding services to reach the urban slums. Ezbet el Nawar was selected as one site because of its apparent lack of infrastructure and services, the presence of NGOs capable of carrying out program activities and its obvious need for assistance. Ezbet el Nawar is the home of a community of zabbaleen, or traditional garbage collectors and recyclers. The zabbaleen are some of the most marginalized

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<sup>2</sup> Fry, S., B. Cousins and K. Olivola. 2002. Health of children living in urban slums in Asia and Near East: Review of existing literature and data. Activity Report 109. Environmental Health Project. Arlington VA.

urban poor populations in Egypt. The second site was later eliminated when the inhabitants were resettled and the dwellings removed.

To have sustainable impact, it also became clear that it would be important to identify a local funding source to be available following termination of funding from Washington, scheduled to end with the conclusion of EHP II in the summer of 2004. The Mission agreed to provide support to a local NGO to work in the selected communities via a PHN grant through the USAID-funded NGO Service Center. The NGO, Coptic Evangelical Organization for Social Services (CEOSS), agreed to include Ezbet el Nawar in its proposal.

A second team visited Cairo in December 2002 to further develop the approach and to seek local partners to help implement the program. Team members included EHP activity manager Sarah Fry and Stephanie Wilcock of USAID/EGAT/Urban Programs. The team visited the selected slum areas, local and national NGOs, USAID and the MoHP and developed an overall approach, the Cairo Healthy Neighborhoods Program (CHNP).

Based on findings of the December scoping visit and discussions with various offices within the USAID/Egypt Mission, the urban health program approach proposed was multi-sectoral in nature and included the following elements:

- Conduct a qualitative situation analysis to encompass socioeconomic, cultural, environmental, and other determinants of child health
- Convene stakeholders' planning meetings to define key program strategies
- Collect baseline data collection through interim DHS
- Identify and implement environmental health and hygiene improvement through the present activities as managed by EHP
- Maternal/Child Health/Reproductive Health and Family Planning Clinic Project and community-based activities would be carried out by CEOSS through a grant from NGO Service Center as part of a USAID Mission PHN buy-in to the Center
- Obtain micro-credit or income generation activities through USAID Mission and other partnerships yet to be determined
- Build capacity of all NGOs and other organizations involved in the program
- Assist the MoHP Urban Programs Directorate and relevant municipal agencies to improve policies and capacity to provide health services to urban slums
- Document program activities and lessons learned for implementation/replication elsewhere in Cairo and other ANE countries/cities.

### 1.3. Situation analysis

A situation analysis (SA) was conducted in May and June 2003 in order to better understand the factors affecting the children's health in Ezbet el Nawar (EEN). The SA also was designed to promote participation by the slum communities during the

problem identification phase and to provide a base for designing program strategies and targeting later interventions. The SA included:

- Community meetings to involve EEN residents in assessing health and hygiene conditions
- Literature search and review of existing reports that contain information relevant to EEN and other similar neighborhoods
- A rapid qualitative assessment of family health in EEN encompassing socioeconomic, cultural, environmental and other determinants

A quantitative baseline survey also was carried out through a separate effort by Egypt Demographic and Health Survey (EDHS) to complement the findings of the EHP qualitative assessment. At the time of this writing, the results from EDHS have not been available for review.

## 1.4. Stakeholder workshops

Two stakeholder workshops were held in July 2004. The objective was to identify priority health problems of Ezbet El Nawar families based on information collected from the literature review and the situation analysis, and to collectively define the best “workable” options for improving the neighborhood health situation.

### 1.4.1. Neighborhood workshop

The neighborhood stakeholder workshop was the first of two stakeholders’ meetings. Participants representing communities and local organizations living and working in the Ezbet El Nawar neighborhood attended the workshop. The challenge of the workshop was to provide the information in a simple, easy-to-use format to enable participants to make informed decisions. Some innovative methods used in the workshop included “gallery walks” of situation analysis results; “out of 10 people” visuals; and a discussion of “lessons learned” from another zabbaleen neighborhood in Cairo.

The participants of the neighborhood workshop identified three priorities for actions relating to health and the environment:

- Basic sanitation (sewage disposal), clean water and clean air
- Improved child health, nutrition and development
- Safe motherhood

In addition to the above priorities, neighborhood stakeholders also were concerned about the livelihoods for the Zeballeen garbage collectors. Over the past year, the government has changed the method for collection of household garbage in many parts of the Greater Cairo region. The traditional household collection and recycling services performed by the Zeballeen have been replaced by municipal contracts with large multi-national garbage hauling contractors.

## 1.4.2. Government/Donor/NGO stakeholder meeting

A second stakeholders' meeting included representatives from the Cairo municipal government, health officials from the Ministry of Health and Population (MoHP), USAID, and several NGOs. At the meeting, priority concerns identified at the neighborhood stakeholders' workshop were discussed, committees were formed, and roles, responsibilities and priority actions were identified through a problem-solving process.

## 1.4.3. Results of the stakeholders meetings

- A committee was formed to address the water and sewage issues and a local NGO, Experimental Center for Recycling and Environmental Development (ECRED) was identified to conduct a short-term awareness campaign to reduce risks related to water, sanitation and air pollution.
- USAID/Egypt was awarded a grant from EGAT/Urban Programs/Making Cities Work to improve the water and sanitation conditions in the neighborhood.
- The neighborhood was added to the MoHP mobile health clinic/immunization services circuit.
- World Education was tasked to develop urban slum-oriented literacy materials and training on hygiene improvement messages for Ezbet El Nawar and other Cairo neighborhoods.

## 1.5. Building neighborhood capacity

The underlying principle of the Cairo Program was to build neighborhood capacity to take actions to improve their own situation. The participatory situation analysis and the neighborhood stakeholders' workshop methods were important mechanisms to build neighborhood skills for interpreting and using information to identify problems and thus demonstrate how the neighborhood could play a role in improving their own health problems by working towards common shared goals. As steps were taken to identify and address immediate problems, the activity created a "snowball effect" and gained attention and participation from both within and outside the immediate neighborhood. The momentum created by these early activities led to other successes in the Greater Cairo Healthy Neighborhood Program/Making Cities Work as described further in this report.



## 2. Greater Cairo Healthy Neighborhood Program/ Making Cities Work Project

### 2.1. Overview

Building on the success of the situational analysis and the accompanying stakeholder meetings, a small grant of US\$100,000 was awarded for implementation of urban environmental health improvements in Ezbet el Nawar. The project goal was to design, promote and implement affordable, feasible and replicable improvements in household and community sanitation, drinking water and other environmental health technologies. The scope of work for this grant is attached in Annex I. The time for implementation was October 2003 to May 2004 but later extended to mid September 2004.

The first step was to assess the current situation for sanitation, water supply and other priorities identified by the community during the earlier situational analysis and ensuing stakeholder meetings. The assessments involved a more in-depth investigation to develop the evidence and support for various interventions. These intervention options were considered by the community through a representative committee and participatory process and choices made for implementation.

Although government plans currently exist to address some of these needs with large infrastructure improvements, it will take a long time before the work commences and is completed. Even after the work finishes, there still remains the key issue of sustainable maintenance. This is a scenario that likely repeats itself in numerous other under-served neighborhoods in Greater Cairo.

To help meet this challenge, the Cairo Healthy Neighborhood Program (CHNP) intended to improve the hygiene situation in the Ezbet el Nawar neighborhood (EEN) by identifying strategies with different levels of cost and technical complexity. Some could be implemented fairly rapidly by the community itself with some support from the CHNP/MCW grant and other sources. Others would need to be submitted to the appropriate governmental agencies for inclusion in existing programs for facilities planning, funding and technical support. CHNP/MCW also supported demonstration

interventions and assisted the community in finding solutions to replicate and sustain the improvements.

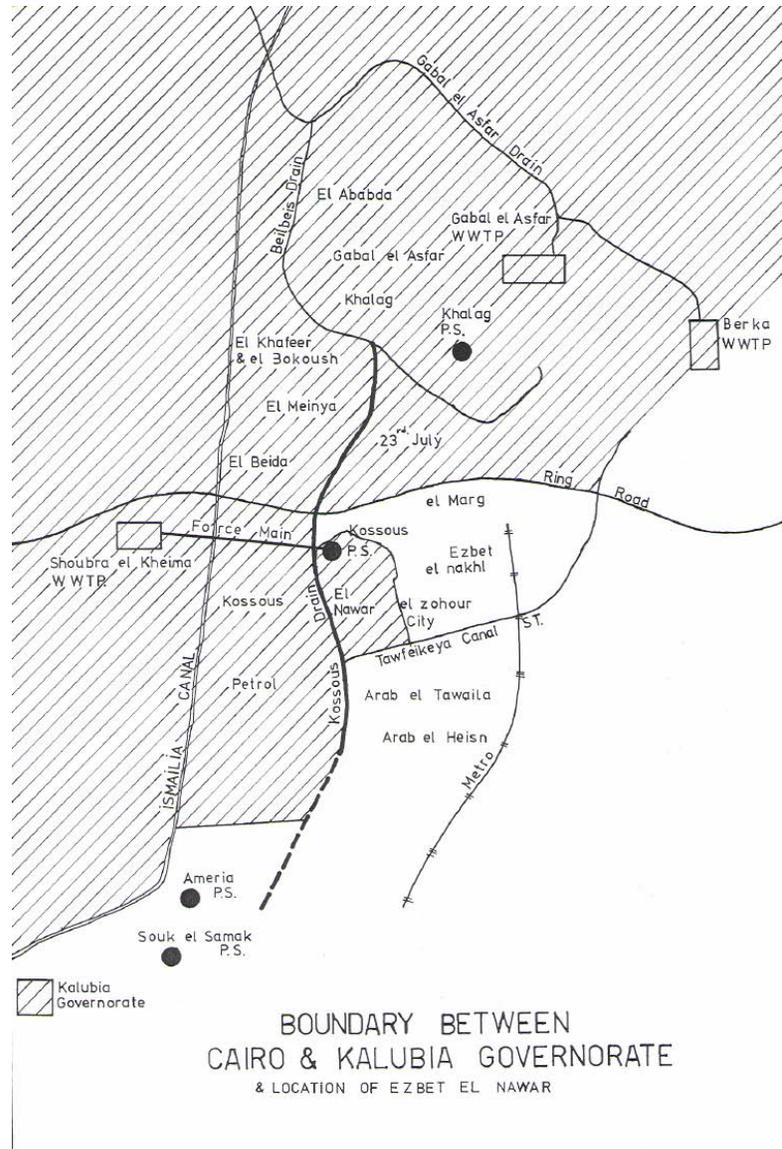
In keeping with the participatory style adopted in the earlier SA phase, the MCW component continued to maintain stakeholder involvement through stakeholder meetings, working with a local water and sewer committee and discussions with community leaders. MCW also coordinated with ongoing MoHP initiatives and with other Greater Cairo Healthy Neighborhood program activities, such as the Integrated Urban Hygiene Promotion and Adult Literacy Project implemented by World Education, an international NGO developing women's literacy and hygiene education materials or the Improving Maternal and Child Health Status Project delivered to Ezbet el Nawar residents through an NGO Service Center grant implemented by the national NGO, CEOSS.

## 2.2. Ezbet el Nawar — the Community

Before 1974, Ezbet el Nawar was a small village located in the southeast region of the present project area. With less than 40 households it had a population of about 300 persons. Officially, most government planning maps still classify EEN as agriculture land even though the 211 hectare site is densely covered by more than 5,200 buildings and very little open agriculture land remains. Despite the presence of approximately 72,000 inhabitants<sup>3</sup>, it has never been officially incorporated into the el Khesous Local Unit, an administrative unit of Khanka City which lies within Qalyubeya Governorate. The implications on funding and service provision are substantial and discussed later.

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<sup>3</sup> Gergis, Obeid Faheem. 2004. Urban Environmental Health Improvements in Ezbet el Nawar, Kalyoubeya Governorate, Egypt: Water and Sanitation. Project Report, Environmental Health Project, Cairo Healthy Neighborhood Project. Cairo. 93 Pages.



### Map of Ezbet el Nawar Boundary between Cairo and Qalyubeya Governorates

The rapid urban expansion of Cairo has engulfed EEN. Bounded on three sides by Cairo and separated from the rest of Qalyubeya Governorate by the large Khesous agricultural drain, (see Figure 1), Ezbet el Nawar geographically is more a part of Cairo metropolitan area than Qalyubeya. It lies more than 50 km south of Benha, the administrative center for Qalyubeya. This creates a fundamental problem for providing infrastructure to Ezbet el Nawar — for even though it may be easier to provide infrastructure like sewage and water supply from the Cairo side, the responsibilities still lies with Qalyubeya Governorate. Few provisions or agreements exist for providing services across political boundaries. Similar problems exist for providing other common services, such as health clinics, schools, and security.

Solutions for such problems will require improved cooperation between the Cairo and Qalyubeya Governorates.

## 2.3. Experimental Center for Recycling and Environmental Development

The Experimental Center for Recycling and Environmental Development (ECRED) is a small non-governmental organization (NGO) started by Mr. Gamal Zekrie Bisada in 1990. Located in the heart of EEN, the ECRED office was the logistics and meeting center for CHNP activities. ECRED staff also functioned as project outreach staff to conduct household surveys, collect water samples, follow-up with local government officials and organize stakeholder and focus group meetings.

ECRED began as a mission of the Egyptian Coptic Church under the patronage of Bishop Athanasious through the Mission of Daughters of St. Mary with the goal to improve the social and environmental plight of the Zeballeen settlement residents. The first focus was on eliminating the practice of burning dirty plastic bags in the community. A building was started through donations in 1992, and the organization has grown gradually over the past decade. It has nineteen staff implementing community services, including women's literacy classes, rudimentary medical clinic, veterinary services, housing programs and maternal child health programming. It also has an adult education and youth center providing literacy classes for teenagers, social and health services, scouts groups, bodybuilding gym and child labor awareness program. Recently the organization started training garbage workers about business start-up. The training gives the garbage workers knowledge about how to establish contracts and agreements suitable for working with the multi-national companies that are contracting for garbage collection in urban Cairo. The center is non-denominational and serves both Christians and Muslims in the community.

## 2.4. Khesous Local Government Unit

The Local Government Unit (LGU) is the lowest branch of the Egyptian civil administration system at the village level. The LGU provides various administrative services, including tax collection, water supply and services to dispose of sewage and solid waste. Ezbet el Nawar is a hamlet (subvillage) of Khesous LGU. The LGU was the main government counterpart for the CHNP activities in Ezbet el Nawar.

Although the LGU serves as a tax collection point, it must pass these monies up to the central finance ministry. Each year, the Al Khanka municipality disperses funds of which the Khesous LGU receives an allotment to pay for services provided. The allotment appears to be divided equally among the different LGU rather than being distributed based upon population or some other measures of priority. As a result, a large LGU like Khesous may receive the same funding as other LGU's with considerably less population to serve.

The head of the Local Unit is appointed by the head of al Khanka municipality. There was a recent change in head of the LGU administration during the late part of the project. Fortunately, the new individual, Mr. Hussein Abou Ahmed seems quite supportive of the project, building on the work of his predecessor, Mr. Ali Tanani.

## 2.5. The Gamiya (Community Development Association)

The Gamiya or Community Development Association (CDA) is a community-based organization that is non-governmental and registered with the Ministry of Social Welfare. The EEN Gamiya is unusual for an interesting reason — it also serves as a private utility for sewer and garbage disposal.<sup>4</sup> Given this important function in the community, it was important for CHNP to include the Gamiya along with the LGU in the environmental activities for EEN.

The EEN Gamiya was organized in 1980, and presently Mr. Adnan Mohamed Abd el Meguid is chairman of the board. It has a membership and a board of directors governing its policies and activities. The members are concerned citizens of the area. Activities focusing on community needs are implemented using funds donated from the members. This includes kindergarten classes and adult literacy classes for women. The building also provides office space for the post and telegraph. The National Democratic Party also has space in the Gamiya building as does a small MoHP family planning clinic.

## 2.6. The Zebbaleen

Traditional garbage collectors in Egypt are called “zebbaleen.” The original zebbaleen were rural migrants from the oasis of the Western Desert. These “wahiya” or “people of the oasis” established rights to collect in certain neighborhoods and sold the fresh green garbage to the Bedouin for goat feed. The remaining material (mostly paper) was dried and used as fuel.

Beginning in the 1950s, the composition of zebbaleen changed as poor migrants began arriving from the Upper Egypt governorates of Asyut, Sohag and from nearby Qalyubeya in Lower Egypt. The new comers found work with the wahiya in garbage

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<sup>4</sup> Maintenance of sewer infrastructure normally is the responsibility of the Local Unit or the Cairo General Organization for Sewage Disposal (GOSD). Fees for this service are included as a portion of the tariff levied for municipal water use. Approximately 35% of the water fee is supposed to pay for sewage disposal. In the case of EEN, the neighborhood has never been officially approved nor included in Khesous Local Unit. This has hampered earlier efforts to include EEN in the area approved for coverage by the municipal sewer infrastructure. The Gamiya responded to citizen complaints about sewage disposal problems by arranging for private contractors to install and maintain private sewer lines that carry household sewage to nearby Khesous, el Marg and al Tawfeikeya agriculture drainage ways. Households paid a one time fee of 500 LE to the contractors for hooking into these private lateral lines. The contractors also collect a monthly fee of 1 LE per household to maintain the sewers. Each contractor must pay 300 LE per month to the Gamiya which assigns the boundaries of the areas served by the individual contractors and reviews the performance of individual contractors. The Gamiya also performs a similar function for household solid waste disposal. Contractors are allotted areas by the Gamiya to collect the garbage regularly and also to collect a monthly fee of 3 LE.

collection. Although a different ethnic group from the wahiya, the general public still referred to them as zebbaleen. Gradually the new zebbaleen bought concessions from the wahiya who allowed them to collect garbage from a certain route or “knot” (lines). The wahiya received the fees paid by the residents for the disposal of their garbage, while the zabbaleen were entitled to only the garbage itself. Eventually, the wahiya, acting more as brokers, grew more wealthy and influential socially while the zabbaleen who collect the garbage survive on the small income made by sorting and selling the waste and by raising some livestock, mainly pigs.

The better off wahiya are more organized and have formed organizations and in some instances created businesses that have contracted with municipalities for collecting from specific districts. The municipalities can collect up to 40% of the total fees collected by the wahiya. Meanwhile, the actual garbage collectors remain basically unorganized and largely uncompensated for their hard work.



**Zebbaleen sorting garbage**

### **Day in the life of a Zaballeen: Enab Babu (20 years old).**

Enab begins work at 3:00 am. He goes door to door to collect garbage in Zeitoun. Accompanied by his mother, it takes about one hour by donkey and cart from Ezbet el Nawar to his “knot,” the line of streets that he services. His mother stays in the cart and sorts while he makes the rounds to the households. Some places have their garbage outside the door and others store it inside so he has to wake someone inside.

At the cart, Enab’s mother sorts out the plastics, cardboard cartons, bones, paper, glass and metals on the street. Non-useable material goes into the dumpsters placed on the street by a large commercial waste hauler. Theoretically he is supposed to carry all waste back and sort at his own place. This would normally require him to hire a truck to carry away the unusable residues to the landfill (17 km distance) at a cost 150–300 LE for final disposal. He has the approval by the city council to collect waste and also to collect a fee of 1-3 LE per month per household. He is supposed to pay 40% of his fee back to the city council. Although the percentage seems high, it is difficult for the council to accurately know how many units he services. In addition, Enab often gains extra money by carrying away extra items on special occasions, such as an apartment renovation project. He also is quite good at recognizing the value of materials in the garbage.

Enab’s business is changing as the solid waste handling industry in Egypt evolves. During the past two years, the municipalities of Cairo, Giza and Alexandria have entered into contracts with large multi-national firms from Spain, Italy and France. The contracts were negotiated to include the collection of garbage by trucks, transportation and final disposal in landfills. Payments are made as a surcharge through the household electricity bill.

The multi-national companies merely collect the waste from roadside containers and transport directly for disposal in various landfills located around the edge of Cairo. Minimal recycling and resource recovery efforts occur in the process. In many locales, the Zaballeen were excluded by the final contracts and are prohibited from doing anything with the waste.

Attempts to work with the multinational companies and the wahiya brokers have not gone well. One group signed a contract allowing them to carry the waste from the household to the roadside containers. They are not allowed to take the waste back to their sorting areas or to remove recyclable materials from the containers. In addition they are not allowed to practice similar jobs anywhere else. As a result, their income has suffered. In the end after three months, the contract was broken by the company and they received no pay. The situation is well described by Ibrahim and Bisada<sup>5</sup> (2003) and Ibrahim (2004)<sup>6</sup>.

<sup>5</sup> Ibrahim, Fouad N and Gamal Zekrie Bisada. 2003. *Cooperation between the Traditional Garbage Collectors and the Foreign Companies of Solid Waste Collection – Suggestions towards a Sustainable Urban Development in Greater Cairo*. Paper presented at the Conference on Improving Living Conditions through Sustainable Urban Development. Egyptian Ministry of Housing, Cairo. December 15-18, 2003.

<sup>6</sup> Ibrahim, Fouad. 2004. in Beck, Kurt, Till Forster and Hans Peter Hahn (eds., 2004): *Blick nach vorn: Festgabe für Gerd Spittler zum 65. Geburtstag*, Rudiger Koppe Verlag, Köln, pp 281-297.



## 3. Assessment Methods

Building on the qualitative evaluation of the Situational Analysis (SA), the project enhanced its characterization of problems in EEN through a series of assessment activities conducted from November 2003 through April 2004. Although the SA identified community environment concerns about water supply, sewage disposal, air pollution and solid waste disposal, a stakeholder meeting held at ECRED on Dec. 6, 2003, produced spirited discussions indicating that the water and sewer issues were of greatest significance to the participants. As a result, the project elected to focus more on these two major priorities. Given the project's short time frame and limited budget, this seemed like a prudent move.

The assessment phase of the Making Cities Work project produced four separate outputs. Copies of each are included in the CD disk accompanying this report.

- Technical assessment of the water and sewage infrastructure implemented by two engineering consultants, Mssrs. Obeid Faheem Gergis and Jeffrey Hendrich
- Water Quality Sampling Program of 75 household and commercial sites conducted by the sanitarians and analytical staff of the MoHP (Annex 2).
- Neighborhood Household Health and Environment Survey of 510 households fielded by ECRED staff; and tabulated using Microsoft Access database.
- Digital base map and informational database prepared using Arc Info 8 and AutoCAD 2000 to depict agriculture drainage zones, major sewer and water lines water sampling sites and water sample analyses for 30 parameters.

### 3.1. Technical assessment of water and sewage infrastructure

The technical assessment of EEN is described in the report, *Urban Environmental Health Improvements in Ezbet el Nawar for Water and Sanitation*.<sup>7</sup> This report by Engineer Obeid Faheem Gergis was essential. It describes the key problems in EEN for sewage disposal and water supply and the regional context for water and wastewater infrastructure in the Greater Cairo Metropolitan Area. It also recommends near-term and long term improvements for EEN.

A highlight of the report was a collection of maps (Annex 3) that greatly improved the ability of the project team and stakeholders to visualize the physical relationships between EEN and the surrounding area. Once circulated, the maps were in high demand by government staff and the public.

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<sup>7</sup> Gergis, Obeid Faheem. 2004. *Urban Environmental Health Improvements in Ezbet el Nawar Water and Sanitation*, Kalyoubeya Governorate, Egypt. Project Document, Cairo Healthy Neighborhood Program. Cairo. 93 pages.

The report content was based upon information derived from many activities, including:

- Field visits to the offices of Cairo General Organization for Sewage Disposal (GOSD) and key sites including the Khesous Water Treatment Plant, Khesous sewage pump station, the Khesous Local Unit temporary sewage pump station; and the GOSD Gabel Asfar Sewage Treatment Works.
- Discussions with engineers and officials of Khesous LGU, Khanka Municipality and Qalyubeya Governorate.
- Transect walks through the community to view the environmental conditions provided opportunities to discuss informally with area residents, municipal workers and the private contractors building and maintaining the lines.
- Focus group meetings convened with the private contractors and the Gamiya leaders in order to better define the management mechanisms for the private sewer lines in the project area.
- Extensive discussions with the Water and Sewage Working Group that included Khesous LGU staff, CHNP consultants, sewer contractors and representatives from the Gamiya and the National Democratic Party.

### 3.2. Water Quality Survey by MoHP and CHNP

In response to concerns about the quality and quantity of drinking water available for EEN residents, the Ministry of Health and Population (MoHP) collected 75 water samples and analyzed them for multiple chemical and bacteriological parameters during March 2004. The MoHP contributed staff and transport for the sample collection. The Cairo Healthy Neighborhood Project (CHNP) developed a basemap for use in the sample and also provided hands-on training to MoHP sanitarians on methods for developing a strategy for selecting sampling sites. The costs for the laboratory analysis (US\$2,850) were paid by CHNP. The unit cost per sample was approximately \$38/sample.



