Field visit to Gharbeya & Beheira with ISSIP local teams

7-8 May 2012

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Framework and objectives

This field trip has taken place in the framework of the ten-day mission to Egypt of BORDA's expert Jörg Haucke, specialist of decentralised wastewater systems world-wide, with two main objectives:

1. Introduce Jörg Haucke to the Egyptian context, to allow him to draw conclusions for BORDA's pre-feasibility study.
2. Visit a few ezbas preselected by ISSIP PM/TA for a preliminary assessment and get a first idea of the typology of those settlements

Programme

Monday 7th May has been spent in Gharbeya, with the visit of three ezbas: i. Ezba Bullis; ii. Ezba Abd el Qader; iii. Ezba Hussein Waly, close to the city of Qotour.

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Tuesday 8th May has been spent in Beheira. First, we visited the leader of Abu Hommus district. Then, two ezbas were visited: i. Sameeha; ii. Islah Abd El Razek, both in Abu Hommus district.

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Tools

We used the maps provided by ISSIP PM/TA head office and an interview guide elaborated for the first contact visit in villages (cf. Appendix 2).

Content of this report

This report features the main observations and recommendations and provides the notes taken in the respective villages, first in Gharbeya and second in Beheira.

MAIN OBSERVATIONS AND RECOMMENDATIONS

This visit was the first related to ISSIP Project in the preselected ezbas. The observations and recommendations below are aimed to provide a basis for further work in ISSIP decentralised component. They highlight the necessity to have a preliminary assessment of each ezba on the field in order to have realistic design parameters and point out the important information to be collected.

Assessing available data

There is only little information available on small settlements such as the preselected ezbas. Main sources of information are old maps and recent Google Earth satellite images. Some data is available from various governmental bodies, but their reliability is questionable.

In such a dynamic environment, it is very important to be very cautious and systematic with data**. Age of maps** and **date of satellite images** should always be clearly indicated. It should be also clear **when, how and where each data has been collected** (especially population number). Providing data without any mention may be very misleading. Any estimation should always be explicitly justified.

Various features of ezbas

Ezbas in the Nile Delta are quite heterogeneous. It is important to identify their main features, as it impacts on the planning and design parameters. Here are a few relevant differences from one village to the other:

- close to a main canal or drain *vs.* surrounded by agricultural land
- «nucleus» *vs.* «linear» shape
- divided by various numbers of smaller drains and canals
- high density *vs*. low-density
- different small-scale industrial activities: cattle farms, chicken farms, plastic granule factory, cheese factory
- informal sewer network *vs.* bayaras or mixed

Pictures 1&2: *example of a dense settlement with buildings of two storeys or more (Iz. Sameeha) and example of a low-density settlement, with much space and one-storey buildings mainly (Iz. Islah)*

Challenges related to sanitation

Ezbas currently face various challenges regarding wastewater collection, transport and disposal, namely:

- High groundwater table, affecting houses; rise of water into house walls through capillarity
- People in the villages are losing the agriculture land due to overflow of wastewater from bayaras or infiltration of wastewater into the soil, leading to sterilisation of surrounding land
- Poor quality of existing infrastructure (broken piping systems, open or broken manholes used for dumping, cracks in concrete structures)
- Concern of people that any deep trench in the street may damage the buildings, especially because of the high groundwater table
- High loads from cattle farms and dairy factory

- Lack of solid waste management
- Sewer networks need to deal with rain episodes

Recommendations for planning and preliminary assessment of ezbas

The heterogeneity of settlements and the lack of reliable data show **the necessity to assess each village one by one with field visits**. A mininum set of data has to be collected if an appropriate, tailor-made design is to be implemented. The list below features information to be collected and observations to be made during a preliminary assessment. Most information can be collected with the interview guide provided in Appendix 2 and transect walks through the villages with villagers and representatives of the village authorities.

A. Population number:

1. Necessity to estimate the population of each village through a **survey**; numbers provided by the Local Units, mainly from 2006, are not reliable and not updated ***at all*.**
2. Counting houses on satellital images is *not enough*; the average number of people per house varies a lot, as housing type vary from one village to the other
3. Population numbers need to be **cross-checked** with estimation from different angles
4. Need to be very careful with the **dates** of statistics, maps and satellital images

B. Village development:

1. Several **development patterns** can be observed:
    - Developments along canals, drains and main roads (e.g. Iz. Bullis)
    - Settlements in the middle of agricultural land tend to densify within their boundaries and privilege vertical development (e.g. Iz. Sameeha)
2. **Planning horizon**: it is illusory to plan for horizon 2050 for such small settlements
3. **Modular, flexible** systems need to be privileged in order to cope with the high uncertainty of future developments

C. Small-scale industries

1. Information about existing small-scale industries (cattle farms, chicken farms, cheese factory) *must* be collected from the beginning through **surveys**.
2. **Specific solutions** for the treatment of those effluents need to be integrated in the planning
3. Presence of factory related to **solid waste** (e.g. plastic granules production) may offer an opportunity to improve solid waste management and reduce the risk of dumping in the wastewater system

D. Parameters influencing wastewater characteristics:

1. **Water consumption**, itself influenced by:
    - Quality of water supply system (e.g. sufficient pressure 24/24)
    - Presence of functioning (informal) sewer network
    - Type of on-site sanitation system : sealed / unsealed bayara
2. Alternative water sources
3. Average number of cows per inhabitant
4. Manure management practice
5. Presence of small-scale industry

E. Disposal sites:

1. Necessity to identify all drains and canals (incl. small ones) during the preliminary assessment
2. Pumping to main drains would turn very expensive
3. Opportunity to **use the small drains** present everywhere around villages

Need of coordination with MWRI

MWRI is an unavoidable stakeholder in the field of rural sanitation. A collaboration would be positive for the following reasons:

- Check possibility to use the small drains for discharge and the status of the small *mesqas*.
- Opportunity of polishing in the small drains, investigated in the past by MWRI
- MWRI owns a lot of land along the drains, sometimes made available for wastewater treatment (e.g. Sheikh Yacoub, Beni Suef Gov.)