**Sanitarian taking water samples**

Samples were gathered from 75 sites using MoHP-approved procedures by sanitarians from the Ezbet el Nawar and Khesous health offices of Qalyubeya Governorate and analyzed by the MoHP Environmental Monitoring and Occupational Health Studies Center, Imbaba, Giza. The sample sites were selected based on geographic location and proximity to water service and known sources of contamination after discussion with MoHP staff, area residents and project consultants. A map of the locations is attached as Figure 3. Staff based in Ezbet El Nawar (EEN) at the Experimental Center for Recycling and Environmental Development (ECRED) assisted the sanitarians and was quite instrumental in obtaining samples and identifying locations. The full report is attached as Annex II.

The sources included 31 samples drawn from municipal water lines, 37 from private underground wells and 7 from mixed lines where the systems were interconnected, but the source was inconclusive. All of the samples were tested for the following parameters:

Chlorine residual → pH → Turbidity → Total Dissolved Solids

Ammonia → Nitrite → Nitrate → Iron

Manganese → Calcium → Sulfate

Total Coliforms → Fecal Coliforms → Fecal Streptococcus

Bacterial Plate counts at 37°C and 25°C → Microscopic exam

In addition, six groundwater samples were tested for Chemical Oxygen Demand and another five for an array of twelve heavy metals, including:

- Lead
- Arsenic

- Cadmium
- Selenium
- Mercury
- Chromium
- Aluminum
- Zinc
- Copper
- Nickel
- Tin
- Silver

The sample sites for the heavy metal analysis were located within the Zareeb area where most of the garbage sorting and related recycling activities occur.

### 3.3. Neighborhood Health and Environment Survey

At the same time that the MoHP was analyzing water quality, MCW also fielded a Neighborhood Health and Environment Survey. Staff from the local NGO, Experimental Center for Recycling and Environmental Development (ECRED) conducted a neighborhood survey that queried representatives from five hundred and ten (510) households in the Ezbet el Nawar area over the course of three months.

The original intent was to use results compiled by an earlier Egyptian Demographic Health Survey (EDHS). The EDHS actually covered the larger area of Ezbet el Nakhl of which EEN is a small portion. Unfortunately, the results of that survey for EEN were not available yet. To move forward, the project elected to conduct a survey that targeted EEN.

The survey questionnaire format was based on the EDHS survey but expanded to obtain additional information on handwashing, solid waste disposal, the sewage and water supply systems and the resident's willingness to pay for improvements. Other topics included incidence of diarrhea and acute respiratory infections, alternate water sources and their quality, and water storage techniques.

Results were tabulated for each of 80 questions. The questionnaire in English and Arabic are attached as Annex 4. An additional 68 reports also were generated that analyzed the results of combining several parameters. For example, the zone and the main source of drinking water or age and incidence of diarrhea. These results are not presented formally in this report, but many conditions described by the survey are included in the later Assessment Results Chapter.

EEN was divided into six zones based on former agriculture and irrigation patterns. Respondents mostly were residents in just the four zones that are more accessible and in closer proximity to the ECRED office — Nawar, Sedak, Kantara and Hena areas. Although the results can be questioned as to whether they are truly representative of

the whole of EEN, they certainly adequately reflect those found in the heart of the community surrounding the Zeballeen settlement.

The selection of respondents was not completely statistically random. However, the surveyors attempted to select respondents randomly in the various zones and to make sure that they did not just go to the main streets or just the ground floors. The surveyors worked in pairs and generally required approximately one hour to administer each questionnaire. The data was then checked by the team leader and the results entered into an Access database.



## 4. Assessment Results

The results presented here describe characteristics about the general community and also the present state of the water and sewer infrastructure. The content is compiled from the three assessment methods described above (technical assessment for water and sewer, water quality sampling program and the neighborhood household health and environment survey). Rather than describe the results by assessment type, the information is combined and presented as follows:

- 4.1 General description of Ezbet el Nawar residents
- 4.2 Overview of Sewer and Water Services in Greater Cairo Metropolitan Area and Qalyubeya Governorate
- 4.3 Existing Potable Water Infrastructure in Ezbet el Nawar
- 4.4 Existing Sanitary Sewage Disposal in Ezbet el Nawar

The last two sections on water and sewer include descriptions of each infrastructure system, a summary of physical and institutional problems for each system and recommended actions (near and long term).

### 4.1. General description of Ezbet el Nawar residents

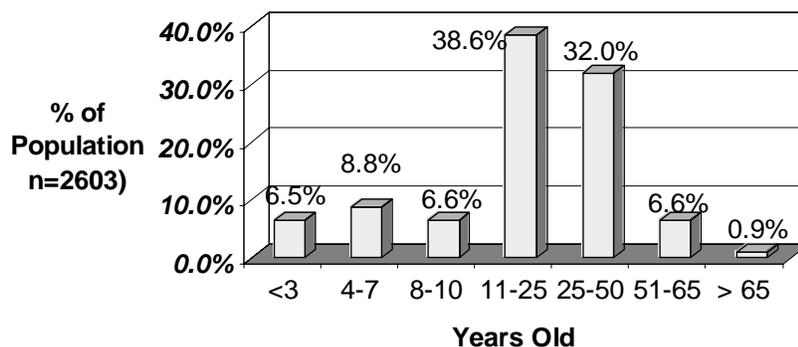
#### 4.1.1. Age distribution

Ezbet el Nawar is an informal settlement that has developed in an unplanned fashion along the southeastern boundary of Qalyubeya Governorate where it abuts Cairo Governorate. It is part of the Greater Cairo Municipal Area but under the administrative authority of Qalyubeya Governorate, Khanka Municipality and Khesous Village.

A residential population of an estimated 72,000 people live on an area of 21 hectares. According to Local Unit Water Billing Records, there are 5,240 buildings as of 2003. Most range in height from 3–8 floors. A Local Unit Site Survey in 1996 estimates that about 23,800 families reside here.

The 510 households in the survey represented approximately 2,603 individuals. The population is young as seen in the age distribution below. Sixty percent of the population is 25 years old or less.

### Age Distribution for EEN



#### Age distribution for EEN

#### 4.1.2. Health status

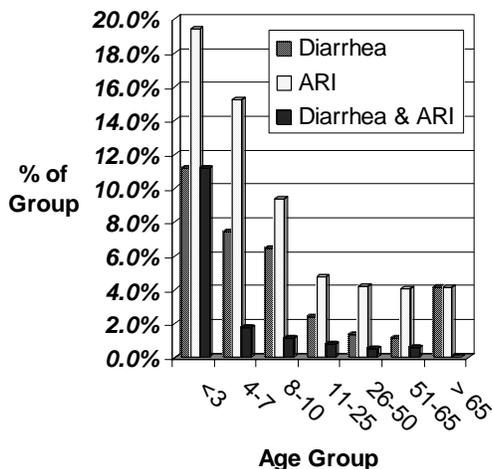
Approximately 11% of the people represented by the survey reported experiencing either diarrhea or acute respiratory infections (ARI) within the two weeks prior to the survey. Acute respiratory infections accounted for about 87% of the illnesses. Anecdotal evidence indicates that the rate of infection for ARI will decline as the weather warms and the number of diarrhea related ailments will rise.

Table 1. Incidence of diarrhea and ARI reported to have occurred within 2 weeks of interview.

Disease Type	# reporting illnesses within last two weeks	% of survey population
Diarrhea	85	3.22
Acute Respiratory Illness	176	6.68
Diarrhea and Acute Respiratory	38	1.44
<b>Total Illnesses</b>	<b>299</b>	<b>11.34</b>

At first glance, the age group 11-25 had the greatest number of infections but the occurrence rates for different age groups shows that infants 0-3 years of age were most at risk for both diarrhea and acute respiratory infections. When combined, the morbidity due to these two broad classes of ailments approached 42% (71 of 170 infants) of the 0-3 group. The combined rate for the next age group, 4-7 years, was nearly halved at 24.3%. Mortality data was not available. In general, children aged 10 years and less had higher rates of incidence for diarrhea and/or ARI when compared between groups.

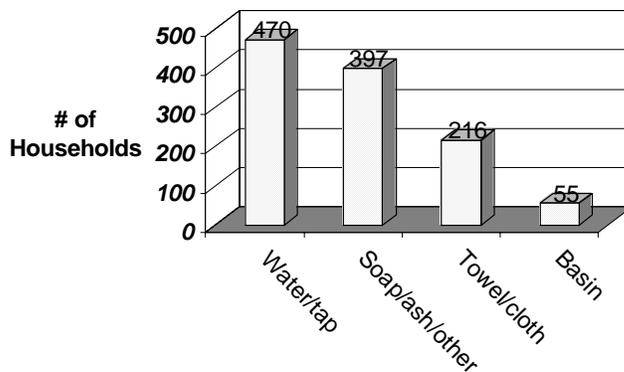
### Prevalence of Diarrhea and Acute Respiratory Infection by Age Group



### 4.1.3. Handwashing

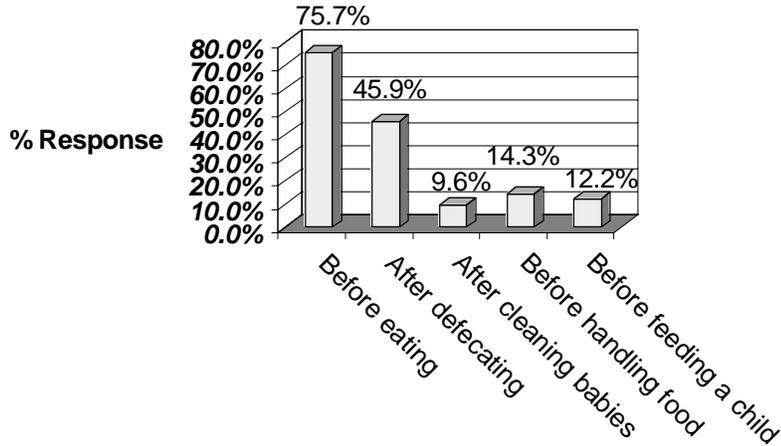
Handwashing facilities were available in the same room or in a room adjacent to the toilet for 80% of the residences. Another 18% had facilities but they were not near the toilet facility. The presence of various implements for handwashing was noted during the survey. The results are displayed below. Very few places had hand basins. Water was present in over 90% of the households in the survey, but soap was present in only about 78%.

### Items Present in Handwashing Area



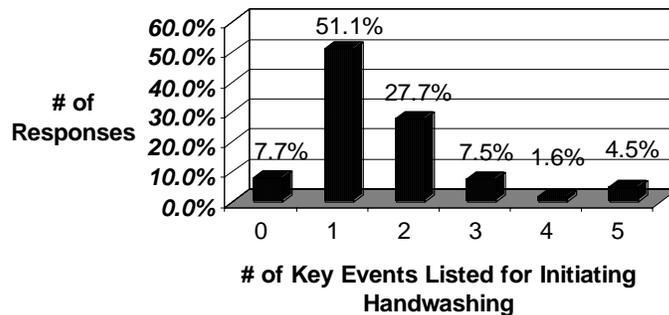
The survey also tried to identify knowledge about the importance of handwashing. Persons were requested to name activities that should be either preceded or followed by handwashing.

### When Should You Wash Your Hands?



The most commonly described handwashing activity was that which occurred prior to eating. Approximately 76% suggested that one should wash their hands before eating. Only 46% mentioned washing their hands after defecating. Fewer than 15% of respondents talked about washing after changing diapers, or before feeding children or before handling food. More than half could list at least one of the critical times for handwashing but only about 28% mentioned two. Some (8%) did not list any of the critical times for handwashing.

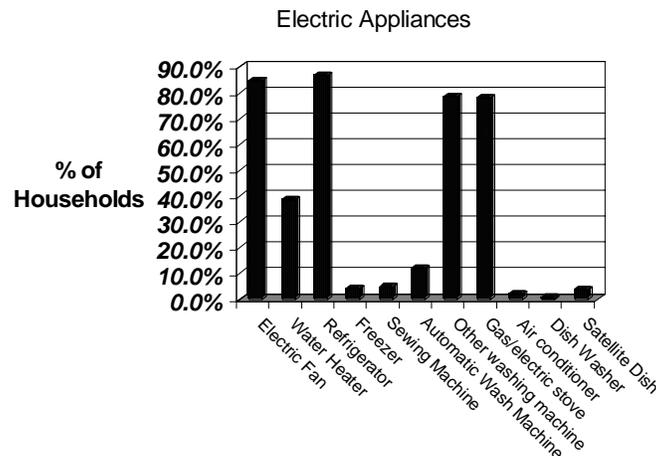
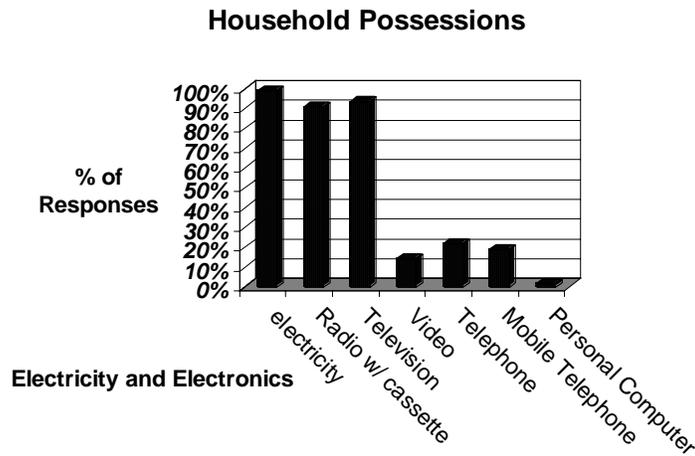
### Handwashing Awareness



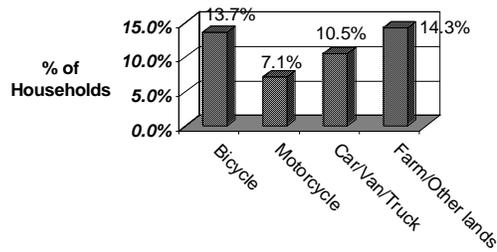
#### 4.1.4. Social Status

The following charts illustrate the ownership of various household appliances and modes of transport. Information about social status was collected in order to better understand the character of the community. Was the population generally destitute or was it doing better than that? Since people are quite reluctant to reveal their salaries and income level, we looked at possessions as a means to gauge their status.

Nearly all of the households had electricity, radios and televisions. Other common appliances included a fan, refrigerator, gas or electric stove (mostly bottled gas) and a basic cloths washer. The findings show a more established neighborhood with some modest income available to contribute to community improvements. The findings also corroborate anecdotal evidence that residents generate a viable income stream from working with recycling and garbage collection.



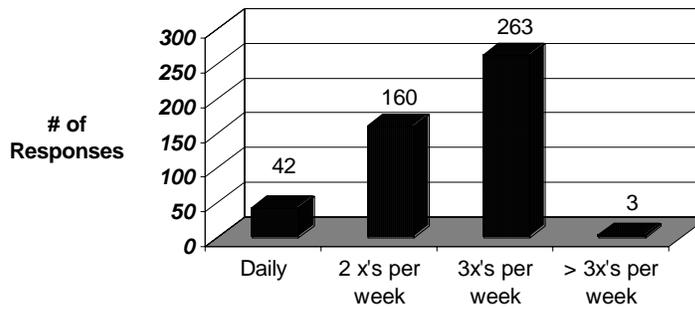
### Transportation and Land Ownership



## 4.1.5. Solid Waste Disposal

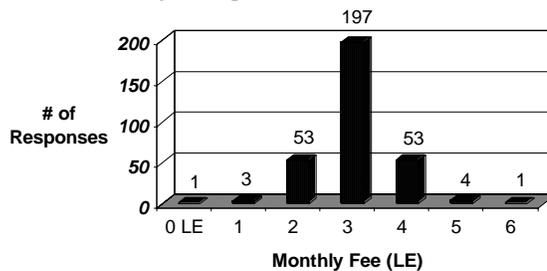
Questions about solid waste disposal were limited to the means of disposal, frequency of collection and the monthly costs. The most common disposal method was for someone to come and collect it directly from the home (71%). Another 6% had their waste collected from containers placed in the streets. Less than 2% fed their waste to animals. Nearly 14% disposed of their solid waste by dumping on the side of the roads or in nearby canals. This material is burned regularly and contributes to localized air pollution.

### Frequency of Trash Collection



The frequency of collection seems relatively high with pick-up occurring 2 or 3 times per week. The average monthly amount charged for the service was 3 LE.

### Monthly Charge for Waste Collection



## 4.2. Sewer and water services in Greater Cairo Metropolitan Area and Qalyubeya Governorate

Ezbet el Nawar is part of Qalyubeya Governorate and is immediately adjacent to the northeast section of the Greater Cairo Metropolitan Area. One cannot discuss the infrastructure, services, and administrative status of the project area (Ezbet El Nawar) without also considering its geo-political relationships with Greater Cairo Municipal Area and Qalyubeya Governorate.

### 4.2.1. The Greater Cairo Metropolitan Area

The Greater Cairo Metropolitan Area (GCMA) is composed of Cairo Governorate, Giza City, and Shobra El Khaima City. Qalyubeya Governorate is not part of the GCMA. The GCMA forms Egypt's metropolitan center and is one of the world's most densely populated urban areas. Cairo's rapidly expanding developed area is estimated to be 1,460 km<sup>2</sup>. Officially, its residents are estimated at about 12.4 million (1996 Census), but unofficial residents, squatters, homeless persons, and daily commuters bring the population significantly higher to between 16-18 million inhabitants. Although Qalyubeya Governorate is not within the GCMA, the Cairo infrastructure systems greatly influence the project area and the improvements proposed for EEN.

#### 4.2.1.1. Potable water of Greater Cairo

Established in 1865 under franchise contract, the Cairo Water Authority provided potable water service to Cairo until 1971 when the General Organization of Greater Cairo Water Service was established under presidential decree. Under the control of Cairo Water Authority, this general authority is responsible for the larger GCMA. Construction of water infrastructure in Cairo is the responsibility of the Cairo Water Authority. At the national level, construction of water collection and treatment infrastructure has historically been the role of the National Organization for Potable Water and Sanitary Drainage (NOPWASD).

There are presently thirteen surface water treatment plants (WTP) serving the GCMA. Eleven of these WTPs draw raw water from the Nile River. The remaining two draw from the Ismailia Canal. One of these is the Mustorad Treatment Plant, which is closest to Ezbet el Nawar. It has a capacity of 1.25 million m<sup>3</sup>/day. The combined treated water capacity of all thirteen WTP's is 6.2 million m<sup>3</sup>/day. Ongoing expansions to the existing WTP's are anticipated to increase overall treated water production to 6.8 million m<sup>3</sup>/day by the year 2007. The WTP's deliver treated water to the distribution system by twenty-four separate pumping stations located throughout the service area. The existing potable water distribution system of the GCMA has a length of 9,800 km (excluding house connections) and serves more than 720,000 registered customers.

#### 4.2.1.2. Wastewater of Greater Cairo

As with the water systems, the larger cities of Cairo, Giza and Alexandria have created semi-autonomous authorities for their respective areas. Construction of wastewater infrastructure in Cairo is the responsibility of the Cairo Wastewater Organization (CWO). Operation and maintenance of wastewater infrastructure after commissioning is the responsibility of the Cairo General Organization for Sanitary Drainage (GOSD). The NOPWASD is also responsible for construction of wastewater collection and treatment infrastructure at the national level.

Cairo has had centralized wastewater collection since 1914. Rapid growth combined with inadequate expansion and poor upkeep of Cairo's original sewage collection system to produce frequent and widespread flooding of Cairo's streets and a rising water table. This posed considerable health risks and also damaged the foundations of buildings and national monuments. In 1965, "The Hundred Day Project" was undertaken to rehabilitate the existing collection system. Consultants in U.S.A. & Great Britain began to expand and improve the collection system in 1976. Executed in 1984 at a cost of 12 million LE, this project would later become known as the AMBRIC Project — perhaps the largest sewage collection and treatment project undertaken in the 20th century.

Under the AMBRIC project, the total wastewater collection and treatment capacity of the Greater Cairo Metropolitan Area increased from 1 million m<sup>3</sup>/day to 3.7 million m<sup>3</sup>/day. Six Wastewater Treatment Plants (WWTPs) and ancillary support infrastructure including lift stations, force-mains, and collection system improvements and expansions were constructed providing sewerage service to 90% of the urban population. A major lift station, Khesous Pump Station, is located within the project area of Ezbet el Nawar but does not receive sewage from EEN. Simultaneously, wastewater collection was provided in other suburban areas of the city under the integrated state plan.



#### 4.2.2.2. Wastewater collection and treatment for Qalyubeya

Four major cities in Qalyubeya Governorate currently have operating wastewater collection and treatment facilities. These include the cities of Kalyoub, Kafr Shokr, Toukh, and Meet Kenana. Total wastewater capacity of the Governorate is 115,000 m<sup>3</sup>/day.

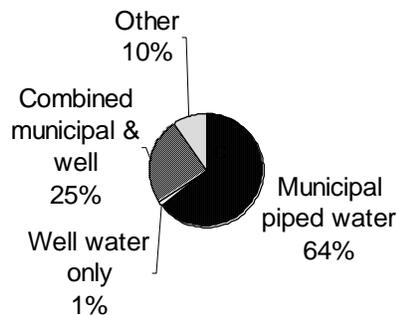
Additional sewage projects are currently under construction to provide treatment for the cities of Benha, Al Kanater, Al Khaireya, El Khanka, Abu Zaabal, Shebin El Kanater, Kaha, Sariakous, Beltan, Mentaille, and, Shobra El Khaima adding an additional capacity of 122,000 m<sup>3</sup>/day . In Qalyubeya Governorate, by the year 2017, it is anticipated that a total of 51 sanitation projects of capacity 868,000 m<sup>3</sup>/day will be in operation.

### 4.3. Existing potable water infrastructure in Ezbet el Nawar

#### 4.3.1. Water supply

Access to sufficient quantities of clean potable water is critical to maintaining good health and hygiene. Providing clean water is a concern in any area of densely packed housing and Ezbet el Nawar is no exception to this rule. Although 64% of the respondents use only municipal drinking water piped into either their own residence or the neighbor's home, another 25% have added a well onto their water system. In most cases the wells are bored within the foundation of the dwelling and are connected directly to the building plumbing. Given the poor water quality found in the community's shallow wells as shown in the separate MoHP water sampling regime, this creates immediate problems of cross contamination of the building water pipes and the municipal filtered water distribution system.

**Main Sources of Drinking Water**



Potable water in Ezbet El Nawar historically has been supplied by several sources in Cairo Governorate:

- The Al Marg Water Treatment Plant (Cairo Governorate)
- The Mustorod Water Treatment Plant (Cairo Governorate)
- Khesous Water Treatment Plant (Qalyubeya Governorate)

#### 4.3.1.1. Al Marg WTP — Cairo Governorate

Prior to 1975, Ezbet El Nawar was a village of less than 60 houses and 300 persons. It was served by individual private wells. In 1975, a four inch potable water main-line from El Marg water plant was constructed to supply disinfected well water to the rapidly growing village. Existing private wells were then abandoned or used as a supplemental water supply. Water from El Marg Water Treatment Plant (WTP) was replaced in 2000 by surface water extracted for the Nile River at Mustorod WTP under the AMBRIC Project. Al Marg is the nearest Cairo water treatment plant to Ezbet El Nawar.

The GCMA has plans for developing a new water treatment at Al Marg with a capacity of 300,000 m<sup>3</sup>/day to serve El Marg and Ezbet El Nakhel. Planned for commissioning in 2008, it is anticipated that the additional water supply could increase the duration of water service to EEN to 24 hrs per day, provided that agreement is reached between Cairo and Qalyubeya governorates to provide water across the boundary.

#### 4.3.1.2. Mustorod WTP — Cairo Governorate

Mustorod Water Treatment Plant (capacity of 1.250 million m<sup>3</sup>/day) lies southwest of Ezbet el Nawar on the Ismailia Canal. It feeds areas of east Cairo including: Nasr City, Heliopolis, El Salam, El Nahda, Al Marg, and Ezbet El Nakhel.

In 1994 two asbestos cement force-mains were constructed from the Cairo Governorate to serve Ezbet El Nawar. An eight inch pipe was installed to the eastern portion of the project area entering at El Sheik Mansour Street. A second 6 inch pipe was extended from Al Khesous in the north to Teraat El Zananeery Street. The two lines supply potable water to the northern, central and eastern parts of the project area.

During this assessment Mustorod WTP supplied water to the project area through these two force-mains only for approximately five hours each day, usually from 1:00 am to 6:00 am. According to the LGU, the demand in the Cairo distribution system exceeds the supply from Mustorod. Water comes to EEN only when demand drops enough that sufficient pressure is available to send water to EEN.

#### 4.3.1.3. Khesous WTP

A third force-main (six inch PVC) has recently been installed (November 2003) from Khesous WTP with the intent to supply the western portion of Ezbet El Nawar along

the Khesous Drain. However, this line has not been commissioned at the time of this assessment. It is rumored that there is not enough production from Khesous WTP to supply this new line.

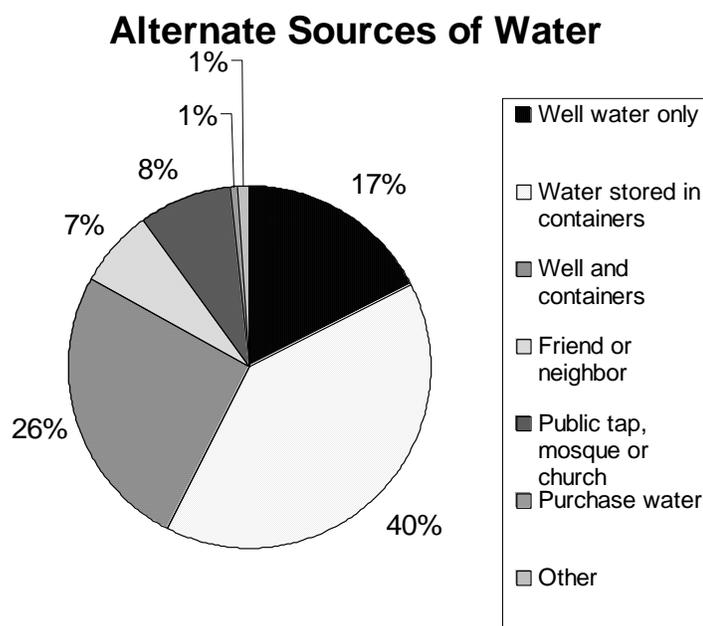
The Khesous WTP is located just north of the Ring Road along the eastern bank of the Ismailia Canal. It is comprised of two small package plants using sand filters. The production rate is approximately 100 m<sup>3</sup> per hour as only one of the two units is functioning. Even then it is running only 14 hours per day as the stand-by pump is inoperable. The second unit is not running due to the lack of a functioning chlorination injection system. It has been off line for more than two years. The site also has several wells for water sources; however, the pump for one well is inoperable and other pumps raw water into the distribution line. Startup would require repair of the pumps and disinfection of the wells.

A key problem seems to be the lack of adequate funding for routine maintenance and operation costs. The WTP does not have a set operations budget except for staff salaries. Any routine expenses must be requested from the Local Unit (purchase of tools, equipment parts and repairs or routine consumables, like alum flocculants or the chlorine for disinfection). The request often is sent to the Utility Department at Khanka Municipality which then forwards it to the Governorate offices in Benha.

#### 4.3.2. Cuts in municipal water service

Cuts in water service occur often in Ezbet el Nawar. Nearly 83% said that the water had been cut during the previous two weeks and 62.5% said that it occurred daily or almost daily. More than half receive water for less than 5 hours per day. Water is most commonly available in the early morning hours from midnight to about 6:00 am according to anecdotal evidence. This is likely to occur as demand drops in the rest of the Cairo distribution system thus raising pressure high enough to feed water to EEN.

The strategy for obtaining drinking water varies when the supply is cut. Very few go to an alternative public source, like a public tap (3%), church or mosque (5%), or purchase water (<1%). Nearly 17% switch to using well water exclusively and 40% use only water stored in their own containers. Another 25.5% switch to their well and also use water stored in containers. When questioned specifically about storing water, 94% of the respondents said that their household stored water for use.



#### 4.3.3. Use of private wells

Local area residents rely upon private, shallow ground water wells to supplement the municipal supply for drinking water (17%) and especially for non-drinking uses like bathing, washing clothes and food and cleaning the household. Water is extracted from private wells by hand pumps or electric motors. In cases where hand-pumps are employed, water is either used on the spot or gathered in containers and transported to the home by hand. In cases where electric pumps are utilized, well water often is injected directly into the building's potable water piping system. From initial field visits it is estimated that as much as 90% of the buildings examined were equipped with private wells. Most of these are constructed within the confines of the building foundation. Few buildings were equipped with overhead storage reservoirs.

Use of private well water is an issue of great concern. First, most of the wells are typically shallow in depth (less than 30 meters in most cases) and draw from the shallowest and unprotected aquifer. Second, many wells are poorly located in or near trash sorting areas or animal pens. They often lack sanitary seals and are mainly unprotected from surface contamination. The historic use of the area for swine farming and solid waste recycling combines with the lack of proper sanitary drainage to make groundwater contamination a distinct possibility. Water quality sampling conducted by the project through the MoHP confirms this condition and was described earlier. The possibility of ingesting contaminated water is a distinct possibility since it is used without disinfection.



**Unprotected well in Ezbet el Nawar.**

As mentioned earlier, the private wells often are connected directly to building piping systems. In these cases the possibility of contaminating the local distribution system is high because there are no internal check-valves to isolate residential piping from the rest of the distribution system. Back flow and siphoning of contaminated water can easily occur as the pressure drops in the municipal system since disinfected potable water is supplied only during limited hours by the municipal network.

#### 4.3.4. Municipal water distribution system

##### 4.3.4.1. Laterals

Private contractors have extended potable water laterals from transmission mains to nearly 95% of the project area. Poor control of design and installation has left a lateral distribution system with potable water lines of poor quality, Many have been installed

at shallow depths making them vulnerable to crushing by street traffic, tampering and illicit connections.

Pipe breakage and leakage is common throughout the distribution area, and it may be assumed that water losses are quite high. The use of a reticulated branching system and the lack of a loop distribution network also led to higher pressure requirements in order to supply water to the ends of each line. This causes more frequent bursting of pipes when the system is charged fully after a period of low or no pressure, a very common occurrence in EEN.



**Installation of new 6" water pipe next to road bed. Note absence of sand bedding and shallow depth.**

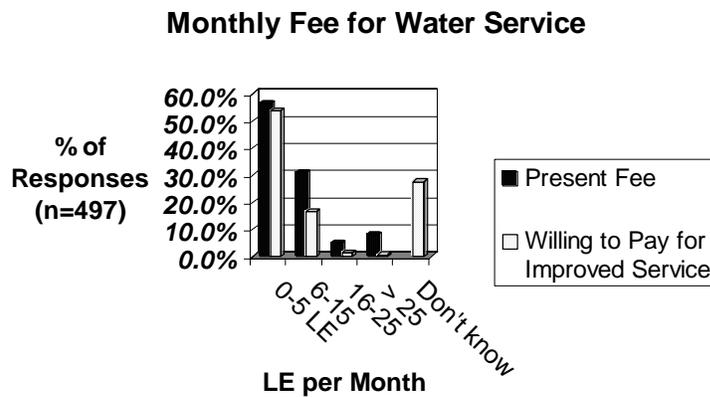
This situation is exacerbated by the fact that there are few valves or hydraulic controls within the local distribution system. The lack of internal controls makes it difficult to distribute water evenly or to make repairs efficiently.

#### 4.3.4.2. House connections, metering and billing

House connections are completed either by the LGU Engineer, private contractors, building owners, and individual residents. House connections require an official permit from the LGU. However, many permits are often granted retrospectively upon

discovery. Standards for house connections do not appear to be rigidly enforced though nearly all connections examined during initial field visits were metered by Cairo Water Authority. This was also corroborated by the results of the Neighborhood Household Environment and Health Survey described later in this document.

Residents with piped water reported that 94.5% had water meters of which about 95% were functioning. The cost of water varied with most (56%) paying 5 LE or less per month and another 31% paying between 6-15 LE per month. In principal, meters are read monthly and customers are billed accordingly. When questioned about their willingness to pay for improved water service, it seems that people generally wanted to pay less than they were currently paying.



### 4.3.5. Potable water demand and supply quantities

#### 4.3.5.1. Potable water demand

An actual measurement of potable water demand was difficult to obtain. While city water is metered to most customers, additional water sources, such as private wells, are not.

Water demand was therefore estimated by assuming that per capita water demand would be similar to surrounding Cairo area namely between 150 to 250 liters per capita per day. Assuming a present population of 72,000 persons implies a daily demand of 10,800–18,000 m<sup>3</sup>/day.

#### 4.3.5.2. Potable water supplied

The bulk metering records were not available for water distributed to the area so no accurate measurement of water distributed to the project area was available during the assessment. As such, we assume a best-guess scenario based upon the following known facts and assumptions.

Knowing:

- That water is delivered to the area by two operational force-mains, one six inch and one 8 inch
- Water is delivered for 5 hrs from 1:00 am to 6:00 am

To meet the theoretical demand of 18,000 m<sup>3</sup>/day over a 5-hour period the combined flow in both supply pipes must be at least 1 m<sup>3</sup>/s (1000 l/s).

Without knowing the actual operational pressure gradient it is not possible to determine the actual flow in pipes supplying Ezbet el Nawar. However, by assuming a velocity of 3 meters per second (a very high velocity in practice) and knowing the pipe diameter, it is possible to calculate the maximum (ideal) volume of water deliverable over the 5-hour supply period.

Table 2. Summary of Calculation of Maximum Supply to the Project Area

Pipe Diameter (inches)	Pipe Diameter (meters)	Area (m <sup>2</sup> )	Velocity (m/s)	Flow (l/s)	Delivery Period (hrs)	Total Volume Deliverable (m <sup>3</sup> )
6	0.15	0.018	3	53	5	954
8	0.2	0.031	3	94	5	1696
Total						2651

The maximum volume of water that can be supplied through pipes of this diameter neglecting frictional losses is 2,651 m<sup>3</sup>. Thus the maximum per capita supply of potable water provided is 37 liters per day. If we account for additional losses due to leakage (25% very conservative) then this amount diminishes to 1988 m<sup>3</sup> or 28 liters per capita per day.

Assuming that this is a best case scenario we can safely assume that there is at least a deficit of 15,000 m<sup>3</sup>/day or 85% in municipal water supply to the project area.

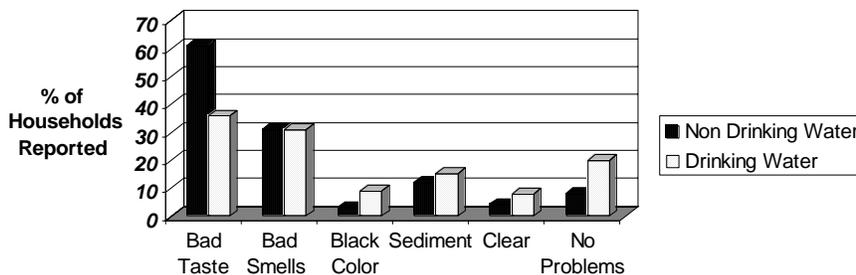
This conclusion is generally supported by the high prevalence of private wells located throughout the project area and by complaints of potable water shortages by local residents during field observation exercises. It may be generally assumed that the majority of the existing water deficit is offset by private well water since there is little evidence of water vending visible in the area.

#### 4.3.6. Water quality

Availability of good quality potable water is critical to health. Consumption of poor quality water can spread diseases such as hepatitis, typhoid, cholera, dysentery, chronic diarrhea, and dermatitis (skin infections).

Households were asked during the neighborhood survey to describe their drinking and non-drinking water. The non-drinking water was more frequently described as having a bad taste. Drinking water was more frequently characterized as having “No Problems.” Curiously, both were equally reported to have bad smells and the municipal drinking water had more complaints about black or brown color. The drinking water had slightly more sediments reported.

**Perceptions of Drinking and Non-drinking Water Sources**

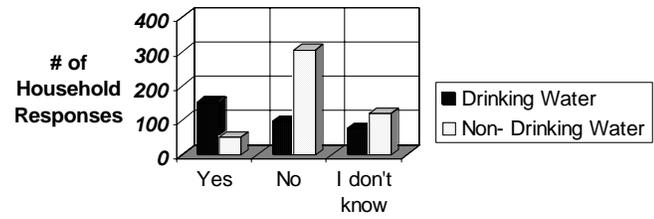


The qualitative findings of the neighborhood survey are corroborated by the results from the MoHP Water Quality Sampling Program. The analysis of 75 samples (both municipal and raw groundwater wells) indicated that EEN residents generally do not receive enough high quality water. Nearly 75% of the samples did not meet the minimum acceptable standards for drinking water in Egypt including 18 of 31 samples drawn from municipal lines. Multiple instances occur where the municipal water samples contained excessive levels of algae, coliform bacteria, nitrate/nitrite and total dissolved solids (TDS). The samples from private wells show high levels of bacterial contamination and excessive amounts of TDS, manganese and nitrate-nitrite compounds. Fortunately, of 5 groundwater samples analyzed for heavy metals, none were found to have levels exceeding MoHP standards.

The water sample results also illustrated the uncertainty of the type and quality of water one receives on opening the tap. Samples that were purportedly drawn while connected to the municipal system actually exhibited elevated levels of nitrate/nitrite and TDS that were more characteristic of the ground water. In some instances, they occurred at intermediate levels that were indicative of a mixture of well water and municipal filtered water. With hundreds of private wells cross connected to building plumbing and thus to the municipal lines, people can never be certain about the quality of the water flowing from their tap.

This uncertainty was reflected in answers to questions about the quality of the water during the household survey. Only 47% felt that the municipal water was safe to drink without any treatment. Another 23% did not know. For the non-drinking water sources, more than 65% felt that it was not safe to drink without treatment.

**Is your water safe to drink without treatment?**



**Cross connection between well source (lower line) and municipal water source with meter (upper).**

### 4.3.7. Household treatment of water

Despite the lack of confidence in the water quality and the widespread perception that the water may not be safe to drink untreated, very few households treated their water to make it safer. Fourteen households boiled their water and only one filtered it. No household reported adding a disinfectant like chlorine or using sunlight (UV-ultraviolet light) as a means to disinfect the water.

### 4.3.8. Summary of deficiencies in potable water supply

#### 4.3.8.1. Key problems for the physical infrastructure for water supply

- Water network is poorly structured and lacks zone control valves and outlets for flushing the lines clean.
- The network is laid at depths that are too shallow and without following good installations practices, such as proper sand bedding and following grade.
- The reticulated distribution system and lack of a looped system design requires higher pressures in order to provide water to the ends of the lines. This increases the chance of bursting pipes when the system is charged fully after being under low pressure for most of the day.
- Breakage of both water and wastewater networks are common. Their close proximity to each other makes cross contamination of the potable water by sewage a possibility.
- The Cairo water source provides water only for about 5 hours per day (late night and early morning) during periods when system demand is low enough to leave water for EEN.
- The only alternate Qalyubeya source available for EEN is operating at less than 50% capacity due to equipment breakdowns and poor maintenance.
- Hundreds of cross connections exist between raw groundwater wells and the municipal water system thus creating the potential for multiple points for contamination to occur. With no check valves to prevent “back-flow” in the system, and the municipal supply only available for 5 hours each day, the system is regularly contaminated with non-disinfected well water. This was substantiated by the results of the MoHP water survey.

#### 4.3.8.2. Key problems for the institutional structure for water supply

- Qalyubeya lacks the ability to transfer funds to Cairo as payment for water use. As a result, alternate water sources in Cairo Governorate are not available.
- There is little bulk metering of water entering EEN so one cannot monitor the quantity of use. This is essential for facilitating future billing between Cairo and Qalyubeya.

- Money is collected to maintain water system through water meters and a tariff but the funds are forwarded to the governorate and onto the central fund. Insufficient funds are returned to the LGU to pay for local O&M costs.
- Water tariff rate is set too low and does not cover the costs of producing and distributing potable water.
- Many of the existing land use practices negatively impact local groundwater quality. Pooling sewage, unmanaged garbage sorting and intensive swine farming pollute the groundwater.
- Private wells (usually less than 30 m depth) supply raw un-disinfected groundwater directly to the potable water network.
- The LGU has little control over new water connections due to lax control on new building construction. As a result, demand for additional water remains high.

#### 4.3.9. Recommended Actions for Improving Water Supply

Since it is difficult to determine water sources at the household tap, all residents should be encouraged to sterilize their water prior to drinking it by boiling, filtering, addition of disinfecting solutions (chlorine or iodine) or be solar disinfection. Households with young infants less than 6 months old should not use groundwater for drinking purposes unless it comes from an approved source. There is a risk of hemoglobinemia occurring in the infants consuming water with excessive nitrite and nitrate concentrations.

Simple disinfection of the water by boiling, filtering or solar disinfection does not remove nitrite/nitrate compounds, but it does significantly lower the risk of bacteriological infections. Infants should be breast fed and given commercially bottled water from approved sources or water from an approved municipal water source after disinfection. After the age of 6 months the risk of anemia decreases substantially. By that age, an infant is able to assimilate the nitrite/nitrates due to changes in the micro-flora content of the gastro-intestinal tract.

The long-term solution is to increase the amount of good quality potable water for EEN. Repairs and renovations of the existing water treatment plant for Khesous will increase the capability to treat water drawn from the Ismailia Canal and from deep groundwater wells but this is not enough. An additional source is required. A future renovation planned for Al Marg water treatment plant could be modified to provide enough additional capacity sufficient to meet the needs of Ezbet el Nawar and adjacent areas. This would greatly increase the supply for Khesous and Ezbet el Nawar. This requires greater cooperation between the two governorates and a system for payment.

Upgrades and maintenance of the distribution network infrastructure would improve the long-term delivery of potable water to the residents of Khesous and Ezbet el Nawar. This may include replacing existing pipes with larger mains, installing

booster pumps, control valves and flushing points, adding loops to connect the dead-ends of lines and developing a maintenance program. Such a program could be partnered with a program to remove the cross-connections between raw groundwater sources that contaminate the clean, potable water in the municipal distribution system.

#### 4.3.9.1. Immediate actions:

- Create public awareness about water quality of EEN, and importance of good handwashing and hygiene practices to human health,
- Install gate valves on distribution system to improve ability to isolate, repair and maintain the system.
- Improve treatment efficiency of existing package treatment units at Khesous Water Treatment Plant by renovating and maintaining equipment.
- Develop a program by LGU staff for cleaning and maintaining the distribution system and the water treatment plant.
- Create public awareness program about methods for disinfecting water: boiling, chlorination, filtering and exposure to UV light (solar disinfection).
- Initiate discussions between Cairo and Qalyubeya to set aside future water capacity at the proposed renovation of the Al Marg Water Treatment Plant.
- Install water meters on mains to determine bulk volume into different sections of EEN.
- Create program to disinfect and protect wells.
- Create program to separate well water from municipal water lines in buildings.

#### 4.3.9.2. Long term actions:

- Institute tighter control on construction of new buildings and on enlarging existing buildings to reduce new demand for additional water.
- Conduct a study throughout EEN to determine where to rehabilitate network lines by replacing with larger diameter mains and laterals and installing control valves.
- Create a looped distribution system by connecting dead-ends together to even the pressures in the system.
- Expand capacity of Khesous Water Treatment Plant by adding additional treatment units.
- Develop a coordinated system for water billing to share costs between Cairo and Qalyubeya.
- Add auxiliary booster pumps along the mains to maintain network operational pressure between 25–45 meters head.

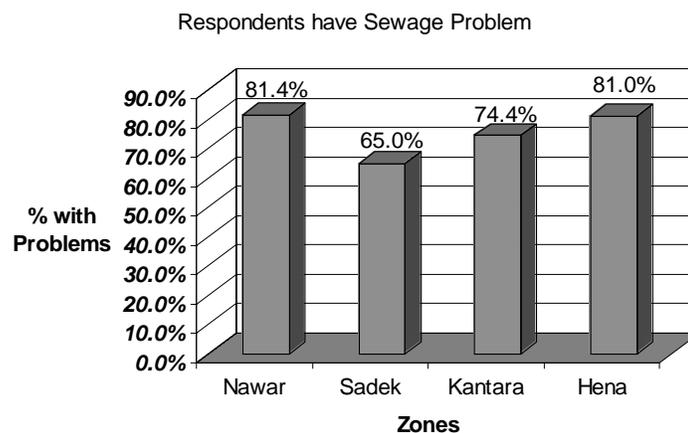
## 4.4. Existing sanitary sewage disposal in Ezbet El Nawar

Most households use toilets to dispose of feces although several households did not have a toilet facility. Modern sit-down, flush toilets were used in 47.6% of households and traditional squat plates with bucket flushes were used in 43.5%. The vast majority (95.3%) were reported as functioning at the time of the survey. Access to the toilet facility usually was not shared between other households. Only about 3% reported sharing their toilet with others.

Very few respondents to the neighborhood survey claimed to be using onsite disposal systems. Most of the toilets (97%) reportedly drained into the private sewer laterals that exist in the roads. These in turn connect to the larger interceptor sewers of the LGU. The remaining households discharged to sealed vaults or septic tanks with soak-aways.

Wastewater in the project area is collected by a reticulated (branching network) sanitary drainage system. The present system consists of a jumble of publicly and privately constructed trunk-mains and lateral collectors composed of reinforced concrete, asbestos cement, vitrified clay, and PVC pipe. At present, many of the laterals discharge directly to drains and nearby low-lying areas. Construction of the existing reticulated collection system began some ten years ago and is presently ongoing.

Almost all of the respondents reported problems for the sewage system. Only 11.5% overall had no problem with their own residence or that of their neighbors. The areas with the most prevalent sewage problem were Nawar and Hena with 81% of respondents having contacted someone about problems with sewage.



## 4.4.1. EEN sanitary sewer network

### 4.4.1.1. Trunk mains

Construction of a reticulated sanitary drainage system to service Ezbet El Nawar began in 1998 when Cairo Wastewater Organization constructed approximately 2.6 kilometers of trunk main collector to service the area. Trunk collectors are 450 to 900 mm in diameter and composed of vitrified clay. Maintenance is the responsibility of the LGU, which lacks the proper equipment.

Approximately 7 kilometers of gravity flow trunk mains have been installed to this date in EEN by the Greater Cairo City Sewage Authority. Generally, City-built gravity trunk main collectors in EEN were found to be of similar but lesser quality to trunk-mains constructed throughout the rest of Greater Cairo. Cairo trunk mains are constructed of reinforced concrete pipe 500 mm to 1000 mm in diameter. Manholes are cast in place and manhole covers are standard steel covers used throughout the Greater Cairo area. Many of the manholes in EEN are missing and have been replaced by make-shift covers, such as used auto tires filled with concrete.

The gravity flow trunk mains flow from east to west and then proceed north towards the Khesous Pumping Station, a huge lift station carrying Cairo wastewater north towards Gabel Asfar Wastewater Treatment Plant. According to Engineer Obied, the existing Khesous Pump Station has a capacity of 100,000 m<sup>3</sup>/day and will expand to 200,000 m<sup>3</sup>/day by 2008 under the current AMBRIC Cairo Master Plan.

Unfortunately, a key facility (wet-well and pump station) to collect and force the wastewater from EEN across a small drain to the Khesous Pump station has not yet been finished. It was scheduled to be completed as of November 2003, but work was halted due to a contract dispute. The contract was subsequently re-bid and work resumed late in Spring 2004. A reasonable completion date appears to be early 2005.



**Incomplete CWO pump station and force-main system**

To keep the trunk mains flowing in EEN, a temporary pump station has been constructed at the site of a manhole. Two electric pumps (one submersible pump (75 l/s) and a horizontal unit (30 l/s) have been placed for use. There is also a portable diesel powered pump (25 l/s) adjacent to the pump shed. These units receive the flows from the main trunk line leaving EEN and discharge it directly into the Khesous Drain. It does not go into the Khesous Pump Station for transport to Gabel Asfar and treatment.

The temporary pump station and force-main system is a key component of the local sewage collection system and was identified as a continuous problem due to frequent failures. Significant parts of EEN flood within 5-6 hours when the electricity fails or fuel runs out for the diesel powered pump.



**Temporary pump station in Ezbet el Nawar**



**Inlet structure for temporary pump station in Ezbet el Nawar**

#### 4.4.1.2. Lateral Collectors

In 2000, the Tawfeikeya Canal on the southern boundary of EEN was covered by the Ministry of Water Resources and Irrigation to eliminate public health problems associated with the poor condition of the drain and its water quality. Unfortunately, this occurred before any system was created to handle the large quantities of sewage being discharged by neighboring residences. A severe problem for sewage disposal was created immediately.

In response, the first lateral sanitary drainage network was constructed by Cairo Wastewater Organization to connect the house sewers to the receiving trunk mains. Consisting of 5300 m with 250–300 mm diameter vitrified clay pipes, it services the southern most area next to the former canal, approximately 5% of project area (9 Hectares).