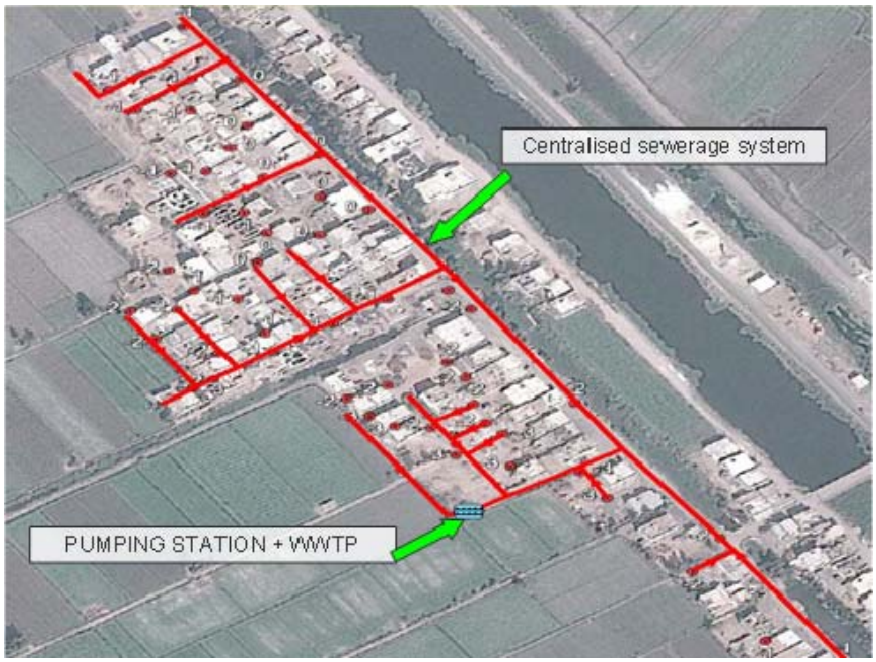
Disadvantages of conventional sewer systems in such settlements

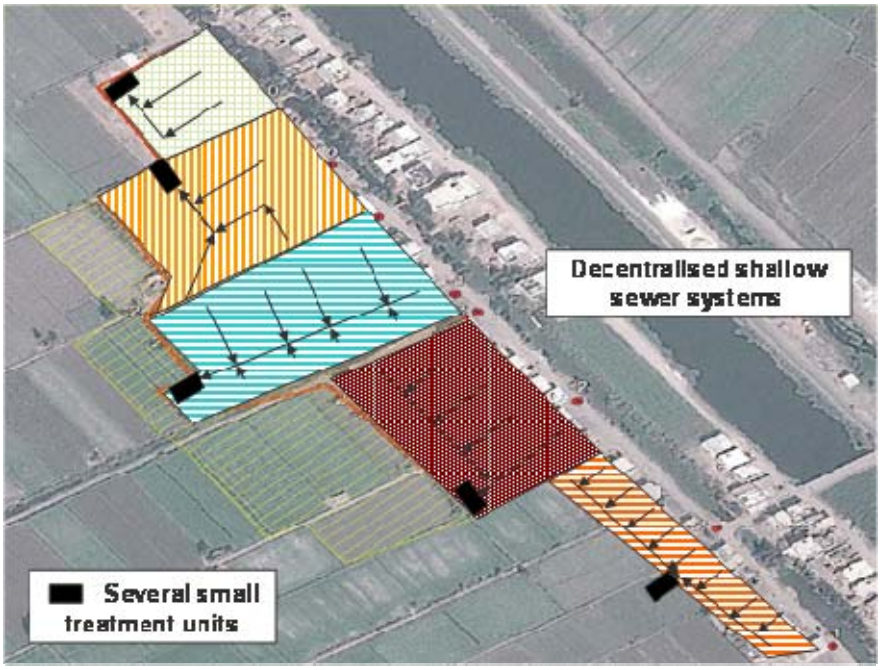
- Higher depth and size of sewers, which is expensive
- Even in small villages, a depth of sewer of 4-5 m is easily reached with a minimum slope of 1%
- The high groundwater level makes any deep trench difficult and costy.
- Risk of structural damage of buildings due to groundwater lowering; this is an expressed concern of inhabitants
- High risk of leakage and water entry, hence higher inflow
- Maintenance of sewer system is difficult due to larger depth
- Expensive crossing of drains and canals
- Not possible to connect new areas to the existing system without pumping station
- Failure of sewer system or treatment infrastructure will affect the entire area
- A pumping station is necessary in all case
- Difficult and expensive for construction of pumping station due to high groundwater level
- Failure of pumping station or treatment infrastructure will affect the entire area

Technical recommendations

1. Consider dividing villages in smaller areas (see figures 1&2), in order to avoid drain or canal crossing and reduce the depth of sewers. Use of **shallow-sewer systems** has the following advantages:
    - Significant money saving, especially through less excavation in difficult conditions.
    - Maintenance of sewer system becomes easier due to shallow depth
    - If failure, only one area is affected
    - Conveyance of wastewater is possible through gravity flow most of the time
    - O&M is easy and can be done by local people
2. Adopt a **modular system**, such as that proposed by BORDA. Modules can be integrated in unused spaces (alleys, roads, parking areas, private yards, etc.), hence **saving agricultural land**. Besides, it is easy to connect or add new modules for new developed areas. (see figures 3&4).
3. Use of small drains for polishing; avoid pumping kilometers away.