Today the lateral collection system has been quasi-officially expanded to serve the project area. Due to staff and budgetary limitations of the local government unit, lateral wastewater collectors in Ezbet El Nawar are typically installed by private contractors who are paid for their efforts through a collective contribution from residents to be served by the system extension. A one time “connection” fee of 500 LE was commonly quoted by local residents. Much of this happened without concern for the overall system.

Approximately 40 km of lateral collectors have been installed without proper design, engineering, or construction supervision, and using substandard building materials. Many of the laterals discharge into nearby drains. There is little coordination between private contractors or oversight between local and city sewer authorities.



**Sewer pipe discharging into Khesous Drain.**

#### 4.4.1.3. House connections

House connections are made for the home or building owner by a private contractor. Typically connections are of PVC type pipe although other materials such as ductile iron and vitreous clay were also observed.

Access to the sewer system is not well regulated. House connections to the sanitary drainage system must be approved by the Local Government Unit, but most are not reported, according to the local engineer. Nearly all of the households are connected to the collection network, where it is available. Buildings often start as 2 or 3 floors in height, but over time these may increase to as much as 7–9 floors as improvements and renovations occur. The uncontrolled additions generate large quantities of sewage.

### 4.4.2. Institutional responsibility

#### 4.4.2.1. Sewer maintenance

The interceptors and pump stations are constructed by Cairo Wastewater Organization, but maintenance normally is the responsibility of the Local Unit. The Khesous Local Unit has the civil responsibility to manage the system but lacks the equipment and capabilities to administer properly. An engineer from El Khanka City has been seconded to the Local Unit and is directly responsible for day to day operation of water and wastewater infrastructure constructed by CWO. The engineer has no full-time personnel and a bare minimum of equipment for system operations and maintenance. He can only provide system management oversight and must rely upon private contractors.

Approximately 35% of the tariff levied for municipal water use is allotted for sewage disposal. It is unclear as to how much of this money comes back to the LGU to pay for operation and maintenance costs, but it seems that very little is returned.

Maintenance of lateral collectors is largely the responsibility of the private contractors who installed them since the EEN private network has not been accepted and thus remains outside the Local Units boundary. Teams of local laborers carry out daily maintenance. The laborers often lack any equipment except for a set of steel rods to push through the blockages. Sometimes they may have a small scoop fastened to the end of a long handle for removing grit from the manholes. Their work mainly involves answering calls of complaint instead of adhering to a regular maintenance schedule. The contractors collect a monthly fee varying from 1 to 5 LE per household. Some residents don't pay the monthly fee and instead pay when repair of the system is undertaken after a blockage occurs.

To aid the residents, the "Gamiya," a local community development association, has taken up stewardship of wastewater services in EEN. The EEN Gamiya is led by a board of seven directors composed of prominent and respected individuals from the community. Board members are selected by a general council composed of some 500

community members. The Gamiya has no staff or technical assistance so they also rely on private contractors. Contractors pay the Gamiya a monthly fee of approximately 300 LE for the right to provide service to a particular zone. The fees are used to purchase equipment or services to augment the efforts of the LGU and contractors in EEN. For example, the Gamiya purchased an electric pump to replace a mobile diesel unit at the temporary pump station.

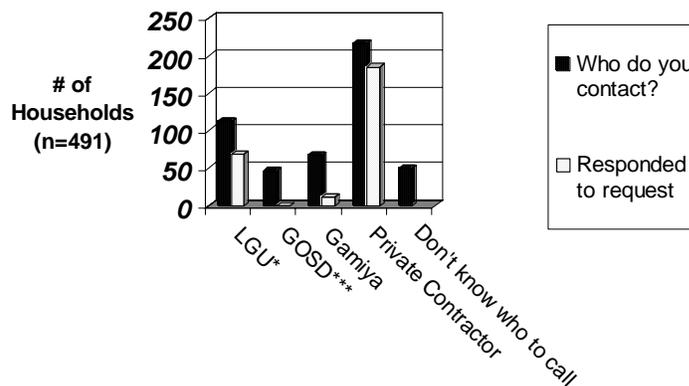


### Sewer cleaners

#### 4.4.2.2. Obtaining help with sewer problems

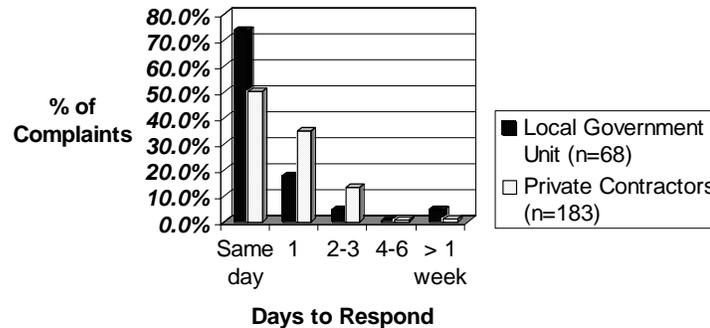
When confronted with sewage problems, residents contacted several different organizations for assistance. The most common response was to call the private contractors who had installed and serviced the lateral lines. Residents also commonly contacted the Local Government Unit (LGU), the Cairo General Organization for Sewage Disposal (GOSD), or the local Community Development Agency (Gamiya). Many residents (10%) did not know who to call for assistance.

**Obtaining Help with Sewer Problems**



The responsiveness of organizations varied after they had been notified. Private contractors and the LGU had the best records for responding to requests for assistance. They generally responded either the same day or within 1 day of notification. Although difficult to discern accurately from the data, it appears that problems were resolved only about half of the time.

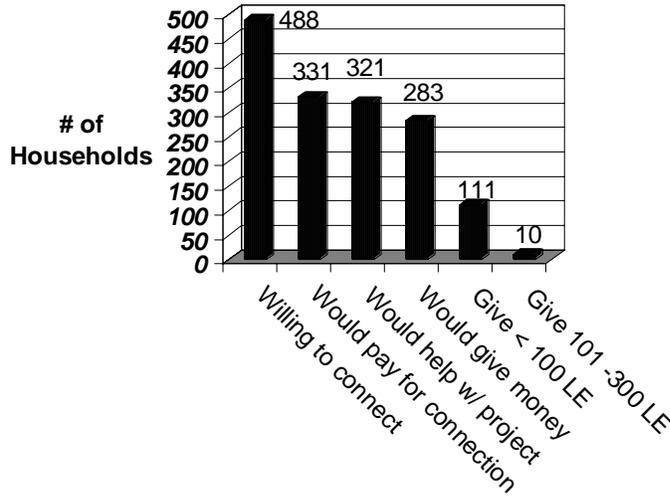
**Response Time to Sewage Complaints**



#### 4.4.2.3. Willingness to pay for sewer connections and improvements

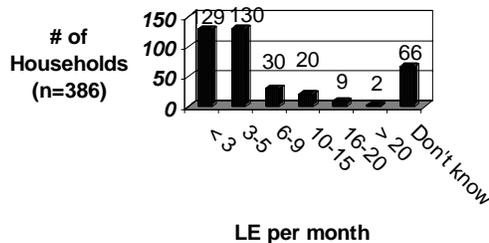
When questioned about connecting to the sewer system, 97% indicated that they are connected or would connect to the sewer network but only 2/3 indicated that they were willing to pay for the connection. When asked about helping with a sewer project, 71% said that they would be willing to help (88% of these said that they would help with a financial contribution). Only a single individual said that they would help in digging or providing pipes and tools. Of the individuals willing to make a financial contribution, 39% were willing to pay less than 100 LE and 3.5% were willing to pay between 101 to 300 LE to improve their sewer service.

### Opinions about Sewer Connections



The monthly fee for sewer service is 1 LE paid directly to the sewer contractors. In addition, the water fee that is paid to the LGU is divided such that 36% is supposed to cover the cost of sewer infrastructure. The table below indicates that many individuals are willing to pay more for a better sewage disposal system. Somehow the LGU must figure out a way to capture some of that marginal benefit.

### Maximum Monthly Fee for Better Sewer Service



With regards to financing the costs associated with sewer improvements about 37% said that they had the financial resources needed for connecting or improving the services of the municipal sewer system. For the remaining majority unable to pay the costs, the overwhelming percentage preferred to hook-up and then pay the sewer authority through an installment plan. A few chose to use the rotating savings mechanism offered by the Gamiya (small loans) or to take a loan from relatives or neighbors.

### 4.4.3. Summary of physical infrastructure and institutional problems for sewage disposal

The condition of the physical and institutional situation is characteristic of communities where growth has outstripped the administrative boundaries and the institutional capacity of local government to provide municipal services. It is representative of similar situations in other unplanned urban areas that are transitioning towards official incorporation within the Greater Cairo Metropolitan Area or other major population centers.

#### 4.4.3.1. Key problems of physical facilities for sewage disposal system:

- Many pipes are improperly sized and leveled so surcharging, clogging, and sedimentation occurs frequently in many areas.
- Pipe materials and installation quality are poor, and therefore the network is subject to leakage and breakage.
- The main collector in El Sheikh Mansour Street (600 mm in diameter) at Kabinat El Nour Street has subsided and needs replacement or maintenance.
- A key pump station for the main collector is yet to be completed and is more than one year late.
- The temporary pump units in place are prone to failure, which quickly floods major parts of the collection system. The main submersible pump lacks an inlet screen.
- The diesel pump has no maintenance schedule, lacks a large fuel tank and cooling water reservoir, and lacks a fence to prevent tampering. The stand-by diesel pumps are out of order.
- The collection system is not adequately protected thus allowing large debris to enter and cause clogging, including household trash and debris from the plastic recycling operations.
- The sewer drainage system in El Zarayeb is often clogged by plastic particles coming from the plastic washing and chopping process. Although some plastic factories have made some improvements, a lot of reform remains to be made.
- The local residents lack knowledge about what to dispose in the sewer. Some use it as a trash receptacle.
- Many of the privately constructed collection laterals do not tie directly to the trunk system but instead discharge directly to nearby drains and low-lying areas especially in the western, northeastern and the southeastern sectors. More than ten outlets have been identified as discharging to various drains. Many outlets have become clogged. Flooding happens continuously, especially in the northern area.
- The Ministry of Water Resources and Irrigation is considering the imminent closure of the Khesous drain, which presently receives large quantities of sewage from EEN.

#### 4.4.3.2. Key institutional problems for sewage disposal

An effective sustainable intervention must be guided by a clearly identified and responsible entity or individual. This is certainly true for water and wastewater service. Unfortunately, a well-defined water and wastewater authority does not presently exist within EEN. The responsibilities are not clear and create many problems:

- Private informal sewer networks that lack proper administration and maintenance.
- Services needs are crossing governorate boundaries yet the cooperative agreements are not in place to meet the demands of the affected communities.
- Poor planning of infrastructure, lack of attention to proper construction practices and use of mediocre materials has created a poorly performing collector system.
- In the case of EEN, the neighborhood network has never been officially approved nor included in Khesous Local Unit area of responsibility. This has hampered earlier efforts to include EEN in the budget and area plans for the municipal sewer collector infrastructure.
- Entry to the sewer system is wide open due to lack of controls by Local Unit or GOSD on building construction or renovations.
- Fees are collected to maintain sewer system as part of the water tariff, but inadequate amounts are returned to the LGU to pay for local sewer O&M costs.
- No revenue facility is available for the LGU to collect additional fees to cover local sewer O&M costs.
- Contractors have little responsibility back to the LGU. Instead they are responsible to the Gamiya, which lacks staff and technical resources to adequately supervise performance. LGU must begin to exert more control over contractors.
- Contractors pay fees to the Gamiya and then also collect fees from the residents on a monthly basis or per event. Nothing compels the residents to pay the contractors for maintenance except for the problems of blockages.
- Significant sections of adjacent Cairo neighborhoods drain into EEN but provide no funds to Qalyubeya Governorate or Khesous for O&M. The sewer drainage system receives flows from areas including from the south (Arab El Tawaila) and the east (El Zohour and El Marg towns).

#### 4.4.4. Proposed future improvements for wastewater

Khesous must improve the sewer collection system in order to handle the additional flows that are sure to occur as the potable water supply increases. Most respondents in the household survey reported problems of sewage pooling around their residence or that of their neighbor. The main pump station is a key component of the sewer collection system that must be finished quickly. A management agreement also must

be developed between the Local Unit, the Gamiya and the sewer contractors for system maintenance and line extensions.

A long term solution should include discussions leading to an administrative agreement between Cairo and Qalyubeya for providing sewer and water infrastructure services for this area. Although administratively part of Qalyubeya Governorate, Ezbet el Nawar is geographically isolated from the rest of Qalyubeya by the Khesous Drain. Surrounded by Cairo Governorate on the three other sides, it may be better if services for water and sewer were coordinated with Greater Cairo. Perhaps the costs of receiving Cairo sewage into Khesous and EEN interceptors can be balanced against the cost of providing water to EEN by Cairo. Such an agreement would improve conditions for an area that has developed without the benefit of regional urban planning. A good administrative agreement between Cairo and Qalyubeya is needed to arrange payment for the water and sewer services.

The conditions that occur in Ezbet el Nawar are similar to those of other informal areas that have become urban settlements during the past several decades. This familiar situation will recur unless there is logical process to ensure that future settlements and new construction conform to accepted plans and standards for infrastructure development and community services support. If new construction continues in the present uncontrolled manner then the sewer, water, solid waste disposal and other community services will always be overloaded. A positive future for EEN must include controls on building construction and good comprehensive planning for maintenance and future infrastructure improvements.

#### 4.4.4.1. Immediate actions to protect temporary pump station

- Install protective screen for the inlet of submergible pump
- Repair leaks in force main line
- Refurbish diesel pump
- Repair the horizontal pump

#### 4.4.4.2. Near-term actions

- Prompt repair of stand-by diesel pumps
- Clean and widen outlets on El Khesous drain
- Clean and widen outlets on El Marg drain
- Construct bypasses between several existing sewers to facilitate drainage flows in northeast section
- Install a pump on the line beside Princess Naamat Palace
- Hasten execution of the new permanent pumping station
- Coordinate with the Ministry of Water Resources and Irrigation to ensure orderly progress towards covering or filling the El Marg and El Khesous drains
- Develop and enforce local regulations to control building size and new construction activities in the area in order to limit the amount of new flows to the sewer system

- Finalize the agreements for management and maintenance of the sewer collection system as recognized in the draft Sewer Protocol between the LGU and the Gamiya

#### 4.4.4.3. Long term plans

- Ensure proper operation and maintenance for the new pumping station
- Develop a comprehensive management plan to ensure systematic cleaning and maintenance for sewers and collectors
- Create registry for records and maps of the network maintenance plan
- Develop a coordinated system for billing to share costs of sewage disposal between Cairo and Qalyubeya
- Develop a plan for the orderly rehabilitation of the entire private sewer network
- Form a special company to operate and maintain sewer collection network
- Verify that all discharges into drains have been closed in conformity with environmental conditions after providing for proper sewage drainage

# 5. Implementation of Community Activities

A project action plan was developed based on discussions arising from the stakeholder meetings in July and December 2003, the preliminary results of the environmental assessment by Obeid and Hendrich and the water quality study. The activities were divided among several different categories including: Household level Point-of-Use water treatment, sanitation education for women and improvements to the water distribution and sewage collection systems. Representatives of the Local Unit and other members of the Working Group discussed the various activities and reached consensus about the activities. Their input was particularly important for the physical infrastructure improvements.

## 5.1. Household level sanitation and water treatment

The inconsistent availability and quality of potable water in EEN's municipal water distribution system led the project to investigate household level interventions for water. The thinking was that improvements to the entire water distribution network would require more time and money than was available through this project. So, if the project could investigate possible interventions at the household level, then it may be possible to implement such an activity through ECRED after the project finished.

Early work by Mr. David Banner, a graduate student from Open University (Milton Keynes, UK) helped to guide the original ideas on Point-of-use water treatment. Mr. Banner collected water samples for preliminary analysis by the laboratory at Gabal Asfar Sewage Treatment Plant. He also studied various options for household level water treatment. The options included:

- Chlorination by addition of dilute sodium hypochlorite solution
- Physical filtration of the water using ceramic "candle" filters
- Solar disinfection using the ultraviolet wavelengths of the sun's rays

Mr. Antoin Gawigati, project assistant and a graduate civil engineering student at American University in Cairo, assisted by constructing proto-type containers to house ceramic filters and helped with the surveys to determine acceptance among users. He also was a key participant in the household neighborhood survey and the water quality survey.

Although point-of-use chlorination programs are promoted by international agencies, such as the CDC's Safe Water Program<sup>8</sup>, it has not yet been accepted by the Egyptian MoHP. The MoHP was reluctant to promote a program that encourages self-dosing of drinking water with a chlorine solution due to concerns about improper application of the disinfectant. People also dislike the taste of chlorinated water. A potential future project would be to obtain the sodium hypochlorite solution generators and to develop the support among MoHP and the public in order to demonstrate the effectiveness of a SafeWater-like project aimed at household level point-of-use applications.

The CHNP also investigated ceramic water filters for removing pathogens. Since the commercially available ceramic filters were designed to fit custom containers that were quite expensive, the project staff elected to construct filter holders and reservoirs using locally available containers and hardware. Several units using single and double filter arrangements were constructed and used by ECREC staff. The response by users was quite positive as to taste and ease of use however the cost of the units remained a discouraging factor. The combined cost of a reusable candle filter, two containers and assorted hardware was about 108 LE (US\$17.50).

The last alternative used solar ultraviolet radiation to disinfect the water. Cheap, transparent, plastic bottled water containers (1.5 liter) are widely available and were used for this alternative. Placed in direct sunlight for as few as 3 to 4 hours or indirect light for a day, water will be cleared of most pathogens, including bacteria, viruses and parasites like cryptosporidium.<sup>9</sup>

Persons liked using the solar disinfection system although there was some inconvenience with placing the bottles in the sun, retrieving them and cooling them before drinking. A climb to the top of an eight story flat to find sunlight is not likely to encourage a commitment to the use of solar disinfection. Still, the test results of others indicate that solar disinfection will work even in open shade locations.<sup>10</sup>

Although effective against pathogens, none of these basic treatments are effective for reducing excessive total dissolved solids levels or high nitrate/nitrite concentrations. Such chemical problems were found in many of the well water samples from EEN. The municipal filtered water does not appear to have such problems. The difficulty with the municipal filtered water was obtaining sufficient amounts of good quality.

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<sup>8</sup> CARE/CDC Health Initiative. 2003. Safe Water Systems for the Developing World: A Handbook for Implementing Household-based Water Treatment and Safe Storage Projects. CARE/CDC Health Initiative, Estes Park Rotary Club and Gangarosa International Health Foundation. Center for Disease Control and Prevention, Atlanta. 187 Pages.

<sup>9</sup> World Health Organization. 2004. Using Heat and UV Radiation in Managing Water in the Home: Accelerated Health Gains from Improved Water Supply. World Health Organization. 4 pages.  
[www.who.int/water\\_sanitation\\_health/dwq/wsh0207/en/index4.html](http://www.who.int/water_sanitation_health/dwq/wsh0207/en/index4.html)

<sup>10</sup> Caslake, Laurie F., Daniel Connolly, Vilas Menon, Cartiona Duncasons, Ricardo Rojas and Javad Tavakoli. 2004. Disinfection of Contaminated Water by Using Solar Irradiation. Applied and Environmental Microbiology, February 2004, Vol. 70, No. 2, p. 1145-1150.

## 5.2. Mother's Day program on sanitation

Women play the principal role in EEN for domestic activities like preparing food, caring for children and animals, house-keeping, and washing laundry. They also work in the waste collection businesses as the sorters — gleaning items of value from the garbage for sale or use. With such a key role, women's attitudes and values about sanitation and hygiene are critical determinants for these indicators within the household.

The project sponsored two community gatherings for women from EEN on March 20 and 27, 2004 to coincide with Egyptian Mother's Day. Over 250 women attended the morning-long sessions at ECRED. ECRED staff presented information about the water problems facing EEN residents. The physician/manager of the local MoHP clinic, Dr. Fareed Helmi Yanni, described the diseases that can spread through dirty water.

ECRED staff and young women of the area presented songs and a small play that depicted the problems of polluted water and parodied a number of unsanitary practices that could spread diarrheal disease. The play also demonstrated good hygiene practices such as techniques for correct handwashing and for storing clean water. Different methods for treating water were demonstrated, including boiling, solar disinfection and use of the ceramic candle filters. The costs and effectiveness of the different techniques were described. Participants also commented about their own experiences with trying to get clean water.



**Mother's Day workshop**

## 5.3. MoHP opens satellite family planning clinic

During the earlier Situation Analysis, the EEN community raised a key concern about the lack of accessible public health facilities. In response, the MoHP opened a small family planning clinic in April in office space provided by ECRED. The MoHP has placed equipment and staff for full time service in family planning. CHNP paid for renovation of the space next to ECRED's office. Approximately 60 women per month attend to receive contraception and family planning services. ECRED's staff encourage local residents to visit the clinic during their outreach and public education programs.

Other MoHP medical services for immunization or primary healthcare are obtained from a mobile health clinic that comes every two weeks to the community. Basic first aid services are provided by clinics like that one at ECRED. These interim measures are being taken until such time that MoHP can construct a full-service clinic. The future clinic is proposed for construction on Tawfeikeya Street along the Cairo-Qalyubeya boundary.

## 5.4. Improvements to sewage and water supply infrastructure

### 5.4.1. Working group for sewer and water infrastructure

A working group was created to assess the status of the water and sewer systems. Members included the head of the Local Unit, Local Unit water and sewage staff, a representative of the National Democratic Party, the chairman of the Gamiya, the CHNP consulting engineer and the CHNP community and institutional development adviser. The group provided valuable information on the status of the sewer and water systems. They also helped to select and implement the interventions to improve the community infrastructure.

A key accomplishment was the preparation of a performance protocol between the Local Unit and the Gamiya that assigns responsibility for sewer maintenance and managing the sewer contractors. It also provides for community oversight with representation by ECRED and the National Democratic Party representative.

### 5.4.2. Improvements for sewage infrastructure

CHNP's activities for sewage disposal were focused mainly on the maintenance and operation of the existing collection network. The critical impediment now is the unfinished sewage pump station for the main collectors draining EEN. Although out of the hands of the project, CHNP has exerted pressure through the Governorate and

District to encourage the CWO to overcome its contract disputes and re-bid the project. Work started up again and progress has occurred, slowly but surely.

Meanwhile, the CHNP engineering consultants discussed with the Local Unit about improving the temporary pump station. Several items were identified and the LGU has taken steps to address the needs:

- Steel screening was placed to make sure that debris in the inflow did not clog the intakes of the two pumps.
- A larger fuel tank was installed on the diesel powered pump to ensure that the pump would not run out of fuel.
- The LGU repaired another diesel engine to use as a stand-by unit.
- At one point, the CGOSD had requested that the LGU relinquish an electric pump operating at the temporary lift station. CHNP drafted a letter to the Secretary General of Qalyubeya Governorate requesting that he ask CGOSD to leave the pump in place until such time that the permanent lift station was operating. The request was granted and the LGU retained use of the pump.
- CHNP advised the LGU about the specifications for an electric pump and panel board to replace the temporary diesel unit. The diesel has since been replaced by an electric pump housed in a small brick building.
- CHNP also advised the LGU about the specifications for a pump to drain the sewage system in the northern eastern quadrant of EEN. Purchase of the pump by the Gamiya is pending.

CHNP also purchased 400 clearing rods made of spring steel and used by hand laborers. These rods are the primary tools used by the local laborers and sewer contractors to clear blocked lines. Cleaning tools that attach to the rods were also included. This would be augmented by purchasing a small sewer line rodding machine (1 hp) to help clear small diameter lines (< 10 inches diameter).

With inputs from GSOD engineers, a simple maintenance manual has been developed for use when the main sewage pumping station is completed and comes on line. The project engineer has provided training to the Local Unit staff and the contractors on how to develop and implement a routine sewer line maintenance plan.

### 5.4.3. Improvements for water supply infrastructure

In addition to work on the sewage collection system, the project is improving the amount and quality of potable water available from the municipal system. The working group decided to make repairs at el Khesous water filtration station and to improve control within the distribution system by placing gate valves at key locations.

The project purchased 15 four inch valves and 5 six inch valves at a cost of 14,200 LE for placement in the distribution network. The Gamiya agreed to provide 8000 LE towards the labor and materials to prepare the vaults for placing the valves. They later added another 4,000 LE. The LGU agreed to provide the parts, manhole covers and

labor to make the valve connections. The sites for the valves were determined by the Working Group.

CHNP also contracted for renovation work at the el Khesous Water treatment plant on the Ismailia Canal. This small plant has two package water filtration systems drawing from the canal that are functioning at less than 50% capacity. The final renovation budget (81,000 LE) included rebuilding or replacement of key valves, pumps and motors, refurbishing the electrical panels, installing a lighting system, maintaining the chlorination system and creating an inventory of key fuses, breakers and switches. The Governorate Department of Public Utilities agreed to provide an additional 35,000 LE to install a chlorination system for disinfecting well water extracted at the same site.

CHNP prepared the specifications and bid preparation documents for all work and facilitated the review of the tender offers and material price offers by the working group. The working group selected the vendors for the valves, cleaning rods and rodding machine and the contractor to renovate the water treatment plant. Members of the working group are monitoring the performance of the plant renovation work and overseeing the installation of the water valves. The renovation work began on Aug. 7, 2004, and was completed on Sept. 13, 2004.

A three day training session was held by the project engineer to demonstrate how to operate and maintain the water treatment plant. A maintenance manual was prepared for the WTP. A separate manual was prepared for use at the main sewage pumping station after it comes on line.

#### 5.4.4. GIS mapping

A digital base map and informational database was prepared using Arc Info 8 and AutoCAD 2000. The map layers include the locations of sewer mains, laterals and manholes, water mains, existing sewage discharge points to local drains, mosques, churches and street names in English and Arabic. It also divides the area into the agricultural basins. The 75 water quality sampling points and data from 30 chemical and bacteriological parameters are included in the GIS database.

#### 5.4.5. Action plan key results

- Environmental Assessment completed
- Baseline data from 510 households was collected and analyzed.
- Working group for sewer and water was established with representation from Local Unit, Gamiya, ECREG and community.
- GIS maps prepared for street names, water and sewer mains, water sample sites
- Sewer Protocol assigning responsibility for sewer maintenance was drafted for discussion by Local Unit and Gamiya. Performance monitoring is by local residents and the working group.

- Training for 5 sanitarians on setting up and conducting water sample regime for an area.
- Water quality data from 75 sample sites (wells and municipal sources) showed that even the municipal distribution system has been contaminated.
- Mother's Day Hygiene program for 250 women dispenses information on protecting health and improving hygiene.
- MoHP provides equipment and staff to open a family planning clinic in office renovated by CHNP and rented by ECRED.
- Output of water treatment plant improves greatly after substantial repairs and maintenance to equipment.
- Gate valves purchased for placement in water distribution system to control flow and distribution. Valve vaults will be prepared by the Gamiya and LGU will install the valves.
- Operation and maintenance manuals were prepared for new sewage pump station and reconditioned water filtration plant.
- Three day workshop on operation and maintenance of the water treatment plant was held for 17 LGU staff.
- Rodding equipment to clear sewer lines is purchased and delivered to LGU.



## 6. Lessons Learned

### 6.1. Working with partners

The accomplishments in EEN by CHNP came with the assistance of multiple partners, particularly with regards to health improvements for EEN residents. The closest collaboration has been with the government officials at the Governorate and Local Unit, MoHP and with the international NGO, World Education. Other partners included USAID/Egypt and the national NGO, Coptic Evangelical Organization for Social Services (CEOSS). CHNP also benefited from assistance by several different USAID projects including the Healthy Mother Healthy Child Project administered by John Snow International and the Secondary Cities Infrastructure Project implemented by Camp Dresser McKee International. The latter was extremely helpful in facilitating the tender and purchase process for the water valves, sewer equipment and renovation work at the Khesous WTP.

#### 6.1.1. Ministry of Health and Population

In addition to testing the water quality, MoHP has been an active participant in EEN for health programming from the beginning. A mobile health clinic began coming to EEN every two weeks as a result of an agreement reached during the Situation Analysis phase. The MoHP local health unit physician spoke during the Mother's Day community training sessions. MoHP also established a small family planning unit in office space adjacent to ECRED's office. MoHP provided staff and equipment after CHNP paid for the improvements to the clinic space. ECRED pays the rent for the apartment.

As time and finances permit, MoHP Qalyubeya District plans to provide additional health care services to EEN residents by opening a full-service community health unit along the Tawfeikeya Canal Street on the Cairo-Qalyubeya boundary. Unfortunately, construction of this new facility was held up due to a conflict between the two governorates over the final position of the governorate boundary and the use of the land. The land is owned by the Ministry of Water Resources and Irrigation and title must be transferred to Qalyubeya Governorate officially. The process has slowed down due to delays in the Property Authority. With the construction delayed, people have quickly encroached on the vacant land. Many private structures have been constructed quickly during the past six months.

## 6.1.2. World Education

World Education implemented the Integrated Environmental Health and Literacy Project (IEHLP). The primary objective was to develop an integrated environmental health and literacy program for female literacy class participants and other community members. The project created a set of literacy lessons and teaching guides with hygiene and environmental health messages as the content for use by the educators from the General Authority for Literacy and Adult Education (GALAE) and other groups managing literacy classes, like local NGOs and CDAs. Each set features storyboards for sparking discussion, literacy exercises and a health information summary sheet. World Education included MoHP staff, CHNP consultants, ECRED and CEOSS staff, GALAE teachers and others from EEN during the sessions to develop the materials. The Healthy Mother Healthy Child project implemented by John Snow International provided very valuable information on the lesson's content and design. Topics include:

- Diarrhea Management for Infants, Children and Adults
- Washing Hands
- Clean Water and Food
- Respiratory Infections
- Clean Environment

The literacy materials also serve as the basis for creating a set of health communication materials for use by health unit staff to reinforce environmental health and hygiene messages. It includes teaching posters, client handouts and facilitator guides for the health staff and others who maintain small clinics in the slums.

## 6.1.3. Coptic Evangelical Organization for Social Services

Coptic Evangelical Organization for Social Services (CEOSS) included Ezbet el Nawar in a project to support malnourished children and provide prenatal care and hygiene training to women in multiple communities. The CEOSS Maternal/Child Health/Reproductive Health and Family Planning Clinic Project provides technical support to the NGO, CABU (Coptic Association for Brotherhood of the Underprivileged). CABU has sub-contracted with ECRED to work on behalf of CEOSS as the local neighborhood facilitators in EEN. The project screens mothers and children less than 2 years of age for malnutrition and provides classes to mothers on cooking and preparing a balanced diet for malnourished children. The meals are eaten by the mothers and children after preparation. Children are followed for six months to look for improvements in weight and other indicators of improving nutritional status.

#### 6.1.4. USAID Egypt

The USAID- Egypt Mission provided support to CEOSS to work in EEN and other selected communities via a PHN grant from the USAID-funded NGO Service Center. The USAID mission also served as a good information source regarding funding for environmental infrastructure. Dr. Emad Yanni, Population and Health Division was quite involved during development of this project. He visited the site several times and assisted by convening meetings between World Education, CEOSS, John Snow International and CHNP.

### 6.2. What worked well

#### 6.2.1. Community organization led by local NGO

The Experimental Center for Recycling and Environmental Development was extremely important to success of the project. The importance of having a local community organization assist with the project cannot be over-emphasized. The Center served as the main meeting point for the consultants. Its staff organized the public hygiene awareness sessions, stakeholder meetings and facilitated entry to the neighborhood for MoHP's sanitarians and the project consultants. ECRED staff conducted a successful household survey. Their familiarity with the community and their local roots opened the doors of many households that likely would have remained closed for government survey teams. ECRED's Executive Director and a founding member, Gamal Zekrie Bisada, was a CHNP team member and functioned as the main conduit to discussions with key government and community leaders. His personal and professional contacts with the community and government officials made it much easier to work in EEN.

#### 6.2.2. Leadership at the governorate and local administrative levels

The project was fortunate to build on the relationships with the Governorate and District (Khanka Municipality) that were developed during the earlier Situation Analysis phase. Engineer Ahmed el Araby Abdel Hameed, Secretary General of Qalyubeya Governorate maintained good support for the project. He recognized the importance of urban health and sanitation problems and urged his colleagues to cooperate with CHNP. Engineer Hessen Ahmad Abo Taleeb, General Director of Water and Sanitation Sector in Qalyubeya Governorate was quite supportive, pledging 35,000LE for installation of a chlorination system at the Khesous WTP.

At the District level, Mr. Shehta Elakhras, Chairman, Khanka City supported the work of his colleagues at the Khesous Local Government Unit, Mr. Ali Hessen el Tanany and Mr. Hussein Abou Ahmed, former and present chairmen of the Local Unit, respectively. The Local Unit representatives were very active members of the Water and Sewer Working Group.

### 6.2.3. Collaboration with MoHP to conduct water quality study

The Ministry of Health and Population (MoHP) provided valuable services that enabled the project to determine the quality of water available to residents in Ezbet el Nawar. At the request of the project, MoHP supplied sanitarians and technicians to obtain the samples and also performed the laboratory analysis. MoHP and CHNP consultants used the study as an opportunity to provide hands-on training to MoHP staff on the methods for planning for an area-wide survey and tracking the results. It was an excellent example of collaboration between the project team and the staff of MoHP with participation that ranged from the local unit to the district office through to the national center and the Ministry.

Dr. Seham M. Hussein, Undersecretary of Environmental Affairs, MoHP was instrumental in planning for the analysis of the water samples at the Environmental Monitoring and Occupational Health Center (EMOHC) in Imbaba and for collection of the samples by sanitarians of the Center and from MoHP, Qalyubeya. Her colleagues, Dr. Olivia Hussein el Shafey, Director General of the Environmental Health Department and Pharmacist Wafaa M. Shalaby, General Director, EMOHC supervised the collection and analysis of the samples. Key MoHP staff involved in obtaining the samples included Dr. Ragab el Kholy, Director of Environmental Affairs, MoHP, Qalyubeya Governorate, Sanitarian Alaa Hagie, MoHP, Imbaba, Giza and Sanitarian Marzouk Hana, Office of Public Health, Nawar. The partnership yielded data that was timely, technically sound and met official standards.



**MoHP and ECRED staff planning strategy for water sampling in EEN**

## 6.2.4. Water and Sewage Working Group.

The group developed solutions for the water and sewage problems of EEN. This follows the Situational Analysis example of the “right people talking about the right issues” as the participants were those most central to developing and implementing the infrastructure solutions for Nawar. Decisions on vendors and contractors were taken by the Working Group. They include the former LGU chairman, Mr. Ali Hessen el Tanany, Mr. Hasan Abou Ahmed, present LGU chairman, Mr. Adnan el Megeed, representative from the Gamiya, and Mr. Saber Shenawy as representative of the community and National Democratic Party. Engineer Sabry Thabt and Engineer Mohamed Ashour from the Local Unit participated as well. The work was facilitated by CHNP Consulting Engineer Obied Gergis and CHNP Social Development coordinator, Mr. Gamal Zekrie Bisada.

## 6.2.5. Stakeholder meeting to establish priorities

The stakeholder meeting in December 2003 gathered persons together to discuss the issues raised in the earlier meetings during the Situational Analysis. As the day progressed it quickly became obvious that sewage and water were the most important issues for the community. Although many items were scheduled for discussion, the major portion of the day centered on the issues of sewage and water. Perhaps this was to the detriment of other subjects like maternal health, solid waste disposal or changes in livelihood, but if one judges importance and priority by the amount and passion of discussion, then sewer and water certainly placed the highest. As a result, the project elected to focus its limited resources on addressing these two issues.

## 6.3. What presented challenges

### 6.3.1. Planning process was truncated

The amount of time available for the project (ten months) created a very short time table. Project start up took longer than expected as did the assessment activities. This in turn shortened the time available for planning remedies and gaining community consensus before beginning implementation. Although the improvements were agreeable to the community and the local Unit, the project had to take more of the lead on implementation than perhaps was desirable.

The short time frame also made it difficult to identify and explore various policy initiatives as a means towards improving service. For example, the mechanism for creating a local fund to pay for water and sewer improvements needs to be determined. This is just being discussed at the close of the project. The same goes for determining the means to integrating unincorporated communities into the official administrative boundaries of local governments. An additional 6-9 months of project support would have been very beneficial by allowing the CHNP to take advantage of the knowledge and momentum that has been gained during the past 11 months.

### 6.3.2. Community expectations were too high

People initially were expecting much more money to improve the infrastructure and a longer project time frame. After the actual budget and schedule were acknowledged, the positive outcome was that the modest amount of money available forced the working group to look carefully at where the most improvements could come for the least money. As a result, the activities revolved around household interventions and specific key improvements to the infrastructure.

### 6.3.3. Use of part-time staff

To accommodate the level of available funding, the coordinator elected to hire project staff on a part-time basis. This made coordination of work schedules and meetings more difficult. As the project progressed, it became apparent that more man days would be necessary if the outcome was to be actual improvements to infrastructure rather than just an assessment of the situation. Additional labor was needed to supervise implementation of repairs and to monitor contractor performance while renovating the water treatment plant. Fortunately the local project staff were flexible enough to be able to accommodate the schedule of the project and its changing needs.

### 6.3.4. The community household survey needed more oversight

The information from the household survey was good but far from complete. In retrospect, the project should have dedicated more time to checking over the completeness of the forms returned by the survey teams. One team was less consistent in returning completed surveys, but this was not noted until midway in the process after receiving comments from the data input specialist. Once identified, the situation was discussed with the team and the quality of their reports improved.

### 6.3.5. Lack of an official project cooperative agreement

The project, although funded through USAID, was not implemented as part of the formal USAID Egypt program and cooperative agreement with the Government of Egypt. As such, the informal nature of the project sometimes made it more difficult to discuss with government counterparts as we were not an official project. This sometimes made it a little awkward when describing the project or seeking official meetings.

### 6.3.6. The question of sustainability post-project

It was difficult to answer questions about “What’s comes next?” after raising awareness and expectations in the community. Discussions with USAID mission staff made it clear that there would not be additional support forthcoming under the present

mission development portfolio. The benefit is that the community now realizes that future support for the work will require expanding the list of donors beyond USAID. This has sparked activity to seek other funding sources.

### 6.3.7. Lack of project bank account

The lack of a project bank account made it more difficult to pay for services or materials. The project manager had to pay a significant amount of the project operating costs out of pocket and carry the debt for several months until reimbursed through the normal expense account reimbursement system. It did not become a problem until the implementation phase of the project commenced when it became necessary to pay larger sums of money as part of the contracts for renovating the water treatment plant and for purchase of gate valves and equipment for sewer maintenance. Fortunately, CHNP was able to collaborate with another USAID project implemented through CDM, Inc., to overcome the contract and cash disbursement issues.

### 6.3.8. Cross-boundary issues for utility services

Lack of representation from Cairo utility organizations, especially Cairo Water, has hindered attempts to define the long-term solutions for providing services across governorate boundaries. The project's consulting engineer, Obeid Faheem Gergis, has longstanding contacts in CGOSD, so he is able to communicate freely with that organization, but a similar close contact in Cairo Water Authority was lacking. The Sewer and Water Working Group would benefit from expanding its membership to include representatives of the Cairo Water and Sewer organizations as well as from neighboring LGUs. They all share a common problem along the boundary between Cairo and Qalyubeya Governorates.

### 6.3.9. Disparity in salaries for water and sewer technicians

There is a large difference in the salary levels for LGU staff working at the WTP versus staff at Greater Cairo sewer and water facilities. Staff in the Khesous LGU WTP earn 150-170 LE per month whereas GSOD staff earn more than 700 LE for performing the same duties. Consequently, the LGU staff feel less motivated to perform their responsibilities. Most also hold second jobs whose performance often takes priority over their duties at the WTP.



## 7. Looking Ahead to Future Activities

The Cairo Healthy Neighborhood Program can be considered successful. Although the initiative was intended primarily to assess the conditions of EEN, it has produced much more than just a paper study. The information generated through the assessments and mapping exercises have placed EEN in a stronger position from which to seek development assistance from sources, both within the national government and also from international donors. EEN's experiences also serves as a model for improving services in underserved areas that abut or straddle administrative boundaries between governorates or other authorities.

The Water and Sewer Working Group have gained experience and momentum as it struggled through the process of identifying key issues, developing alternatives and implementing the solutions. Ezbet el Nawar now receives more attention and has better name recognition in the central government at the Qalyubeya Governorate and Al Khanka District level. Taking advantage of the notoriety, several key initiatives can be considered in the next round of development for EEN:

- The Water and Sewer Working Group should be expanded to include representatives from the Cairo Water Authority and GSOD. It could also include representatives from the neighboring hamlets and LGUs for discussion of issues that are more regional in nature. A request for GSOD to assume maintenance of the sewer network in EEN should be considered.
- Prior to finalizing the design for the new El Marg water treatment plant in Cairo, discussion should occur on a broader regional scale between Cairo and Qalyubeya Governorates in order to negotiate a supply of water to Ezbet El Nawar. Such action with a close neighbor would be beneficial for public welfare on both sides of the boundary.
- Ezbet el Nawar should apply for formal recognition by the national government and Qalyubeya Governorate. A determination should be made as to whether it is better to remain within the Khesous Local Unit or to seek recognition as a separate individual Local Unit. The process would illustrate how to "regularize" or incorporate an area that has been randomly developed so that it can begin to receive services and funds officially.
- The Japanese Development Agency, JICA, has shown interest to receive a proposal for improvements to the water distribution system. The Local Unit could investigate further and develop a proposal for requesting technical assistance and infrastructure improvement funds. The Khesous WTP would benefit from additional support to maintain its production and improve its distribution system. Construction of additional treatment capacity would help

- reduce the present deficit in the water budget for EEN and Khesous. The present potable supply provides less than 15% of the total demand needed for EEN. The remainder is met with poor quality water from local wells.
- Any system for water supply or disposal of sewage and solid waste requires funds for operations and infrastructure maintenance. The Local Unit needs to look closely at mechanisms for raising the local funds necessary to sustain its operations. Can water tariffs be raised and the difference kept in the local treasury. Can the system for sewage maintenance be regulated so that funds are generated for system O&M and the quality of service improves? The neighborhood study indicates that people are willing to pay more for a better sewer system. These and other questions need additional study. The draft Sewer Protocol is a good starting point for discussion. The Gamiya has requested that the LGU take a stronger role in managing the sewer contractors.
  - Although solid waste was a priority identified during the Situation Analysis, this project focused principally on water supply and sewage disposal. Future projects should investigate the solid waste handling practices of the Zeballeen community. How can they be better tied into the new waste handling paradigm that incorporates the large multi-national companies without relegating the Zeballeen to the level of mere laborers? Is there a way to sustain their high levels of resource recovery and recycling of materials from the waste stream of northern Cairo? Presently much of the material collected by the multi-nationals goes straight to landfills without any resource recovery.
  - EEN could be a good location for placement of a solid waste transfer station. Urban transfer stations have been implemented in other countries that allow for smaller neighborhood facilities that use locally available equipment sized to meet the local requirements. A feasibility study should look at the economy of scale derived from such an operation. It could improve the sanitation of the area by facilitating the end disposal of the residue remaining after the valuable materials have been removed by the Zeballeen.
  - A community education program can be developed to inform the public about the hazards of contaminated water and the methods to treat water at the household level. Such a community hygiene program could be developed with MoHP and include components to reduce the number of cross connections between the municipal system and the wells after the quantity of potable water has increased.
  - A full service MoHP medical clinic is planned for construction on Tarat el Tawfeikeya Street, but the work is delayed by a boundary dispute between Cairo and Qalyubeya Governorates. Meanwhile squatters are rapidly usurping the land. Both governorates should intervene to facilitate the rapid transfer of land from the Ministry of Water Resources and Irrigation to Qalyubeya Governorate Health District.

## 8. Conclusion

The Greater Cairo Healthy Neighborhoods Program/Making Cities Work Project was implemented as an initiative with a modest budget. The challenge was to find cost-effective and creative approaches that demonstrate how targeted investments can have positive results.

The steps taken during the past ten months have catalyzed efforts among the general community of EEN, the local and regional governments and the national government. Advances in sewage disposal and water supply have occurred largely as a result of the stimulus created by CHNP and the attention drawn to the conditions in EEN. The project's efforts to identify challenges, determine opportunities and assign responsibility have heightened awareness among the different stakeholders about the problems of EEN. Their relevance to the national context has also been identified as a model that can apply in other parts of Egypt.

The steps taken in Ezbet el Nawar are merely the beginning of a process that needs to become more sustainable. Such sustainability can occur only through the partnerships derived when local and central governments, civil society groups and private sector companies all participate in creating a supportive environment at the local level. Some of the most difficult tasks involve sorting out how these entities can interact for the benefit of the community.

The most common state of mind is to think in terms of taking an established existing set of finite resources (manpower, expertise, money, tools, land, etc.) and then dividing it among individual issues. The challenge for any project is to identify the resources available and then look for synergism that can increase those resources. The best way to do that is by creating partnerships and collaboration among groups that have some stake in the outcomes at the local level.

Success in such a venture will be determined, not in the near-term but instead as measured over the long-term. It will be measured by actual changes and improvements in the conditions of the environment and the improvements to quality of life for the residents of Ezbet el Nawar. Against this measure, the Greater Cairo Healthy Neighborhoods/Making Cities Work Project is a successful starting point.



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# Annex I. Scope of Work for Making Cities Work Project

## Scope of Work

*USAID/EHP Cairo Healthy Neighborhood Program*

*Coordination of Environmental Health Improvements in Ezbet El Nawar*

*September 15, 2003*

## Purpose:

To design and promote affordable, feasible and replicable improvements in household and community sanitation, drinking water and other environmental health technologies in an underserved urban neighborhood of Cairo, Egypt, under a grant from the USAID *Making Cities Work* program.

### 1. Overview:

This SOW describes the approach and tasks involved for planning, coordinating and evaluating the technical and organizational activities designed to improve water supply, household and community sanitation, and other environmental health problems as identified and prioritized by the community of Ezbet El Nawar. The priority problems were articulated as a result of a participatory situation analysis followed by community-level and donor/government level stakeholders meetings to discuss possible actions.

Since submitting the grant proposal, community-based NGOs and EHP have received new information concerning government plans for WSS improvements in Ezbet El Nawar. MCW program activities will coordinate with national and local government and Qalyubeya Governorate agencies responsible for improved services, and promote strengthened linkages between the community and GOE.

Program activities are expected to be:

- Technical assessment of water supply, sanitation (excreta disposal), solid waste,
- and air pollution conditions such as local fumes from garbage burning, indoor recycling workshop pollution, etc
- Discussion between technicians and community representatives of technical options available for improving and financing WSS etc
- Development of plan of action for several demonstration WSS improvements

- Coordination with other program activities, especially hygiene BCC at household and health facility levels
- Implementation and evaluation of activities with recommendations for replication and scaling up.

These activities are funded under a grant from USAID/EGAT/Urban Programs through the *Making Cities Work* Program.

## 2. Background:

- ANE UH Initiative and Cairo Healthy Neighborhood Program
- Partners include EHP, USAID/Egypt, MoHP, NGOs
- Program neighborhood description: Mostly zabbaleen, virtually no services, serious health problems.
- Activities to date:
  - o Situation Analysis using PRA and DHS
  - o Identification of neighborhood priorities for action (WSS, MCH, job/income-related issues)
  - o Community and GOE/Donors/Other Partners Stakeholders Meeting
  - o Experimental DHS for urban slums as baseline for program
  - o Award of MCW grant for WSS/EH improvement
  - o NGO Service Center grant to CEOSS for strengthening MCH service delivery in Ezbet El Nawar and other slums (nearly ready but not at this writing yet)
- Results to date:
  - o MoHP sent mobile clinics for immunization to Ezbet
  - o MoHP committed to creating a new health center
  - o Strong support for program from Governorate and local government
  - o Several USAID offices have shown interest in participating: Micro-Enterprise, Environment, Pop/FP.
  - o Not as a result of this program, German government is rehabilitating 40 “tin shacks” (garbage dumping/sorting and sometimes living areas) from center of neighborhood (or possibly building new structures to include household WSS systems).

## 3. Current status:

- Finalizing Situation Analysis/Stakeholders Meeting report
- Stakeholders meeting minutes/list of participants/results update to be distributed in Arabic to participants
- Coordinating committee ready to be activated by head of community NGO (Gamal) but awaiting firm program to submit to them

- EHP/DC is putting mechanisms in place to begin implementation of program. First step should be the development of a neighborhood plan of action to be reviewed by community stakeholders and pieces submitted for funding to various agencies (USAID, GOE)
- CEOSS is readying itself to work with neighborhood NGOs to create maternal/neonatal health centers and child nutrition centers

#### 4. Overview of MCW Grant for Environmental Health Improvements:

The interventions to improve water supply, sanitation, solid waste, and air pollution address the #1 priority expressed by the community of Ezbet El Nawar. Government plans apparently exist to address these needs with large infrastructure improvements; however, it may take a long time before the work actually begins. This is a likely scenario in numerous underserved neighborhoods of Cairo. The purpose of this program component is to help improve the hygiene situation in the neighborhood by identifying strategies at different levels of cost and technical complexity. Some could be implemented fairly rapidly by the community itself with some support from the MCW grant or other sources, some (for example modern sewer connections) need to be submitted to the cognizant governmental agencies for funding and technical support. The first portion of this program will assess the current situation and propose different options for sanitation, water supply etc. These options will be considered by the community through a representative committee and participatory process, and choices made for implementation. MCW will support demonstration interventions and assist the community in finding financial solutions to replicate and sustain the improvements. In addition to cost recovery, the potential for WSS improvements becoming income generating (for example, community-managed public toilet complexes) and self-sustaining should be explored.