4. Pump rather the treated effluent rather than raw wastewater.
5. Investigate the opportunity to use **low-powered aeration** (such as done in China with low-voltage and photovoltaic cells) and **air-lift pumps** for effluent lifting.
6. Potential to use rice straw for the post-treatment, such as investigated in the National Research Center.





Figures 1&2: *Comparison of a fully centralised scenario with conventional sewer system (above) and a decentralised scenario, featuring several shallow sewer systems and modular treatment units. Case study of Iz. Islah, Beheira (drawing: Jörg Haucke)*

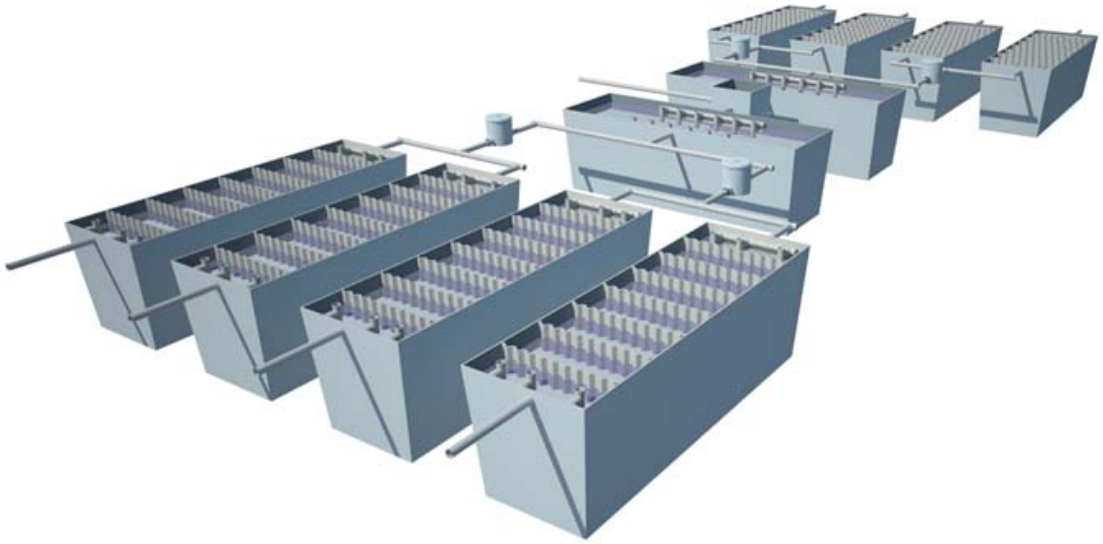


Figure 3: *Modular prefabricated treatment units, consisting, in that case, of 2 prefabricated settlers and 8 prefabricated anaerobic baffled reactors (ABR), treating about 80 m^3/day (drawing: courtesy of BORDA[1])*

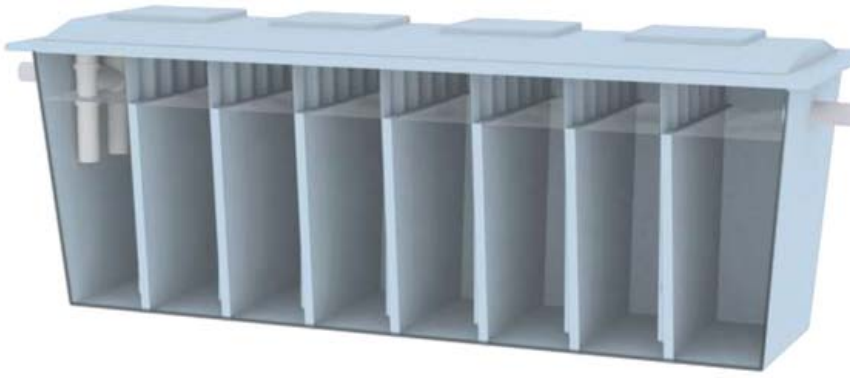


Figure 4: *A prefabricated anaerobic baffled reactor, aimed to treat about 10 day (drawing: courtesy of BORDA[1])*

[1] Drawings from *BORDA (2012), Prefab-DEWATS - The new prefabricated modular solution for decentralized wastewater treatment*, Brochure.

VILLAGES VISITED IN GHARBEYA (7th May)

Monday 7th May has been spent in Gharbeya, with the visit of three ezbas: i. Ezba Bullis; ii. Ezba Abd el Qader; iii. Ezba Hussein Waly, close to the city of Qotour (see map in Appendix 1).

Ezba Bullis

(Coordinates: 30°58'14.32"N - 30°54'52.07"E)

Preliminary comment: *Ezba Bullis has not been identified correctly on ISSIP PM/TA map. The village identified as Ezba Bullis is in fact Ezba Bahr, on the other side of the canal. (cf. Map in Appendix 1)*

Number of inhabitants:

- according to ISSIP PM/TA: 626 inhabitant
- according to the estimation of one of the villagers , the number of inhabitants is about 1,600.

=> population number **to be checked** by other methods

Number of houses:

- according to the villagers' estimation, there are 120 houses, average of 5 households in each house (to be checked)

Main occupation of people:

- Farmers (**do not own the land they cultivate**); the owner of one of the chicken farms is owns the agricultural land in the village.

Sanitation practices:

- Bayaras made in bricks with unsealed bottoms; salt is used to increase infiltration
- There are three pumping trucks for the village, which discharge either in the canal or in the agricultural drain (Hamama drain).
- High groundwater table; **big problems with capillarity**

Small-scale industries:

- **three cattle farms**
- six chicken farms (number of chickens range between 8,000 – 15,000 – 40,000); the manure is dumped or used as fertilizer
- two plastic recycling factories (small factories for plastic solid waste collection-separation and producing plastic granules), and no aquaculture
- no milk factory

Miscellaneous:

- no aquaculture: seems to be a speciality of Kafr El Sheikh governorate
- the village on the other side of the canal, Ezba Bahr (which actually the one featured on the satellital image we received) is said to have an informal sewer system.
- there is a CDA, not serving according to the villagers present, and an agricultural association.

Ezba Abd El Qader (markaz Qotour)

(Coordinates: 30°59'17.95"N - 30°56'4.57"E)

Preliminary comment: *this village is not on the list for decentralised systems.*

We were first invited by the omda for a preliminary discussion. We used our interview guide to know about the current situation in the village.

Number of inhabitants:

- according to omda, about 1000 inhabitants (to be checked)

Number of houses:

- according to omda, about 100-125 households (to be checked)

Main occupation of people:

- mainly farmers (renting the land)
- only small portion of the farmers have animal houses (about 2-3 cattle in each)

Sanitation practices:

- bayaras made in bricks with unsealed bottoms; salt is used to increase infiltration
- septage disposed in canal
- high groundwater table , which causes high damage for the buildings, even new buildings
- sometimes they dump animal manure (solid and liquid) in the bayara
- people pay 15 EGP/ trip for desludging (by private trucks); no trucks in the village; villagers call private entrepreneurs in neighbouring villages.
- some streets are inaccessible to trucks; bayaras simply overflow when full.
- they don't use wastewater in their fields – awareness that the use of wastewater sterilises the soil
- 90% of the population have drinking water supply, the rest are using hand pumps.
- water supply is good, with good pressure, and water consumption is increasing, according to the omda

Small-scale industries:

- five chicken farms (about 8,000 to 10,000 chicken in each),
- five **cattle farms** (about 100 cows in each)

Miscellaneous:

- no CDA or other associations

Ezba Hussein Waly

(Coordinates: 30°58'26.94"N - 30°55'13.36"E)

Preliminary comment: *this village is a very small hamlet. The hamlet indicated by local people as Hussein Waly is definitely not the one identified on PM/TA maps (called Iz. Radi), and neighbour to the one mentioned as Hussein Waly on Google Earth. Another check will be necessary to see if the bigger settlement described as Hussein Waly on Google Earth belongs to the same village or not.*

Number of inhabitants and houses:

- according to locals: about 400 inhabitants, 60 to 70 houses (to be checked)

Main occupation of people:

- farmers, with 1-2 cows each

Sanitation practices:

- people are using trenches

Small-scale industries:

- cheese factory and chicken farm (but according to ISSIP team, consider as outside the village – to be confirmed)

Miscellaneous:

- The nearest drain is called Zahar drain.

VILLAGES VISITED IN BEHEIRA (8th May)

Tuesday 8th May has been spent in Beheira. First, we visited the leader of Abu Hommus district. Then, two ezbas were visited: i. Sameeha; ii. Islah Abd El Razek, both in Abu Hommus district (see map in Appendix 1).

Introduction in BWADC – ISSIP local office

ISSIP local staff went to the village councils to take the maps and collect population data.

There is a confusion about the Ezba Islah which has been identified by PM/TA headquarters. There are at least seven Ezba Islah in Beheira. We identify the one preselected by Cairo office thanks to the map.

Visit to the Local Unit in Abu Hommus

Collection of population data:

- Ezba Sameeha - number of inhabitants given: 584
- Ezba Al Islah Abd el Razek - number of inhabitants given: 386

Sameeha

(Coordinates: 31° 4'8.17"N - 30°23'39.73"E)

Preliminary comment: *the omda does not live in Sameeha, but in Ezba el Omda. Contact in the village is Ali, living in the pink-green house at the entrance of the village*

The village is surrounded by a drain.

Number of inhabitants and houses:

- According to locals: about 1000 inhabitants and 100 houses (to be checked)

Main occupation of people:

- 75 % farmers

Sanitation practices:

- A quarter of the population is using informal sewer networks, the rest use bayaras
- There are two informal sewer lines in the villages parallel to each other and discharging in the same drain; this drain is surrounding the village
- People don't know where septage is discharged from pumping trucks
- A lot of people dump solid waste in the drain too.
- All the village is served by drinking water supply network (old line and new line under construction)
- NB: a drinking water supply pipe is broken *under* the drain where the informal sewer networks are discharging; fortunately, it seems that the water supply is under pressure
- People are using hand pumps to get water for washing and for the animals, in order to reduce the consumption.