#### 5. Tasks for Coordination:

##### 5.1. Information Collection

- a. Meet with USAID, MoHP, GOE, NGO, and community stakeholders to clarify various roles and responsibilities and stakes in neighborhood improvements. Understandings should be recorded.
- b. Determine the GOE institutional context for water, sanitation, solid waste in urban slums (groundwork on this has already begun through stakeholders meetings)
- c. Become familiar with the dynamics of the zabbaleen community, esp. as they relate to garbage collection/recycling and possible privatization
- d. Review the various studies recently completed (EHP Situation Analysis and literature review) and soon to be published

- e. From community-level meetings, become familiar with local players (church, NGOs, health facility personnel)

## 5.2. Development of Assessment Methodology and Tool

Develop appropriate questionnaires and participatory methodology to assess environmental health conditions illustrated by the following questions:

- What is the current system of drinking water supply?
- What is the quality of drinking water?
- What are sources of contamination?
- Is the supply sufficient for bathing, cooking, washing clothes?
- What is the current status of household and community sanitation (excreta disposal)?
- Are sanitation systems adequate/appropriate for children?
- Do local schools have sanitation/handwashing facilities?
- What are households currently paying for WS&S services?
- What is the current solid waste situation in the neighborhood?
- What are the main sources of indoor and ambient air pollution in the neighborhood?
- What informal sector industries exist on the neighborhood that create environmental health risks?
- What feasible technologies could improve access to and quality of water supply and sanitation facilities?
- What are feasible and affordable improvements of solid waste management and air pollution?
- What are some feasible payment schemes so the residents can afford the improved technologies?
- What are feasible institutional arrangements for operating and managing the technologies at both the household and community level?
- How can the residents generate income from the proposed technologies (manufacture, sales, maintenance)?

## 6. Technical Assessment of EH conditions

- a. Identify and assemble assessment team members (consultants, community members, GOE technical agencies).
- b. Train and otherwise prepare team
- c. Conduct appropriate community level meetings to explain process, expectations, and to enlist support
- d. Carry out technical assessment

- e. Summarize findings and recommendations in a format understood by the community (Arabic, bulleted etc)
7. Selection of interventions and Plan of Action
- a. Present findings and options to the community coordination group for decision making
  - b. Identify possible implementation partners (local NGOs etc)
  - c. Together with community representatives, present proposals for larger scale improvements to government agencies with mandate and budget for carrying them out
8. Implementation
9. Monitor implementation of demonstration water/sanitation and other improvements through mechanisms that can include subcontracts
10. Evaluation, to address:
- a. Effectiveness of process
  - b. Effectiveness of technological options
  - c. Recommendations for replication in other similar neighborhoods
  - d. Recommendations for scaling up similar activities

## Schedule

Information collection	September '03
Development of Assessment Methodology and Tools	early October '03
Technical Assessment of EH conditions	October '03-March '04
Selection of interventions and Plan of Action	February-April '04
Implementation	March- August '04
Evaluation	August-September '04

## Personnel Requirements

MCW grant activities will be managed by one part time local EHP consultant with a background in providing or improving water supply, sanitation and other environmental services in difficult settings as well as program management

experience. Expertise from local (Egyptian or other) water and sanitation engineers, social service providers, etc... will be sought as required.

Deliverables

Interim progress reports.....end-November 2003, March 2004

Final report with evaluation results...end May 2004

# Annex II. Cairo Healthy Neighborhood Project: Water Quality Analysis

Ezbet el Nawar, Khesous Local Unit

El Khanka, Qalyubeya Governorate

by

R. Steven Nakashima, MSPH, MPA, RS

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Sanitarian Khalid El Khatab, Office of Public Health, Khesous.

Sanitarian El Desoki El Sadek Momar, Qalyubeya Governorate

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Mr. Sobhe Abd el Meseeh, Project Officer, Experimental Center for Recycling and Environmental Development, Ezbet el Nawar

Mr. Antoin Gawigati, Project Assistant and translator, Cairo Healthy Neighborhoods Project, Heliopolis

## **Water Quality Analysis**

For

Ezbet el Nawar, Khesous Local Unit

El Khanka, Qalyubeya Governorate

Cairo Healthy Neighborhood Project

## **I. Introduction and Study Overview.**

Ezbet el Nawar is a community located on the border between Cairo and Qalyubeya Governorate. It is an informal area that has developed with little regard to planning for infrastructure services, such as water supply or sewage disposal. On planning maps, it is still shown as agriculture fields and has not been officially designated as a village within Khesous Local Unit. Beginning as an agriculture village for pig and animal growers, it has been engulfed by the urban housing of a growing Greater Cairo Metropolitan area over the past twenty years.

Ezbet el Nawar is administratively part of Qalyubeya Governorate even though it is bounded by Cairo on three sides and physically separated from Qalyubeya by the Khesous Drain (see Figure 1). Ezbet el Nawar (EEN) receives water from two official municipal sources: an 8 inch line from the water treatment plant in Khesous Village (Qalyubeya) and a 10" line from the Cairo Mostorod station. Despite these two services, EEN suffers from chronic shortages of potable drinking water in its municipal distribution system.

According to the preliminary results of a neighborhood survey of 510 EEN households, water from the municipal piped sources is rarely available more than 5 hours per day. This water usually is only available during the late night and early morning hours. To compensate for the scarcity of municipal water, water is often collected and stored for use during periods of low or no water flow. Water is also carried from sites where good quality water is available.

A very frequent alternative is to drill wells in the ground floor of the building to depths ranging between 10-30 meters. These wells are connected directly to the building plumbing and consequently, to the municipal water distribution system. A set of gate valves manually directs water from either the well or municipal source to the individual building system.

In response to concerns about the quality and quantity of drinking water available to residents in Ezbet el Nawar, staff from the Ministry of Health and Population (MoHP) collected 75 water samples and analyzed them for multiple chemical and bacteriological parameters during March 2004.

## **II Study Description**

Samples were gathered from 75 sites using MoHP-approved procedures by sanitarians from the Ezbet el Nawar and Khesous health offices of Qalyubeya Governorate and analyzed by staff from laboratories of the MoHP Environmental Monitoring and Occupational Health Studies Center, Imbaba, Giza. The sample sites were selected based on geographic location and proximity to water service and known sources of contamination after discussion with MoHP staff, area residents and project consultants. A map of the locations is attached as Appendix 1. Staff based in Ezbet El Nawar (EEN) at the Experimental Center for Recycling and Environmental Development (ECRED) assisted the sanitarians and were quite instrumental in obtaining samples and identifying locations.

The sources included 31 samples drawn from municipal water lines, 7 from mixed lines and 37 from private underground wells. All of the samples were tested for the following parameters:

Chlorine residual	pH	Turbidity	Total Dissolved Solids
Ammonia	Nitrite	Nitrate	Iron

Manganese	Calcium	Sulfate
Total Coliforms	Fecal Coliforms	Fecal Streptococcus
Bacterial Plate counts at 37°C and 25°C		Microscopic exam

In addition, six groundwater samples were tested for Chemical Oxygen Demand and another five for an array of twelve heavy metals, including:

Lead	Arsenic	Cadmium	Selenium
Mercury	Chromium	Aluminum	
Zinc	Copper	Nickel	Tin Silver

The overall results indicate that the majority of the samples (56 of 75 samples or nearly 75%) did not meet the minimum acceptable standards for drinking water in Egypt. The water samples most commonly exceeded the acceptable standards for concentrations of nitrite and manganese and for presence of coliform bacteria. Although only 5 samples were analyzed for heavy metals, none were found to have excessive levels. A summary of the key results is presented below for the three types of water sources. The details of each sample result are attached as Annex 2.

At the same time that this water quality study was being conducted, the Cairo Healthy Neighborhood Project also conducted a Neighborhood Health and Environment Survey. Five hundred and ten (510) households in the Ezbet el Nawar area were surveyed by staff from ECRED. Survey topics included incidence of diarrhea and acute respiratory infections, water sources and quality, sewage disposal, solid waste disposal, hand washing and water storage techniques. Although these results are not presented formally in this report, some of the conditions noted during the course of that survey are included in the discussion portion of this report.

### **III. Results of Water Analysis.**

#### **A. The municipal filtered water:**

Thirty one (31) samples were drawn from fixtures served by municipal water. In most cases (75%) chlorine residual was detected with levels that ranged from 0.3-2.3 ppm. Despite the presence of residual chlorine, many municipal filtered water samples did not meet the minimum standards for drinking water. Some of the results include the following:

- Although no fecal coliforms were detected, 7 of 31 samples (22.6%) were not acceptable based on presence of other coliform bacteria with total coliforms counts ranging from 20-60 MPN/100 ml.
- Of 22 samples exhibiting a chlorine residual, 7 (32%) were unacceptable based on presence of total coliforms (6), *Streptococcus faecalis* (2) or blue green algae (1). Blue-green algae were detected in the sample collected from the EEN health clinic.

- 13 of 31 (42%) samples were not accepted due to elevated nitrite (NO<sub>2</sub>) levels. Samples varied from not detectable to 0.05 mg/l. The acceptable level is less than 0.005 ppm.
- Elevated manganese levels greater than the maximum allowable level of 0.3 mg/l were found in two samples.
- Except for one very high result (1140 ppm), the Total Dissolved Solids (TDS) mean value was 366 ppm but the median value was 278. The maximum allowable is 1200 ppm.
- Sulfate ranged from 34-250 mg/l while the median level was 44. This is well below the maximum allowable level of 400 ppm.

### **B. Mixed samples**

Seven samples (7) were considered as mixed when the municipal pipes were obviously connected with well sources and the actual source water could not be determined with complete confidence at that time. See Figure 3 above.

- 3 of 7 samples exhibited residual Chlorine values from 0.1 to 0.7 ppm.
- 3 of 7 samples were positive for total coliforms, including one that had residual chlorine level of 0.7 ppm.
- The TDS ranged from 228 to 1009 ppm with the median at 418.
- Of 7 samples, 3 were not acceptable due to excessive nitrite greater than the acceptable limit of 0.005 ppm. Nitrite levels ranged from Not Detectable (ND) to 0.05 ppm with the median at 0.001 ppm.
- Sulfate ranged from 40-166 with a mean of 84 and median of 80. The maximum allowable is 400 ppm.
- One sample exceeded the maximum level for Manganese (< 0.3 mg/l) in groundwater.

### **C. Groundwater samples**

The irregular timing and volume of water available from municipal water lines forces residents to obtain water from alternate sources. Water is often collected and stored for use during periods of low or no water flow. In the CHNP study, 94% of 510 households store water for use during periods of no flow. Water is also carried from sites where good quality water is available. A frequent alternative is to drill wells in the ground floor of the building to depths ranging between 10-30 meters. Water is withdrawn from the ground with assistance from hand or electric pumps.

Samples were drawn from 37 water taps where groundwater was the known source.

- 15 of 37 (40.5%) were positive for total coliforms and several were positive for Fecal Streptococci. No Fecal Coliforms were detected.

- TDS ranged from 275-1430 ppm with a median value of 602 and mean of 591. 4 samples exceeded the maximum acceptable level of 1200 ppm.
- For Nitrite, 10 samples were ND while 25 samples (68%) exceeded the acceptable limit of 0.005 ppm. Nitrite results varied from ND to 0.14 ppm with a mean of 0.0146 and a median of 0.017 ppm.
- Sulfate ranged from 32-420 mg/l with a mean of 98 and median of 80. Only one sample was unacceptable based on excessive sulfate exceeding the limit of 400 ppm.
- The maximum level for Manganese (<0.5 mg/l in groundwater) was exceeded in 8 samples.

Of five groundwater samples (5) tested for heavy metals, none exhibited excessive levels in our analysis despite their close proximity to the garbage collector's settlement. Although the small sample size limits the conclusions that we can draw from this round of sampling, it is still good news. It is also quite possible that other areas of the community still may be prone to heavy metals accumulation if centers for metal scavenging or cleaning operations are present.

#### **IV. Discussion**

##### **A. Water Quality**

Overall, the quality of water generally available for residents of Ezbet el Nawar does not meet the minimum standards of the Ministry of Health and Population. Nearly 2/3's of the samples were unacceptable for chemical reasons and 1/3 was unacceptable based on bacterial contamination. About 17% (13 of 75) of the samples exhibit evidence of gross contamination as shown by the combined presence of high bacterial counts, grossly elevated NO<sub>2</sub> concentrations and high TDS levels.

In several instances, sources may have been assigned to the filtered (municipal) category although a review of their water characteristics (TDS and residual chlorine) indicates that perhaps they should have been considered as groundwater or mixed. Residual chlorine levels varied for filtered water samples from non detectable to 2.3 ppm. Given the short residence time of the filtered water in the distribution lines, it is possible that the variation may reflect the effects of dilution by outside sources rather than the normal decay of chlorine residual after passage through a long distribution path. In other instances, TDS levels were considerably higher (by an order of 2 or 3 times) than those recorded for samples known to be using municipal filtered water.

This supports our assessment that individual users may experience great difficulty to determine the true source of their drinking water because it varies from time to time, day to day. Several food or beverage sites stated emphatically that their water came from the municipal source despite clear evidence that the municipal water was not available at the time of obtaining of the sample. Of 510 CHNP study respondents, 87% (443) reported that they use wells for either drinking or non-drinking water for their household.

##### **B. Cross-connections between potable and non-potable water sources.**

According to the CHNP survey, 20% (103 of 510 surveys) reported wells directly connected to municipal service lines. The pipes from the wells commonly are connected to the building plumbing system with a set of gate valves controlling the source of water. Except in very rare instances, there were no back-flow prevention devices or check valves in place to prevent introduction of well water into the municipal water system.

In such situations, contamination of the municipal system can easily occur if there is a drop in water pressure in the municipal system. A pressure drop can occur during periods of high water use for flushing of municipal lines for maintenance reasons or for fighting fires. It can also occur as demand suddenly increases when thousands of households turn on their taps after waiting a day for water. Such a case can be easily imagined for a neighborhood such as EEN.

The resulting drop in water pressure sucks water from wherever there maybe a leak in the system. An open valve connecting to a private well can allow entry of contaminated groundwater into the system as can cracked distribution pipes in the ground. A hose left hanging in a laundry basin of dirty clothes is another common example.

### **C. Recommendations:**

#### **1. Reducing bacteriological hazards**

Given the uncertainty surrounding the bacteriological quality of water in EEN, it is suggested that residents treat their water prior to using it for drinking or washing food and utensils. Only 6% of 510 CHNP Study respondents reported taking steps to sterilize their water even though 23% didn't know if it is safe to drink and 20% thought that it is unsafe to drink. Sterilizing treatment techniques can include:

- solar disinfection by placing water in clear bottles in direct sunlight for at least 4 hours;
- boiling the water for ten minutes
- passing it through certain filters that meet anti-bactericidal standards, such as the ceramic candle filters made by Berkshire or Doughton
- adding chemical additives like chlorine or iodine solutions.

All of these measures are effective for removing bacterial, viral and parasitic pathogens but they will not remove chemical compounds like nitrate, nitrite, or manganese.

#### **2. Nitrite, nitrate and manganese**

Nitrite, nitrate and manganese were the most common inorganic chemical substances of public health significance found in the water samples. They were most often found in the well water samples although 42% of the filtered municipal water samples also exceeded the maximum allowable levels for nitrite or nitrate. Common sources of Nitrite and Nitrate are malfunctioning sewage systems and water seeping from animal holding pens.

Young infants, less than six months of age, are quite susceptible to the effects of ingesting excess nitrite and nitrate. Too much can impair the ability of the red blood cells to carry

oxygen throughout the body. Fortunately, after about the age of six months, the child's body has matured enough to counteract the effects of ingesting nitrite and nitrate and is much less susceptible.

Parents of young infants less than six months of age should continue to breast feed their infants. All community residents should use water from approved commercially bottled sources or from known approved municipal sources that are then sterilized to ensure removal of bacteriological pathogens. Boiling alone does not remove nitrogen compounds from water. In fact it can increase the concentrations. Unfortunately there are no inexpensive means to remove nitrite or nitrate that are available for use at the household level.

### **3. Improving the water filtration plant of Khesous.**

Ultimately, the long-term solution is to improve the quality and quantity of water from the municipal filtration plant. A review of the Khesous water treatment plant by project staff in April 2004 found that the filtration plant is operating significantly below its design capacity. The main problems point towards the need to repair or replace several pumps and to increase the capacity for chlorinating the water after filtration. Lack of funds dedicated for maintenance and for purchase of parts and chemicals seems to be a significant long-term problem. Efforts to repair the treatment plant will provide only a temporary solution unless a means is found to pay for continued maintenance.

Additional sources of water could be considered. For example, future improvements to the Al Marg water treatment facility currently are under discussion. An increase in design capacity for that facility could allow for providing water for the Khesous area and adjacent communities. Negotiations between the Cairo and Qalyubeya Governorates should be opened in order to facilitate consideration for this solution.

### **4. Reduce number of cross connections**

It is suggested that the MoHP undertake a strong effort to reduce the risk of public water supply contamination by removing the connections between the private wells and the public drinking water system. Even before additional water becomes available, households should remove the direct connections between the wells and municipal filtered water system. This can be accomplished by several means:

Completely cutting off and closing the wells;

Ensuring that households using groundwater have a complete separation between the two building plumbing systems, potable and non-potable. Some households have cut the connection and maintained a tap for municipal water on the ground floors. The well water remains connected to the household plumbing and is used for washing and flushing of toilets.

Placement of suitable devices like check valves and vacuum breakers (air gaps), to prevent back-flow of polluted water into the municipal system. This is least desirable as it still leaves open the potential for cross contamination if the devices malfunction.

### **5. Improvements to the main distribution network**

The Khesous Local Unit would benefit from a program for upgrading the main water distribution line infrastructure of the area. This would include a review of the main

distribution network with a view of placing valves for controlling flows to various parts of EEN. This would make it easier to isolate different sections of the system and facilitate repairs and maintenance. The Local Unit also should also consider the addition of new lines that would join existing dead-end lines and serve to create loop distribution networks. Creating loops in the network will help balance the water pressure and volume throughout the loop and help to reduce the occurrence of burst pipes.

As with any correct installation of pipes, care and supervision must be used in order to ensure that pipes and valves are installed at the correct depth using the proper materials and designs. Adequate sand bedding should be properly placed to prevent punctures, compression or sagging of the lines after installation.

Improvements to the water distribution systems must be complemented by a program to improve the carrying capacity of the local sewer infrastructure. Increases in the quantity of water available will increase the amount of sewage discharged per household. Significant problems currently exist with the present sewer system whereby sections of EEN regularly flood due to blockages and failures in the sewer system. Of 506 respondents in the CHNP neighborhood survey, 81% reported pooling sewage around either their own residence or their neighbor's.

Significant improvements need to be made for the sewage disposal system, such as completing the main wet well and pump station that receives EEN sewage. A protocol also must be developed which explains the responsibilities for construction and maintenance of the sewage collection systems. Presently these responsibilities are divided between the Local Unit, private contractors and the Gamaya (Community Development Association). A written agreement would help when developing a comprehensive management plan for the sewer.

The last recommendation would be for the Local Unit to maintain a closer control on new construction of residences. At any time in Ezbet el Nawar, one can see construction occurring as additional floors and new apartments are added to existing buildings and vacant land. Even an area with an existing, well planned system for water and sewer infrastructure will swiftly be overloaded if an increase in the number of dwelling units is allowed to occur unchecked. Such uncontrolled growth compounds the present deplorable situation and will exacerbate the present problems of EEN.

## **6. Health Education and Raising Public Awareness**

The local health unit also should promote programs that can educate the public about the problems of a contaminated municipal water supply and the difficulty in determining whether or not the water is coming from an approved source. The MoHP could demonstrate effective methods for point of use treatment to sanitize the domestic water for use by individual households and the ways to store clean water.

It could also emphasize the importance of proper hand washing techniques. The vast majority (75-83%) of CHNP study respondents did not seem aware of the importance of washing their hands after changing a baby, before feeding it or before preparing food. Only 68 % thought it was important to wash after defecating however 84.5% considered it important to wash your hands before eating.

Local community development associations and non-governmental organizations could assist the MoHP staff after receiving training and materials to target specific groups, such as women, youth or garbage collectors.

## **V. Conclusion**

The analysis of 75 water sources (both municipal filtered water and groundwater wells) indicates that Ezbet el Nawar residents generally do not have sufficient amounts of high quality drinking water. The majority of the samples (56 of 75 samples or nearly 75%) did not meet the minimum acceptable standards for drinking water in Egypt. The water samples most commonly exceeded the acceptable standards for concentrations of nitrite and manganese and for presence of coliform bacteria.

The results for municipal filtered water sources show that this water is compromised in its quality and thus its suitability for drinking water. The most likely contamination source of the municipal water lines would be the numerous private wells that are cross-connected to building plumbing and thus also connected to the municipal lines. Further testing is necessary to clearly determine that the water treatment plants are not sources of poor quality water.

A survey of 510 households found that most people experience cuts in water service daily while 54% receive water less than 5 hours per day. To supplement the municipal water supply, most residents (87%) reported that they use wells for supplying either drinking or non-drinking water for their household. The samples from multiple private wells show high levels of bacterial contamination and excessive amounts of manganese and nitrate-nitrite compounds. The presence of bacterial contamination as shown by the total coliforms analysis indicates the likelihood of fecal contamination of the groundwater.

Since it is difficult to determine water sources at the household tap, all residents should be encouraged to sterilize their water prior to drinking it by boiling, filtering, addition of disinfecting solutions (chlorine or iodine) or be solar disinfection. Households with young infants less than 6 months old should not use groundwater for drinking purposes due to the risk of anemia occurring in the infants from elevated nitrite and nitrate concentrations. Simple sterilization of the water by boiling, filtering or solar disinfection does not remove nitrite/nitrate compounds but it does significantly lower the risk of bacteriological infections. Infants should be breast fed and given commercially bottled water from approved sources or water from an approved municipal water source after sterilization.

Several long-term solutions are needed to increase the amount of potable water available from the water treatment facilities of Khesous. Repairs and renovations of the existing water treatment plant for Khesous would increase the capability to treat water drawn from the Ismailia Canal and from deep groundwater wells. A proposed addition to the Al Marg water treatment plant could be modified to provide enough additional capacity sufficient to meet the needs of Ezbet el Nawar and adjacent areas. This would greatly increase the supply for Khesous and Ezbet el Nawar.

Steps to upgrade and maintain the distribution network infrastructure would also improve the long-term delivery of potable water to the residents of Khesous and Ezbet el Nawar. Such a program must be partnered with a program to remove the cross-connections between water sources that contaminate the clean, potable water in the municipal distribution system.

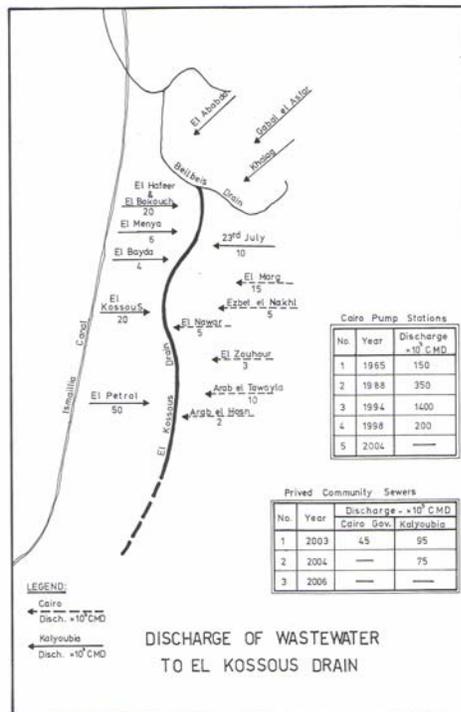
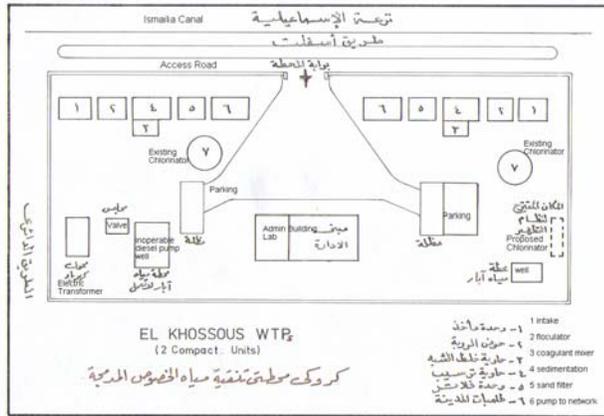
Khesous also must improve the sewerage collection system in order to handle the additional sewage flows that are sure to occur as the potable water supply increases. Most respondents in the household survey reported that they already experience problems of sewage pooling around their residence or that of their neighbor. Key components of the sewer collection system, like the main pump station, must be finished. A management agreement also must be developed between the Local Unit, the Gamaya and the sewer contractors for system maintenance and line extensions.