Small-scale industries:

- three chicken farms (1000 chicken average in each),
- no cattle farms and no aquaculture.

Miscellaneous:

- There is agriculture association.

Ezba Al Islah Abd el Razek Abu el Kheir

(Coordinates: 31°11'46.21"N - 30°23'38.14"E)

Preliminary comment: *the village is located along a main drain and two canals; the level of the main drain is higher than the village.*

The village consists mainly of one-storey buildings; population density much lower than in the other villages we visited.

It is clear that the treated wastewater should be brought away from the canal, main drain, in the direction of the further drain, via the small drainage system.

Number of inhabitants and houses:

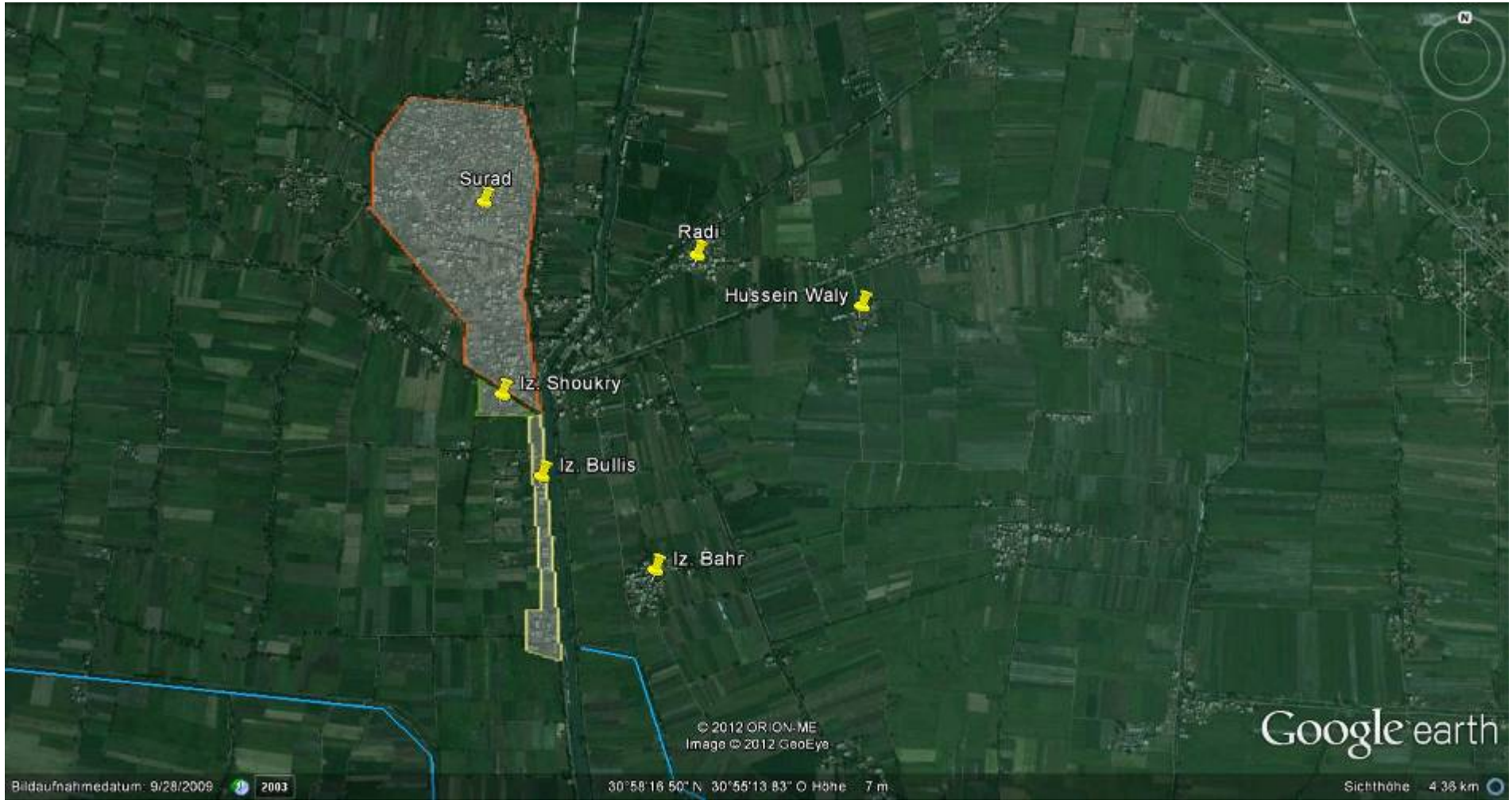
- According to locals: about 2500 inhabitants and 215 houses (to be confirmed – 2500 seems a bit high, especially regarding the number from the government: 386 !!!)

Sanitation practices:

- Direct disposal in canal or bayaras
- NB: presence of a fake bayara between one house and the canal!
- Bayaras are emptied at night in the canal (other drain is 2 km far)

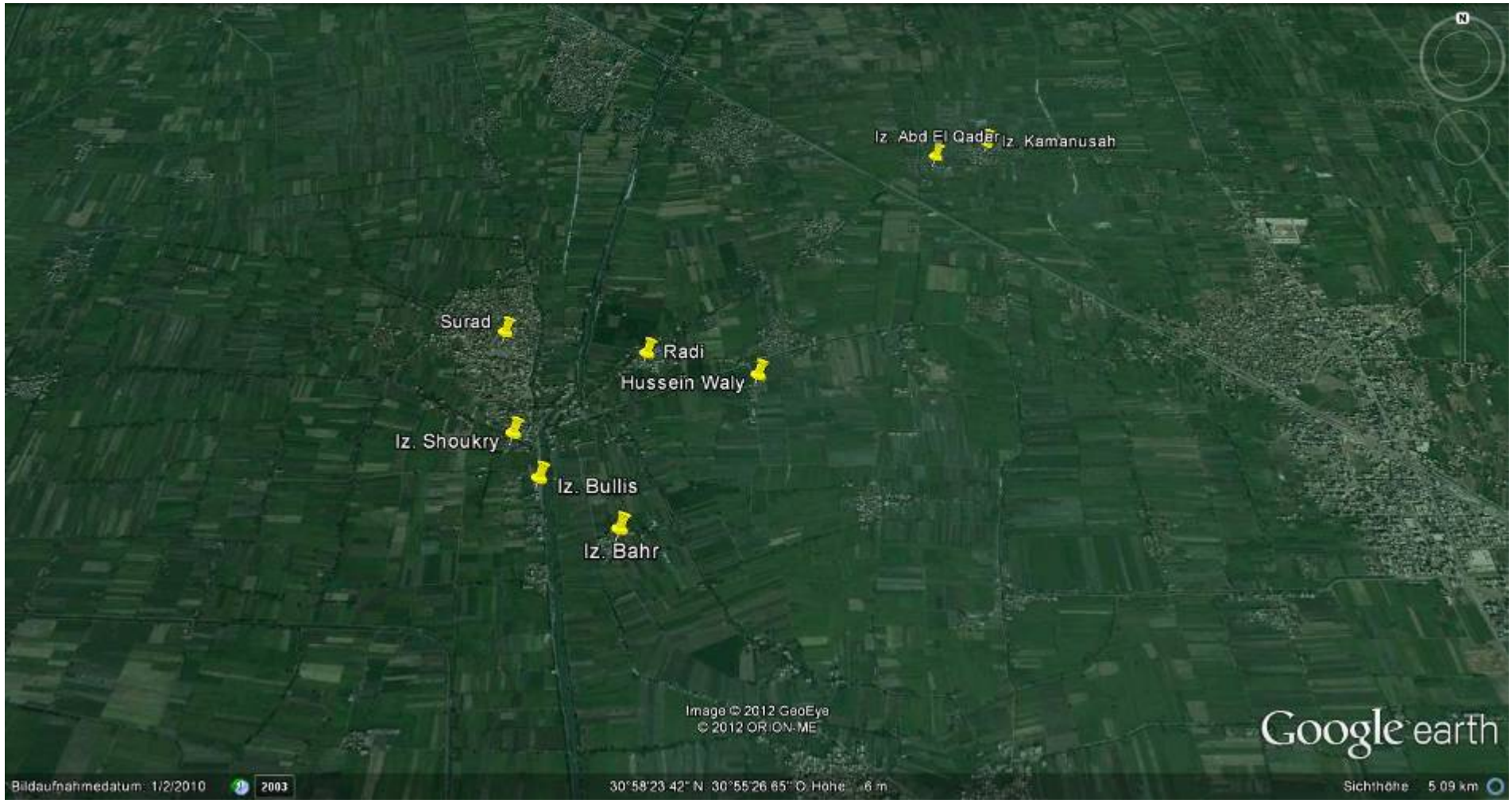
No small-scale industry.

APPENDIX 1: Situation map according to the information collected during the field trip on 7th May 2012 (Gharbeya)