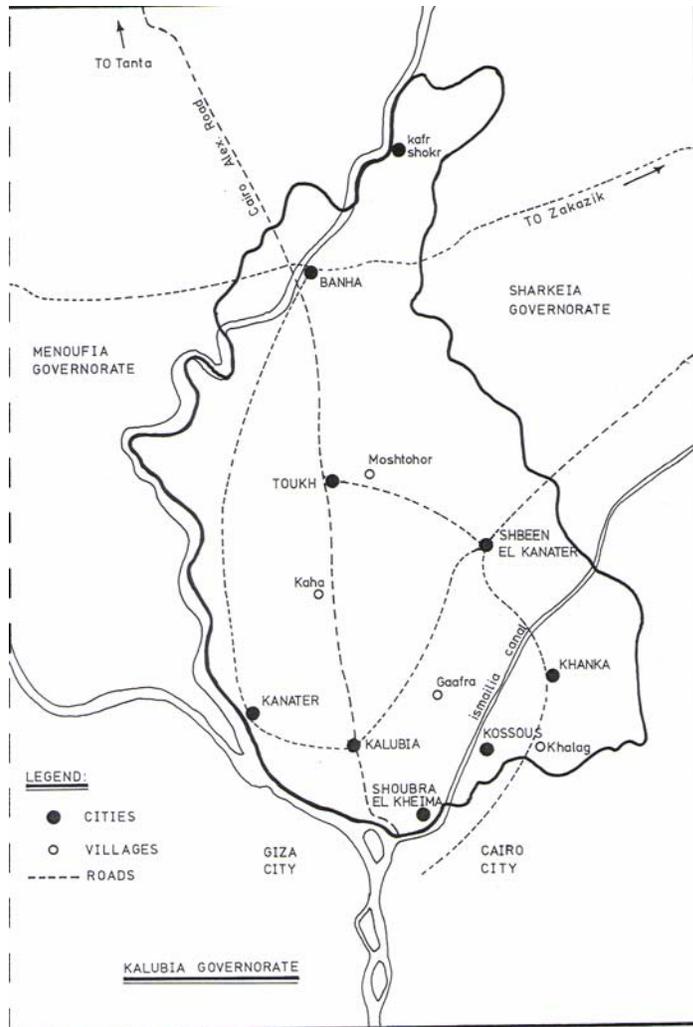
A long term solution should include discussions leading to an administrative agreement between Cairo and Qalyubeya for providing infrastructure services for this blighted area. Although administratively part of Qalyubeya Governorate, Ezbet el Nawar is geographically isolated from the rest of Qalyubeya by the Khesous Drain. Surrounded by Cairo Governorate on the three other sides, it would be better if services for water and sewer were provided from the Cairo side. Such an agreement would improve conditions for an area that has developed without the benefit of regional urban planning.

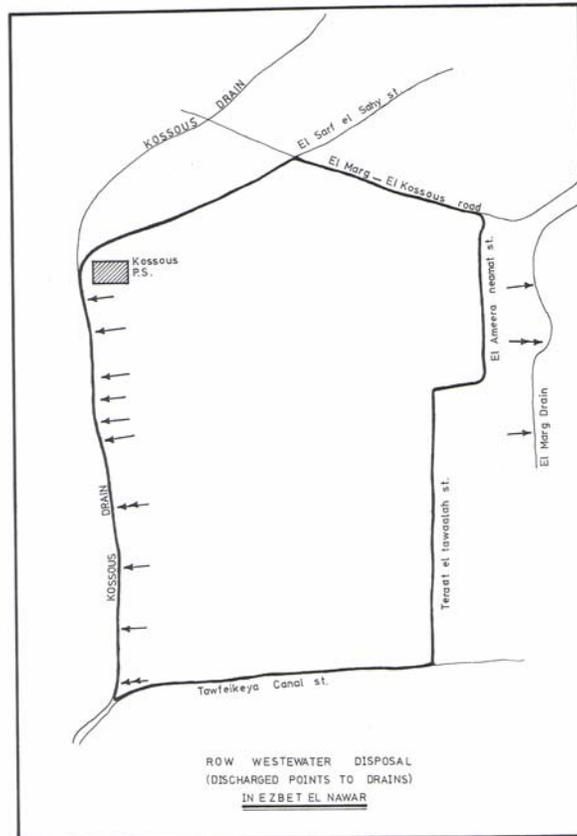
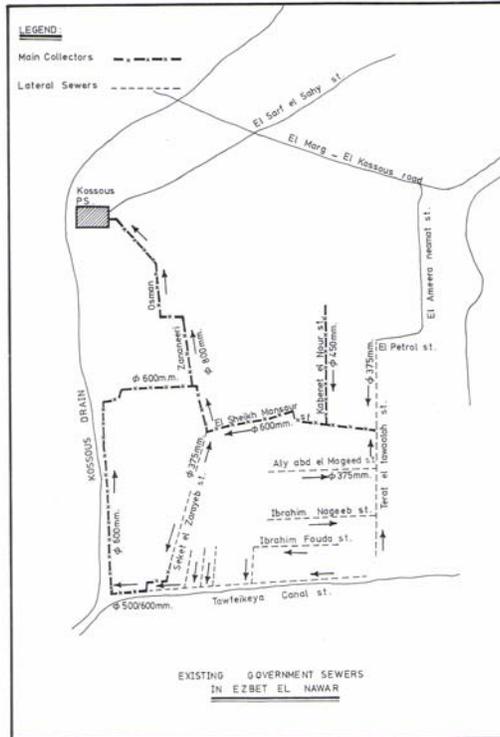
The conditions that occur in Ezbet el Nawar are similar to those of other informal areas that have become urban settlements during the past several decades. It is a familiar situation that likely will recur unless there is logical process for ensuring that future settlements and construction conform to accepted plans and standards for infrastructure development and community services support. If new construction is allowed to continue in the present uncontrolled manner, then there will always be an overload of the sewer, water, solid waste disposal and other community services. A positive future for EEN must include controls on building construction and good comprehensive planning for maintenance and future infrastructure improvements.













# Annex IV. Arabic Questionnaires for Neighborhood Household Survey



المسح الميداني للحالة الصحية والبيئية لعزبة النوار

		التعاريف			
عدد الطوابق في المنزل:		المحافظة:	القطاع رقم:		
1-1	3 طوابق	قسم / مركز:	العمارة رقم:		
4-2	6 طوابق	شباخة / قرية:	رقم وحدة الإسكان:		
3	< 6 طوابق	رقم المنزل داخل القطاع:	العنوان بالتفصيل:		
عدد الشقق بكل طابق		إسم رب المنزل:			
1	شقة واحدة				
2	شقتين				
3	3 شقق				
4	4 أو أكثر				
بأي طابق يقع هذا السكن بما في ذلك الطابق الأرضي؟					
		زيارات المقابل			
الزيارة النهائية		3	2	1	
يوم: شهر: سنة:					التاريخ
الفريق					الفريق
المقابل					المقابل
المشرف					المشرف
مساعد المشرف					مساعد المشرف

النتيجة				النتيجة
إجمالي عدد الزيارات:				الزيارة التالية: التاريخ: التوقيت:
إجمالي عدد الأفراد بالمنزل	أكواد النتائج :			
	1 تمت 2 لا يوجد أحد بالمنزل/لا يوجد شخص مسنول بالمنزل. 3 كل أعضاء المنزل مسافرين لفترة ممتدة. 4 تأجلت 5 رفضوا 6 المسكن فارغ/ العنوان ليس سكناً 7 المسكن قد هدم 8 لم نجد المسكن 9 غيرها (حدد) -----			
HHQ رقم السطر للمجيب من				
تم التأكد من العنوان: نعم 1 بواسطة: ----- -- لا 2		أعيدت المقابلة: نعم 1 بواسطة: ----- -- لا 2		
المفتاحي:	المكود:	الكاتب بالمكتب:	الكاتب الميداني:	الاسم:
200 / /	200 / /	200 / /	200 / /	التاريخ:
				التوقيعات:

### جدول المنازل

نريد بعض البيانات عن الأشخاص المقيمين معكم بالمنزل أو الذين يزورونكم الآن :

رقم السطر	المقيمين والزوار	القرابة	الإقامة	النوع	العمر	الحالة الاجتماعية	حدوث الأمراض
-----------	------------------	---------	---------	-------	-------	-------------------	--------------

013	012	011	010	009	008	007	006	002	001
ضع دائرة حول رقم السطر الخاص بأي شخص مصاب بإصابة تنفسية حادة مع كحة ونهجان خلال الأسبوعين الماضيين	ضع دائرة حول رقم السطر للأشخاص الذين أصيبوا بالإسهال خلال الأسبوعين الماضيين	ما هي الحالة الاجتماعية الخاصة به/يها؟ -1 متزوج -2 أرمل -3 مطلق -4 منفصل -5 لم يسبق له الزواج مكتوب كتابه/كتابتها	كم عمر (فلان) في عيد ميلاده الأخير؟ سجل الأعمار التامة	هل (فلان) ذكر أم أنثى؟	هل نام (فلان) هنا الليلة الماضية؟	هل يقيم (فلان) هنا عادة؟	ما قرابة (فلان) برب الأسرة؟ أنظر الكود أدناه	أرجو إعطائي أسماء الأشخاص عادة بدءاً من رب المنزل. المقيمين يعد ملء الأسماء إذهب إلى الأسنلة 3-5 للتأكد من المعلومات.	
سطر رقم	سطر رقم		بالأعوام	ذكر/أنثى	نعم لا	نعم لا			
01	01			2 1	2 1	2 1	رب الأسرة 01		01
02	02			2 1	2 1	2 1			02
03	03			2 1	2 1	2 1			03
04	04			2 1	2 1	2 1			04
05	05			2 1	2 1	2 1			05
06	06			2 1	2 1	2 1			06
07	07			2 1	2 1	2 1			07
08	08			2 1	2 1	2 1			08
09	09			2 1	2 1	2 1			09
10	10			2 1	2 1	2 1			10

أكواد السؤال رقم 006

القرابة لرب الأسرة :

01 = رب الأسرة

02 = زوج/ زوجة

03 = أبن / ابنة

04 = زوج الابنة / زوجة الابن

05 = حفيد

06 = والد

07 = حما

08 = أخ / أخت

09 = زوج الأخت / زوجة الأخ

10 = قريب آخر

11 = ابن بالتبني / ربيب

12 = ابن الزوج

13 = غير قريب

98 = لا أعلم

لمجرد التأكد أن ما سجلته كاملاً :

003 هل هناك أي أشخاص آخرين مثل الأطفال الصغار أو الرضع

لم نذكرهم؟ نعم --- أضف إلى 002 لا---

004 بالإضافة إلى ذلك ، هل يوجد أي شخص غير عضو بالعائلة، مثل الخدم ، المسافرين أو الأصدقاء يقيم هنا عادة ؟

نعم --- أضف إلى 002 لا---

005 هل لديك أي ضيوف أو زوار مؤقتين يقيمون هنا أو أي شخص

آخر نام هنا الليلة الماضية؟ نعم--- أضف إلى 002 لا---

014 ضع علامة هنا إذا كنت قد استخدمت جدول منازل إضافي .



رقم	الأسئلة والمرشحات	طوائف التكويد	إذهب إلى
029	كيف تتم المحاسبة على استهلاك المياه	21 قيمة متوسطة شهرية 22 قراءة العداد الفعلية 23 لا أعلم	
030	هل تعتقد أن مياه الشرب هذه آمنة للشرب إن أتت من المصدر بدون أي معالجة ؟	1 نعم 2 لا 3 لا أعلم	
031	اشرح نوعية مياه الشرب المتوافرة لديكم ؟ ( أشر على كل ما ينطبق )	1 طعمها سيء 2 رائحتها سيئة 3 صافية 4 لونها أبيض 5 لونها بني أو أسود 6 بها شوائب 7 لا توجد لدي مشاكل	
032	خلال الأسبوعين الماضيين ، هل كانت المياه غير متوفرة من المصدر المذكور برقم 024 ؟	1 نعم 2 لا 3 لا أعلم	041 041
033	ماذا تفعل عندما تنقطع مياه الشرب ؟	1 تنتقل لمياه الآبار 2 تحضر المياه من جار أو صديق 3 تشتري مياه زجاجات 4 تستخدم مياه مخزنة بخزانات 5 تشتري من تاجر مياه 6 تستخدم حنفية عمومية 7 تستخدم الجامع أو الكنيسة	
034	هل يحدث هذا يومياً أو شبه يومياً أو بضعة مرات أسبوعياً أو أقل من ذلك؟	1 يومياً أو شبه يومياً 2 بضعة مرات أسبوعياً 3 أقل من ذلك 8 لا أعلم	
035	كم ساعة تتوافر المياه يومياً ؟	1 > 5 ساعات 2 6-12 ساعة 3 12-18 ساعة 4 < 18 ساعة 5 لا أعلم	
036	من أين تحصل على المياه لغير أغراض الشرب ؟ (الاستحمام ، غسيل الملابس ، غسيل الأطعمة ، تنظيف المنزل )	نفس مصدر مياه الشرب 11 مواسير مياه لمنزلكم 12 مواسير مياه باحة البيت 13 حنفية عمومية 14 حنفية الجيران 21 بئر مياه مفتوح بالمنزل 22 بئر مياه مفتوح بباحة المنزل 23 بئر مياه مفتوح عمومي 31 بئر مياه مغطى بالمنزل 32 بئر مياه مغطى بباحة المنزل 33 بئر مياه مغطى عمومي 41 مياه جارية من التربة 51 زجاجات مياه 96 غيرها (حدد)	039
037	هل تعتقد أن هذه المياه آمنة للشرب من المصدر بدون أي معالجة ؟	1 نعم 2 لا 8 لا أعلم	
038	المستخدمة لغير أغراض الشرب المتوافرة لديكم ؟ اشرح نوعية مياه ( أشر على كل ما ينطبق )	نفس مصدر مياه الشرب 1 طعمها سيء 2 رائحتها سيئة 3 صافية 4 لونها أبيض 5 لونها بني أو أسود 6 بها شوائب 7 لا توجد لدي مشاكل	039
039	إذا كنت تستخدم بئر لمياه الشرب أو الأغراض الأخرى كم يبلغ عمق البئر ؟	1 > 10 متر عمق 10-2 15 متر عمق	

20 متر عمق	3 <- 15
25 متر عمق	4 <- 20
< 25 متر عمق	5

رقم	الأسئلة والمرشحات	طوائف التكويد	إذهب إلى
040	أطلب رؤية مكان البئر (لاحظ إن كانت هناك وصلات بين البئر و مواسير المياه العمومية) ضع دائرة على كل الإجابة صحيحة	1 البئر خارج المبنى 2 البئر داخل المبنى 3 مواسير المياه العمومية متصلة مع البئر 4 مواسير المياه العمومية غير متصلة مع البئر 8 لم أتمكن من الملاحظة	
41	هل تقومون بتخزين المياه بالمنزل ؟	1 نعم 2 لا 8 لا أعلم	045 045
042	أطلب رؤية خزانات المياه . هل يمكن أن أرى خزانات المياه ؟ لاحظ : هل الخزانات مغطاة ؟	1 كلها مغطاة 2 بعضها مغطاة 3 كلها غير مغطاة 8 لم أتمكن من الملاحظة	045
043	لاحظ : هل الخزانات لها فتحة علوية واسعة أو ضيقة ؟	1 فتحة ضيقة 2 فتحة واسعة 3 من النوعين	
044	لاحظ : ما نوع الخزانات المستخدمة للتخزين ؟	1 لا يوجد 2 خزانات علوية 3 تانكات صلب مجلفن 4 براميل بلاستيك 5 جراتل 6 زجاجات مياه أو صودا بلاستيك 96 غيرها _____	
045	هل تعالجون المياه بأي طريقة لجعلها آمن للشرب ؟	1 نعم 2 لا 8 لا أعلم	047 047
046	إذا نعم ، فماذا تفعلون لجعل المياه آمن للشرب ؟ ضع دائرة حول كل ما ينطبق .	1 الغليان 2 إضافة كلور أو مبيضات 3 الترشيح (فلتر) التعرض لضوء الشمس تركها لتترسب قبل الاستخدام غيرها _____	
047	ما نوع دورة المياه التي يستخدمها معظم أعضاء الأسرة ؟	11 تواليت حديث بالطرد 12 تقليدي بخزان طرد 13 تقليدي والطرد بجردل 21 ميولة / صرف للبول 31 لا يوجد 96 غيرها (حدد) _____	053
048	هل يعمل التواليت حالياً ؟	1 نعم 2 لا 8 لا أعلم	
049	أين يتم هذا الصرف ؟	01 صرف عام 02 بيارة بطلمية عاطسة 03 ترانش 04 مواسير متصلة بالترع 05 مواسير متصلة بترانش 06 بيارة بدون طلمية ( إستعانة بسيارة كسح) 96 غيرها (حدد) _____ 8 لا أعلم	
050	هل تعاني أو يعاني أي من جيرانكم أي مشاكل في هذا النظام للصرف ؟ إذا كانت الإجابة "نعم" ما نوع المشاكل ؟	1 برك حول السكن الخاص 2 برك حول سكن الجيران 3 تكلفة عالية للنزح 4 لا يتم الصرف 96 غيرها (حدد) _____	

	5 لا توجد مشاكل لا أعلم		
	8 عدد المنازل الأخرى المشتركة في نفس الصراف غير متأكد من العدد المشترك لا تتم المشاركة في الصراف	هل تتشاركون مع منازل أخرى في هذا الصراف ؟ إذا كانت الإجابة "نعم" كم عدد المنازل الأخرى المشاركة ؟	051
	1 خاصة مشتركة 2 عامة 8 لا أعلم	إن كنتم تشاركون في الصراف فهل هي عامة أو خاصة مشتركة؟ خاصة مشتركة: إستخدامها محصور لأشخاص معينون.	052
<b>رقم</b>	<b>الأسئلة والمرشحات</b>	<b>طوائف التوكيد</b>	<b>إذهب إلى</b>
053	أطلب أن تشاهد التواليت الذي يستخدمه معظم أعضاء المنزل ؟ لاحظ ما إذا كان هناك أي بقايا براز على حوائط التواليت أو على الأرض .	1 نعم موجودة بقايا 2 لا يوجد بقايا 3 لم أتمكن من الملاحظة 8 لم أتمكن من دخول التواليت	
054	هل يوجد بمنزلكم أي مكان لغسل الأيدي ؟	1 نعم 2 لا	058
055	أطلب مشاهدة المكان المستخدم لغسل الأيدي عادة . وضح إذا ما كان في نفس الغرفة أو في غرفة مجاورة للتواليت المستخدم بواسطة أعضاء المنزل .	1 في نفس الغرفة أو غرفة مجاورة 2 ليست قريبة من التواليت 3 لم أتمكن من التحديد / لا يوجد تواليت 8 لم أتمكن من ملاحظة أي مكان لغسل الأيدي	058
056	<b>لاحظ إذا ما توافرت الأشياء التالية في منطقة غسل الأيدي:</b> حنفية مياه ؟ صابون ، تراب ، أو أي مواد تنظيف ؟ فوطه أو قماشه ؟ بانينو ؟	نعم لا 1 2 1 1 1	
057	متى يكون مهم أن تغسلون أيديكم ؟ ملاحظة: لا تقروا السؤال بل حاول أن تستخرج منه الإجابات بطريقة غير مباشرة	قبل الأكل بعد التواليت بعد تنظيف الأطفال قبل التعامل مع الأطعمة قبل إطعام الأطفال	
058	كيف يتخلص هذا المنزل من القمامة وبقايا المطبخ ؟ سجل الطريقة الرئيسية للتخلص من القمامة فقط ، وإذا كانوا يستخدمون طريقتين أو أكثر بنفس الدرجة ، سجل أكثر الوسائل استخداماً .	تجمع: 11 من المنزل 12 من صندوق بالشارع تلقى : 21 في الشارع أو خرابه 22 في ترعة أو مصرف تحرق: 31 تغذى بها الحيوانات 41 غيرها (حدد) 96 98 لا أعلم	
059	متى تجمع القمامة الخاصة بكم ؟	1 يوماً 2 مرتين أسبوعياً 3 3 مرات أسبوعياً 4 أكثر من 3 مرات أسبوعياً	
060	ما هي رسوم جمع القمامة من منزلكم ؟	جم 98 لا أعلم	
061	ما هو نوع الوفود المستخدم بمنزلكم للطهي ؟	01 الكهرباء 02 غاز طبيعي 03 كيروسين 04 فحم / إيجنايت 05 فحم نباتي 06 خشب محرقه / قش 07 القمامة 98 غيرها (حدد)	

لا	نعم		هل يوجد بمنزلكم : كهرباء؟ راديو كاسيت؟ تلفزيون؟ فيديو؟ تليفون؟ محمول؟ كمبيوتر شخصي؟	062
2	1	كهرباء 000000000		
2	1	راديو كاسيت		
2	1	تلفزيون		
2	1	فيديو		
2	1	تليفون		
2	1	محمول		
2	1	كمبيوتر شخصي		

رقم	الأسئلة والمرشحات	طوائف التوكيد	إذهب إلى
063	هل يوجد بمنزلكم : مروحة كهربائية سخان ماء ثلاجة فريزر ماكينة خياطة غسالة أوتوماتيك أي غسالة أخرى بوتاجاز بالغاز أو بالكهرباء تكييف هواء غسالة أطباق دش ساتا لايت	نعم مروحة كهربائية سخان ماء ثلاجة فريزر ماكينة خياطة غسالة أوتوماتيك أي غسالة أخرى بوتاجاز بالغاز أو بالكهرباء تكييف هواء غسالة أطباق دش ساتا لايت	لا 2 2 2 2 2 2 2 2 2 2 2 2
064	هل تمتلك أنت أو أي من أفراد المنزل : عجلة؟ موتوسيكل أو سكوتر؟ سيارة أو فان أو نقل؟ مزرعة أو أي أرض أخرى؟	عجلة موتوسيكل سيارة أو فان أو نقل مزرعة أو أرض	2 2 2 2
065	كم يدفع منزلكم في المتوسط لفاتورة الكهرباء شهرياً؟	لا توجد كهرباء لا أعلم	بالجنيهات 997 998
066	في حالة وجود نظام صرف صحي أو قيد الإنشاء في منطقتك : هل توصل منزلك على الشبكة؟		لا نعم 2 1
067	هل توافق على دفع ثمن توصيلة المنزل؟		2 1
068	هل توافق على المساعدة في المشروع؟		2 1
069	إذا كنت تتوي المساعدة ، ما نوع المشاركة التي تستطيع تقديمها؟	مساعدة مادية المساعدة في الحفر توفير الماسير والعدد توفير عمالة أخرى غيرها	1 2 3 4 5
070	إذا كنت تتوي المساعدة مادياً فما هو المبلغ الذي تتوي تقديمه لتحسين خدمة الصرف الصحي؟	لا أعلم لا يمكنني التحديد أقل من 100 جم 300 جم 500 جم 700 جم	1 2 3 101-4 301-5 501-6

701-7	1000 جم				
8	1000 جم				
لا	نعم				
2	1			هل لديك حالياً الموارد المادية المطلوبة للصراف على التوصيلة لتحسين الخدمات الخاصة بنظام الصراف للبلاد ؟	071
2	1	يمكنني الاقتراض من عملي		إذا كانت الإجابة لا فما هي الطريقة المثلى للحصول على المال؟	072
2	1	يمكنني عمل جمعية			
		يمكنني الاقتراض من			
2	1	الجيران والأقارب			
2	1	يمكنني أخذ قرض بنكي			
		يمكن التوصيل ثم أسدد			
2	1	للحكومة بنظام تقسيط			
1		أقل من 3 جم		ما هو أقصى القسط الشهري الذي يمكنكم سداده الآن لتحسين خدمة الصراف الصحي ؟	073
3-2		5 جم			
6-3		9 جم			
10-4		15 جم			
16-5		20 جم			
6		أكثر من 20 جم			
98		لا أعلم			
1		لا أنوي المشاركة		هل تتوي المشاركة في التواليت وحوض الغسيل مع منازل أخرى؟ إذا نعم فكم هو العدد الأقصى من المنازل التي تقبل أن تتشارك معهم ؟	074
2		منزل واحد			
3		منزليين		إستخدم عدد أفراد الأسرة 6 أشخاص.	
4		3 منازل			
5		4 منازل			
6		5 منازل أو أكثر			
8		لا أعلم			
1		المجلس المحلي		في حالة المشاكل في الصراف ، من تود أن يساعدك ؟	075
2		هيئة الصراف الصحي			
3		الجمعية المحلية			
4		وزارة الصحة			
5		مقاول خاص			
96		غيرها			
6		لا أحد			
8		لا أعلم			
1		نعم		قبل كلمتم أيأحد من قبل بالنسبة لمشكلة الصراف؟	076
2		لا			
لا		نعم		هل هناك استجابة لطالبك من :	077
2	1	المجلس المحلي			
2	1	هيئة الصراف الصحي			
2	1	الجمعية المحلية			
2	1	وزارة الصحة			
2	1	مقاول خاص			
		غيرها			
1		في نفس اليوم		إن كان هناك إستجابة في سؤال 77 فكم من الوقت إستغرقت الإستجابة؟	078
2		1 يوم			
3		2-3 يوم			
4		4-6 يوم			
5		أسبوع أو أكثر			
1		نعم		هل حلت المشكلة؟	079
2		لا			
1		أقل من 5 جنيه		ما هو أقصى القسط الشهري الذي يمكنكم سداده الآن لتحسين خدمة المياه ؟	080
6-2		9 جم			
10-3		15 جم			

	16- 4 5 6 98	20 جم 21 - 25 جم أكثر من 25 جم لا أعلم	
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# Annex V. Executive Summary (Arabic)



## الخلاصة التنفيذية

إن التوسع الحضري السريع والغير محكوم يعتبر قاسم مشترك في المدن الرئيسية في كافة أنحاء العالم، حيث يجذب الريفي الفقير إلى المناطق الحضرية بإغراء الوظائف و العائلة و الحياة الأفضل. في أغلب الأحيان يتجمعون على أطراف المدن في الأحياء الفقيرة الحضرية الغير مخططة الشديدة الإزدحام. تتوسع مثل هذه الأحياء في أغلب الأحيان بدون التخطيط الرسمي أو الأحكام الضرورية لتخطيط استخدام الأراضي و الأمن و الخدمات الإجتماعية و الصحية أو البناء التحتي للطرق و الصرف الصحي و الماء و الكهرباء و الإتصالات. هذه هي حالة عزبة النوار، فهو حي فقير عشوائى واقع في الحدّ بين محافظتي القاهرة و القليوبية في جمهورية مصر العربية.

نفذ برنامج جعل المدن تعمل / أحياء القاهرة الكبرى الصحية ( Making Cities Work/Greater Cairo Healthy Neighborhood Program) في عزبة النوار من أكتوبر 2003 إلى أغسطس 2004. هذا البرنامج كان ممول من قبل الوكالة الأمريكية للتنمية الدولية (USAID) برنامج جعل المدن تعمل و تم تطبيقه من قبل مشروع الصحة البيئية و المركز التجريبي لإعادة تدوير المخلفات و التنمية البيئية بعزبة النوار.

هدف المشروع كان أن يصمّم ويروّج ويطبّق عملية رخيصة وتحسينات يمكن تكرارها على المستوى المنزلي و المجتمعي في مجالات الصرف الصحي، مياه الشرب وتقنيات الصحة البيئية الأخرى. تضمّنت النشاطات تقييم بيئي لشبكات الماء الصرف الصحي و تحليل 75 عينة مياه من الآبار الخاصة و المصادر العمومية كما تم عمل مسح ميداني لـ 510 أسرة مركزاً على الصحة و البيئة و تم تحضير خرائط رقمية و خطة عمل محلية، و تطبيق تحسينات للصرف الصحي و الماء. كما تم تصميم نشاطات لتطوير ودعم للتدخلات المستقبلية بمشاركة المنفعين و أصحاب الحصص في عزبة النوار.

### 1. الوضع الراهن للصحة و مصادر المياه

#### 1. الصحة و إمدادات المياه

إن الأطفال أقل من عمر 3 سنوات أكثر عرضة لمخاطر الإسهال و الأمراض التنفسية. نسبة ظهور هاتين الحالات المرضية قاربت 42% (أي 71 من 170 طفلاً). النسبة للمجموعة العمرية التالية من 4 إلى 7 سنوات قلت للنصف أي 24.3%.

حيث أنه لا توجد عيادة طبية متكاملة في عزبة النوار فتقوم القافلة الطبية بزيارة المنطقة أمام عيادة تنظيم الأسرة كل أسبوعين و قامت أخيراً وزارة الصحة بفتح عيادة تنظيم الأسرة بالقرب من المركز التجريبي. كما توجد عيادات خاصة صغيرة لتوفير الإسعافات الأولية في المركز التجريبي و مركز السلام.

كما كشف المسح الميداني على معرفة الناس لأوقات غسل الأيدي حيث إستجاب حوالي 76% من المشاركين بأنه يجب غسل الأيدي قبل الأكل و حوالي 46% ذكروا غسل الأيدي بعد التبرز، تمكن نصف المشاركين من حصر على الأقل نشاط واحد و 28% ذكروا نشاطين في حين 8% لم يذكروا أي نشاط لغسل الأيدي.

إن إمداد المياه العمومية ليس مستقراً حيث أن أكثر من 65% من المجتمع يعانون من إنقطاع الماء يومياً طوال النهار عدا ساعات متأخرة بعد منتصف الليل حتي الساعة السادسة صباحاً. فالمياه العمومية تغطي أقل من 15% من الإحتياجات الأساسية للمياه لعزبة النوار مما أدى إلى

إستيفاء باقي الإحتياج عن طريق المئات من الآبار الخاصة التي تسحب مياه ملوثة من أعماق قليلة. كما أن الزيادة الدائمة في المباني و الوحدات السكنية الغير محكومة يضاعف المشكلة نظراً لزيادة الطلب على الماء.

أما بالنسبة لعينات المياه الـ75 المأخوذة من (مياه جوفية و عمومية) عزبة النوار فإن 75% منها لم تطابق الحدود الدنيا لمواصفات مياه الشرب في مصر. العينات عادةً تجاوزت المواصفات في النترت و المنغنيز و بكتيريا الكولونية، أما المعادن الثقيلة لم تظهر بمستويات كبيرة. إقترحت إختبارات وزارة الصحة و السكان وجود خلط بين مياه الآبار و المياه العمومية و تأكدت هذه الإقتراحات بعد المعاينة و وجود العديد من الوصلات التي تؤدي إلى تلوث الخطوط العمومية.

إن الخيارات لزيادة كميات المياه من المصادر العمومية محدودة. فالمصدر الوحيد من محافظة القليوبية يكمن في محطة تنقية المياه في قرية الخصوص التي تعمل بكفاءة أقل من 50% نظراً للأعطال الدائمة و قلة الصيانة. أما الحصول على المياه من القاهرة من خلال محطات المرج و مسطرد فهو غير وارد نظراً لعدم كفاية الإنتاج من القاهرة و عدم وجود إتفاقيات لسداد رسوم الخدمات عبر حدود المحافظات علاوةً عن أن الرسوم المحصلة من المنازل نظير إستخدام المياه تعتبر أقل من تكلفة الإنتاج و توزيع المياه بالإضافة إلى أن الأموال المحصلة تحول إلى خزانة الحكومة و المردود منها غير كافي لعمليات التشغيل و الصيانة الدورية. أما شبكات توزيع المياه فهي تفقد التصميم و نظام تحكم المناطق و فتحات غسل الخطوط. و نظراً لعدم توفر نظام حلقي للشبكات فذلك يتطلب ضغوط أعلى من المياه لوصول المياه لأطراف الشبكة مما يؤدي لحدوث إنفجارات للخطوط. كما أن طفوحات تحدث أيضاً في خطوط الصرف الصحي و نظراً لقرب الخطوط من بعضها فإحتمال تلوث المياه العمومية بالصرف الصحي وارد.

## 2. الوضع الراهن للصرف الصحي

أغلب المنازل بها مراحيض موصولة إلى شبكة من خطوط الصرف الصحي مبنية بالجهود الذاتية و الحكومية. العديد من هذه الخطوط تصب نهاياتها بالمصارف الزراعية أو الأراضي المنخفضة المجاورة في حين ان وزارة الري و الموارد المائية تدرس غلق مصرف الخصوص الذي يصب فيه كميات كبيرة من مياه الصرف من عزبة النوار.

أغلب المنازل (من 65 إلى 80%) تشتمل من تكوم مياه الصرف حول منازلهم أو منازل جيرانهم. من أكبر المشاكل هي تأخر إستكمال الأعمال بمحطة رفع الصرف الصحي بعزبة النوار التي سترفع مياه الصرف الصحي إلى الخطوط الرئيسية الذاهبة إلى محطة الجبل الأصفر. أما طلبات المؤقتة الموجودة حالياً فهي عرضة لأعطال مفاجئة مما يؤدي سريعاً إلى غرق مناطق كثيرة بالصرف الصحي.

من أسباب السدد و التسريب من خطوط الصرف الصحي هي النوعيات الرديئة من المواد المستخدمة في الشبكة. على سبيل المثال، حدث هبوط في المجمع الرئيسي بشارع الشيخ منصور مما أدى إلى سدد المجمع لذا يجب إستبداله. كما أن الشبكة عرضة لدخول أشياء كبيرة الحجم إليها تؤدي إلى سدد الخطوط مثل قمامة منزلية و مخلفات بلاستيكية من عمليات إعادة تدويره. قلة السيطرة على المباني الجديدة من قبل الوحدة المحلية و قلة التجديدات للشبكة من قبل هيئة الصرف الصحي تؤدي إلى زيادة عدد الوصلات و التنفقات في الشبكة بالإضافة إلى أن الأحياء المجاورة من جهة القاهرة (أحياء عرب الطويلة و الزهور و المرج) تصب تصرفاتها من

الصرف الصحي على عزبة النوار و لا تدفع أي رسوم لتشغيل و صيانة الشبكة إلى الوحدة المحلية أو محافظة القليوبية.

حيث أن مسئولية صيانة الصرف الصحي مشتركة بين الوحدة المحلية و جمعية تنمية المجتمع، فكلاهما تفتقر إلى العمالة و الموارد التقنية للإشراف على مستوى أداء الصرف الصحي لذا يعتمد على الشركات للقيام بأعمال الصيانة. كما أن الميزانية المخصصة لصيانة الصرف الصحي قليلة جداً حيث أن المصاريف تجمع كجزء من تعريف الماء وهي قليلة جداً.

### ب. الأعمال المقترحة لتحسين البنى التحتية

تم تحديد العديد من المقترحات اعتماداً على الدراسات و الأنشطة التقييمية و بالمشاركة مع مجموعة العمل

#### 1. إمدادات المياه:

إختبارات المشروع أوضحت صعوبة تحديد مصادر المياه و نوعيتها داخل المنازل لذلك على السكان تعقيم مياه الشرب عن طريق الغلي أو الترشيح أو إضافة مطهرات (كالكلور أو اليود) أو بأشعة الشمس (فوق البنفسجية). إن عمليات التعقيم البسيطة تقلل كثيراً مخاطر الإصابة البكتيرية لكنها لا تزيل النتريت أو نترات أو المركبات الكيميائية.

يجب على الأطفال الرضاعة من صدر الأم و شرب المياه المعبئة من مصادر موثوقة أو مصدر مياه عمومية موثوق. أما الأطفال الأقل من ستة أشهر فيجب عدم استخدام المياه الجوفية للشرب إلا في حالة المصدر الموثوق. حيث أن الأطفال الذين يشربون مياه بها قدر من النتريت و النترات قد يعانون من الأنيميا.

إصلاح و صيانة محطة تنقية المياه بالخصوص لزيادة كميات مياه الشرب المتوفرة لعزبة النوار. التعاون مع القاهرة بحيث يمكن للتجديدات المستقبلية في محطة المرج أن تزيد إمدادات المياه لعزبة النوار. ولكن هذا يتطلب تنسيق خاص لتحصي الفواتير و مقاسمة التكلفة.

تطوير و صيانة شبكات توزيع المياه عن طريق إستبدال بعض الخطوط بأخرى أكبر و تركيب محابس تحكم و غسيل و إضافة وصلات لجعل الشبكة حلقيه و إضافة مضخات تقوية للخطوط الرئيسية للحفاظ على ضغط تشغيلي ثابت بالإضافة إلى إنشاء برنامج صيانة.

عمل توعية في المجتمع حول نوعية المياه في عزبة النوار و أهمية النظافة للصحة العامة و طرق تطهير المياه مثل الغلي و إضافة الكلور و الترشيح و التعريض الماء لأشعة الشمس.

فصل الوصلات بين الأبار و مصدر المياه العمومي في شبكات توزيع المياه. وضع أحكام قوية على المباني الجديدة و إضافات المباني القائمة لتقليل الطلب على الماء و الصرف الصحي.

#### 2. الصرف الصحي

من أهم الأولويات الحفاظ و تحسين الطلمبة المؤقتة بعجالة و سرعة الإنتهاء من أعمال إنشاء محطة الرفع الرئيسية.

تحسين أوضاع شبكة الصرف الصحي لتلائم و زيادة كميات المياه المستخدمة بأنشطة مثل:

- شراء أدوات تسليك و معدات تسليك أو مضخات تسليك
- تنظيف و توسعة مصبات الصرف الصحي على مصارف الخصوص و المرج.

- إنشاء فائز بين غرف التفتيش بالمنطقة الشمالية الشرقية لتيسير السيولة و وضع ظلمبة رفع على الخط بجوار قصر الأميرة نعمت.

الإتفاق علي نظام إدارة و صيانة وتوسعة شبكة الصرف الصحي يشمل:

- إبرام مذكرة تفاهم بخصوص الصرف الصحي و وضع خطة عمل لصيانة و تشغيل محطة الرفع وجميع الخطوط.
- عمل خطة لتنظيم و إعادة تأهيل شبكة الأهالي
- إنشاء سجلات و خرائط لصيانة الخطوط
- التأكد من أن جميع المصبات على المصارف تتوافق مع المواصفات البيئية
- التنسيق مع وزارة الري و الموارد المائية لضمان ردم أو تغطية مصارف الخصوص و المرج بطريقة سليمة.

على الوحدة المحلية إحكام السيطرة على المباني الجديدة و تعليية المباني القائمة للحد من زيادة تدفقات الصرف الصحي. إذا تم التهاون بزيادة المباني فذلك سيعني أن جميع الخدمات لن تؤدي بشكل صحيح و لائق.

إنشاء إتفاقية طويلة الأمد بين القاهرة و القليوبية لتوصيل خدمات البنى التحتية لهذه المنطقة المحرومة. مثل هذا الإتفاق يجب أن يشمل سبل دفع قيمة خدمات المياه و الصرف الصحي.

### ج. الأنشطة المنفذة من قبل المشروع بعد التقييم

أنشئت خطة عمل للمشروع حول العديد من التطبيقات بعد إنتهاء مجموعة العمل من نشاطات دراسة و تقييم أوضاع الماء و الصرف الصحي.

#### 1. تنقية المياه عند المصدر على المستوى المنزلي:

نظراً لعدم توفر مياه الشرب بإستمرارية بعزبة النوار قام المشروع بدراسة وسائل معالجة المياه في المنازل، الحلول المقترحة هي:

- إضافة محلول هيبوكلوريد الصوديوم
  - الترشيح بإستخدام المرشحات السيراميكية
  - تعريض الماء لأشعة الشمس (أشعة فوق البنفسجية)
- أعجبوا الناس بالمرشحات السيراميكية و لكنها باهظة الثمن و من ناحية أخرى التعرض لأشعة الشمس كانت الأقل تكلفة و مقبولة من ناحية نوعية المياه. لم يتم ترويج لإضافة الكلور نظراً لمخافة وزارة الصحة من قلة معرفة الناس بطرق الإضافة و المحاليل اللازمة. لكن يمكن في المستقبل إعادة النظر في هذا الأمر عن طريق مشروع مياه أمنة معقمة.

#### 2. برنامج التوعية الصحية في عيد الأم ل250 سيدة:

خلال شهر مارس 2004 حضر أكثر من 250 سيدة محاضرات توعية، تزامنت مع عيد الأم، أقيمت في المركز التجريبي بعزبة النوار. قام فريق العمل بالمركز التجريبي بعرض معلومات عن المشاكل الناجمة من المياه في عزبة النوار. كما قام مدير الوحدة الصحية بعزبة النوار بمناقشة الأمراض التي تواجه سكان المنطقة. ثم قام الأطفال بأداء مسرحية و أغنية تتمحور حول مشاكل تلوث المياه و العادات السيئة المصاحبة لذلك التي تؤدي للإصابة بالإسهال، كما ركزت

المسرحة على الطرق الصحيحة لغسل الأيدي و حفظ الماء و طرق معالجة المياه في المنازل. في نهاية اللقاء تم عرض التكلفة وكفاءة كل طريقة معالجة تلاها مشاركة السيدات بخبراتهم في الحصول على مياه نظيفة.

### 3. تحسينات لشبكات المياه و الصرف الصحي

مجموعة عمل المياه و الصرف الصحي: تم تكوين مجموعة عمل للمساعدة على تقييم شبكات المياه و الصرف الصحي ضمت كل من رئيس الوحدة المحلية و ممثل الحزب الوطني الديمقراطي و رئيس جمعية تنمية المجتمع و شركات صيانة الصرف الصحي و مستشاري المشروع. عملت هذه المجموعة على إعداد مذكرة تفاهم بين الوحدة المحلية و الجمعية لتحديد مسؤوليات صيانة الشبكات و إدارة شركات الصيانة.

قام المشروع بإعداد و طرح مستندات المناقصات لجميع الأعمال كما تمت مراجعة عروض الأسعار و المناقصة بمعرفة مجموعة العمل. كما قامت مجموعة العمل بإختيار موردين للمحابس و أسياخ التسليك و ماكينة التسليك و مقاول تطوير محطة تنقية المياه. و ستقوم مجموعة العمل بمراقبة أداء مقاول التطوير التي بدأت في 7 أغسطس و ستنتهي في 6 سبتمبر 2004.

تحسينات لمحطات الرفع: نصح المهندسين الإستشاريين للمشروع الوحدة المحلية بتحسينات للطلميات المؤقتة و بالفعل قامت الوحدة المحلية بالآتي:

- وضع شبك صلب حول مأخذ الطلمبات لمنع الشوائب كبيرة الحجم.
- تم عمل تحسينات لطلمية ديزل قبل إستبدالها بأخرى كهربائية موضوعة في بيت من الطوب.
- قام المشروع بوضع مواصفات لمضخة في الجزء الشمالي من عزبة النوار لصرف المياه من خطوط الصرف إلى مصرف المرج، حيث قامت الجمعية بمساعدة الوحدة المحلية بشراء المضخة.

شراء المعدات: قام المشروع بشراء 500 سيخ تسليك مصنوع من الصلب المرن حيث أن هذه هي الأدوات الأساسية لعمال تسليك الصرف الصحي. كما تم شراء ماكينة تسليك للخطوط الصغيرة حتى 10 بوصة لتصاحب أسياخ التسليك.

محابس تحكم بشبكة توزيع المياه: إتخذ فريق العمل قرار بتحسين التحكم بالشبكات عن طريق وضع محابس سكينه في مناطق مهمة من شبكة توزيع المياه. قام المشروع بشراء 15 محبس قياس 4 بوصة و 5 قياس 6 بوصة بتكلفة إجمالية 14200 جنيه مصري. كما وافقت الجمعية بدفع 8000 جنيه مصري لأعمال الحفر و بناء غرف التفتيش للمحابس و بعد ذلك قاموا بزيادة 4000 جنيه مصري أخرى و وافقت الوحدة المحلية بتوريد أغطية غرف التفتيش و تركيب المحابس.

تجديد محطة تنقية المياه بالخصوص: قام المشروع بالتعاقد و قدره 60 ألف جنيه لتطوير محطتي التنقية المدمجة التي كانت تعمل بكفاءة أقل من 50%. يتضمن هذا العقد تغيير عدد من المضخات و المحركات و إعادة تأهيل لوائح الكهرباء و أنظمة الكلور و توريد مخزون من قطع

الغيار. كما وافقت المحافظة على دفع 35 ألف جنيه أخرى لتركيب نظام تطهير بالكلور لمحطة مياه الآبار.

التدريب: قام مهندس المشروع بتدريب أفراد الوحدة المحلية و عمال الشركات على تطوير و تطبيق خطة صيانة دورية لخطوط الصرف الصحي. كما تم عمل دليل صيانة متكامل ليستخدم حين تعمل محطة الرفع الرئيسية.

#### د. المبادرات المستقبلية بعد مشروع أحياء القاهرة الكبرى الصحية

كان المشروع مبادرة ناجحة لأنه أنتج أكثر من تقييم بيئي و خطة عمل. حيث عملت الوحدة المحلية و المحافظة و المركز التجريبي و مجموعة العمل للمياه و الصرف الصحي مجهودات لرصد الوضع الراهن و دراسات لتحسينات البنى التحتية. بالإضافة للمقترحات الموضحة أعلاه فيمكن للمجتمع أخذ بالإعتبار النشاطات التالية في المستقبل:

- بدء عملية تنظيم عزبة النوار رسمياً بحيث يمكن وصول التمويل بطرق رسمية. كما يجب تحديد تابعة عزبة النوار إما للخصوص أو لمحافظة القليوبية مباشرةً.
- أبدت وكالة التنمية اليابانية إهتمام بتطوير شبكات المياه في عزبة النوار، فعلى الوحدة المحلية بطلب المساعدة التقنية و طلب تمويل تطوير البنى التحتية للمحافظة على مستويات إنتاج المياه و تطوير شبكات التوزيع، علماً بأن إنشاء محطات معالجة إضافية سوف تقلل من نقص المياه الحالي في عزبة النوار و الخصوص.
- على محافظة القليوبية و الوحدة المحلية بالخصوص التنسيق مع محافظة القاهرة لتأمين كميات مياه إضافية لعزبة النوار من خلال محطة المرج الجديدة قبل الإنتهاء من تصميمها. يمكن موازنة تكاليف الإمداد بالمياه مع تكاليف التعامل مع صرف القاهرة على عزبة النوار.
- على الوحدة المحلية جمع كميات إضافية من الأموال لضمان إستمرارية عمليات الصيانة و التشغيل للبنى التحتية. علماً بأن المواطنين مسعدين لدفع المزيد من المال لتوفير خدمات أفضل.
- على المشروعات المستقبلية دراسة ممارسات مجتمع الزبالين و إمكانية دمجهم مع الشركات الأجنبية بدون تخفيض مستواهم لمجرد عمال. فالسؤال هل يمكن إستمرارية المستويات العالية من إعادة تدوير المواد؟ حيث أن المخلفات المجموعة من قبل الشركات تدفن فوراً بدون إعادة تدوير.
- عمل دراسة جدوى إقتصادية و تقنية لمحطة تحويل المخلفات الصلبة حيث يمكن لها تحسين النظافة بعزبة النوار نظراً انها سوف تيسر خروج المخلفات الصلبة من المنطقة بعد إنتهاء الزبالين من فرز و أخذ الأشياء ذات القيمة.
- برنامج توعية صحية للمجتمع عن مخاطر المياه الملوثة و طرق معالجتها في المنازل، معدة من قبل وزارة الصحة تتضمن آليات لفصل وصلات الآبار و المياه العمومية بعد زيادة كميات مياه الشرب.
- من المخطط أن يقام مستوصف لوزارة الصحة و السكان على شارع ترعة التوفيقية و لكن الأعمال مؤجلة لحل المشاكل الحدودية بين القاهرة و القليوبية. كما أن العشوائيات بدأت بالتسرب و إشغال المنطقة. على المحافظتين التعاون لنقل ملكية الأرض من وزارة الموارد المائية و الري إلى الإدارة الصحية بمحافظة القليوبية.

تم تطبيق برنامج جعل المدن تعمل / أحياء القاهرة الكبرى الصحية بميزانية متواضعة مما زاد التحدي لإكتشاف طرق رخيصة و مبتكرة لعرض كيفية نجاح الإستثمارات المستهدفة. أهم الإستراتيجيات كانت في مشاركة مجموعات لها منفعة من مخرجات المشروع على المستوى المحلي.

تحديات المشروع كانت في تحديد الموارد المتوفرة و فرص زيادتها مما زاد من وعي المساهمين بالمشاكل الموجودة في عزبة النوار، و من أصعب المهمات هي تحديد كيفية مشاركة الجهات المختلفة لمنفعة المجتمع.

الخطوات المتخذة بعزبة النوار تعتبر الخطوة الأولى و يجب إستمراريتها من خلال مشاركة بين الحكومة و منظمات المجتمع المدني و القطاع الخاص.

نجاح مثل هذه المغامرة سوف يظهر على المدى البعيد من خلال تحسين البيئة و المستوى المعيشي لسكان عزبة النوار.

أحياء القاهرة الكبرى الصحية/ مشروع جعل المدن تعمل هو نقطة إنطلاق ناجحة.