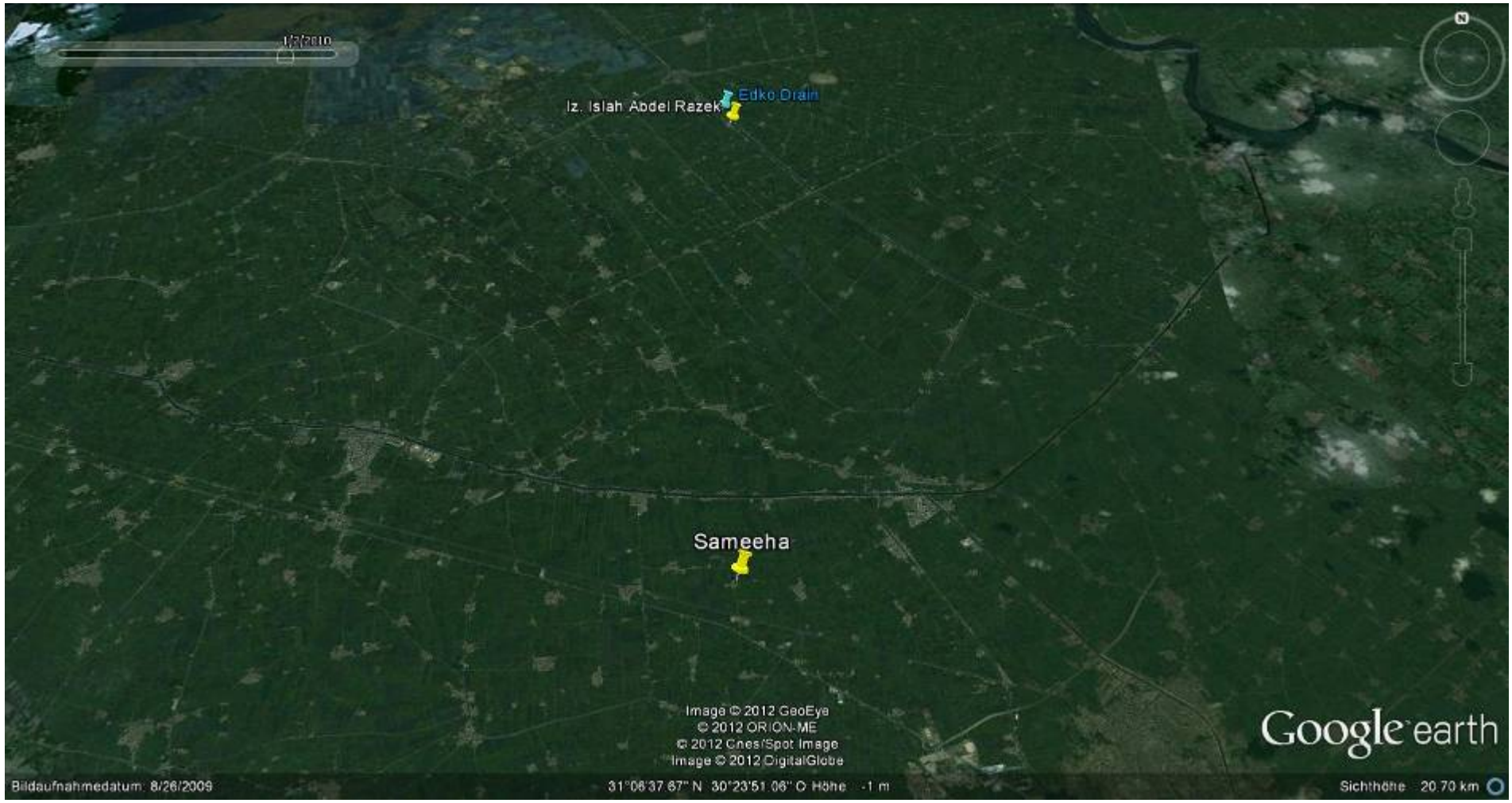
Situation map according to the information collected during the field trip on 7th May 2012

(On the right side, Qotour City)



Situation map according to the information collected during the field trip on 8th May 2012

(At the bottom of the map, on the right, Damanhur City)



APPENDIX 2:

Interview Guide to Village Authorities and Representatives

دليل المقابلة مع المسؤلين فى القرية

- First Contact Visit –
أول زيارة

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Rationale of the study الهدف من وراء هذة الدراسة

ESRISS project is an **applied research project** led by the **Swiss Research Institute for Water and Wastewater** aiming to support the Egyptian Holding Company for Water and Wastewater (HCWW) in the development of sustainable and cost-effective rural sanitation. Until now there is no clear strategy for sanitation in isolated ezbas, and most initiatives in rural areas failed because of lack of understanding of the particularities of the Egyptian village.

هذا المشروع هو بحث تطبيقى يقوم بة مركز ابحاث سويسرى للمياة و الصرف الصحى هدفة دعم الشركة القابضة المصرية للمياة و الصرف الصحى لتطوير الصرف الصحى المستدام فى القرى,حتى ألان لا يوجد استراتيجية واضحة للصرف الصحى فى العزب المعزولة ,ومعظم المبادرات فى المناطق الريفية فشلت بسبب قلة فهم الاوضاع الخاصة للقرى المصرية.

The goal of our research is to develop improved wastewater management systems for ezbas. A good system should اهداف هذة الدراسة:

collect and treat the wastewater properly تجميع و معالجة مياة الصرف الصحى بصورة صحيحة

- improve the cleanliness and hygiene inside and around villages and reduce the pollution of drains, canals and groundwater resource

  تحسين النظافة داخل وحول القرى والحد من تلوث الترع و المصارف وموارد المياة الجوفية

- improve public health تحسين الصحة العامة
- reduce the amount of money that households have to pay currently to empty bayaras

  تخفيض التكاليف التى تتحملها كل أسرة من اجل تفريغ البيارات

- This study should provide Egyptian decision-makers with a good basis for the design and implementation of sustainable and cost-effective sanitation systems for isolated rural areas.

  هذة الدراسة من المتوقع ان تقدم اسس جيدة لصانعى القرار فى مصر من اجل تصميم و تنفيذ شبكات صرف صحى مستدامة تكون فعالة فى المناطق الريفية

Methodology المنهجية (المنهج المتبع)

Our study encompasses three components: هذة الدراسة تشمل ثلاثة مكونات

1. Assessment of past and on-going small-scale sanitation initiatives in rural areas in Egypt
   تقييم المبادرات السابقة و الحالية للصرف الصحى على نطاق صغير فى المناطق الريفية فى مصر
2. Assessment of the situation of ezbas in the Nile delta, including needs of the communities, sanitation practices and characteristics of raw wastewater
   تقييم الوضع فى العزب الواقعة فى دلتا النيل, بما فى ذلك أحتياجات المجتمع , و الممارسات الصحية و خصائص مياة الصرف الصحى الخام
3. Development of scenarios, including technical proposal and management schemes.
   وضع السيناريوهات بما فى ذلك اقتراح التكنولوجيا ومخططات الادارة

In order to understand the existing situation and to be able to develop our approaches we will start by studying two representative ezbas, one with and another without sewers. To collect information, we will use the following tools:

من أجل استيعاب و فهم الوضع الحالى ولنكون قادرين على تطوير منهجنا ,سوف نبدأ بدراسة عزبتان ,واحدة منهم بها مجارى والاخرى لا يوجد بها ,من اجل جمع المعلومات المناسبة سوف نستخدم الادوات التالية :

- Transect walks and observation المسح الشامل و الملاحظة
- Interviews with key-stakeholders (omda, bayara emptiers, farmers, person responsible for the sewer network, village council, NGOs (e.g. CDA), women associations, mosque caretaker, health centres) مقابلات مع الشخصيات المؤثرة و المسؤلة عن كل ما لة علاقة بالدراسة بداية من العمدة و المسؤلين عن القرية
- Household surveys دراسات منزلية (مقابلات مع اهالى القرية)
- Wastewater sampling and analyses اخذ عينات و تحليل مياة الصرف الصحى

Preliminary questions for omdas اسئلة للعمدة

1. How many inhabitants, how many households? ما عدد الاسر الموجودة ؟عدد السكان
2. What are the main professional occupations of the inhabitants? ما هى الوظائف الاساسية لمعظم السكان
3. Are there small industrial activities (e.g. milk factories)? هل يوجد انشطة صناعية صغيرة (البان؟)
4. Are there any community members who play a special role in this village? (Examples: leading an association, organizing special activities, religious leaders, etc.)
   هل هناك أىً من الافراد الذين يلعبون دورا خاصا فى القرية؟ (على سبيل المثال:تأسيس جمعيات,تنظيم أنشطة أجتماعية)
5. Are there NGOs in the village? A Water User Association?
   هل هناك منظمات غير حكومية فى القرية؟ او جمعية لمستخدمى المياة؟
6. Is there a health centre? هل يوجد مركز صحى

Questions during transect walk اسئلة اثناء المسح الشامل

Goal of transect walk: get a first impression and understanding of الحصول على الانطباع الاول و فهم: اهدافة:

- *the current infrastructure and practices,* البنية التحتية و الممارسات الحالية
- *hot spots and problems related to wastewater management,* البقع الساخنة و المشاكل المتعلقة بادارة المياة العامة
- *requirements for sampling and measurements.* المتطلبات لآخذ العينات و القياسات

7. How many animals does one household have on average? Do they live in the house, a separate building or outside?
كم عدد الحيوانات التى تملكها الاسرة الواحدة (المتوسط) ؟ هل تعيش هذة الحيوانات فى نفس المنزل أم فى مبنى منفصل؟

8. Are there significant differences in the inhabitants' income and social status?
هل هناك فرق واضح فى الدخل و المستوى المعيشى بين أهالى القرية؟

If yes: what are the different categories?
أذا كان الجزاب بـ "نعم" , ما هى الفئات المختلفة؟

9. Are all households connected to the drinking water supply network? Is this supply good (pressure, quantity, quality)?
هل كل ألاسر موصلة لشبكة مياة الشرب ؟ هل هى جيدة من حيث (ضغط المياة,الكمية ,نوعية المياة)

10. Can you describe the sanitation situation of the village? How has it evolved over the past 40-50 years? Are there any problems?
هل يمكن شرح و ضع الصرف الصحى فى القرية؟كيف تطور خلال ال الخمسين سنة الماضية؟وهل هناك مشاكل؟

11. *If there is a sewer:* اذا كان هناك مجارى
    a. How many households are connected? If not, why?
    كم عدد ألاسر الموصلة أليها ؟ اذا كان لا ف لماذا؟
    b. When was this system built? متى تم الأنشاء
    c. Who was involved in the planning, design and construction?
    من كان المسؤل عن التصميم و التخطيط و البناء ؟
        Company, consultant, contractor? *Name*: شركة؟ مستشار؟ مقاول؟
        Village leaders? رؤساء القرية
        CDA? جمعية تنمية محلية
        Omda? العمدة
    d. What material is it made of? ما الخامات المستخدمة فى ألانشاء
    e. Where are the main lines located? اين تقع الخطوط الرئيسية
    f. Where is the wastewater discharged? اين يتم التخلص من مياة الصرف
    g. Who is responsible for the maintenance? من المسؤل عن الحفاظ علية (الصيانة)

If there is no sewer: اذا كان لا يوجد مجارى

a. Are there households that have a different system than bayaras? Which one?
هل هناك أسر تستخدم أنظمة غير البيارة؟ ما هى هذة ألانظمة؟

b. Is there someone in the village who builds bayaras?
هل هناك من يبنى البيارات فى القرية

c. How bayaras are constructed (lining, bottom, filled with gravel, etc.)?
كيف يتم أنشاء البيارات؟(ألارضية,القاع,..)

d. Where is the sludge from the bayaras disposed of?
اين يتم التخلص من مياة المجارى من البيارة

e. Do farmers use wastewater from the bayaras in their fields?
هل يستخدم الفلاحون مياة الصرف من البيارات فى الحقول؟

f. Do farmers use manure and animal urine in their fields?
هل يتم استخدام روث الحيوانات فى الحقول؟

g. What is the price of desludging? ما هى تكلفة أزالة مياة المجارى

h. What happens if someone cannot afford emptying?
ماذا يحدث لو أحد ألافراد لا يستطيع تحمل التكلفة ؟

12. What would you do to improve the existing system and practices? ماذا يمكن ان تفعل لتحسين الوضع الحالى

Ask for contact number رقم تليفون العمدة أو أى شخص أخر يمكن الاتصال بة فى القرية