GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation

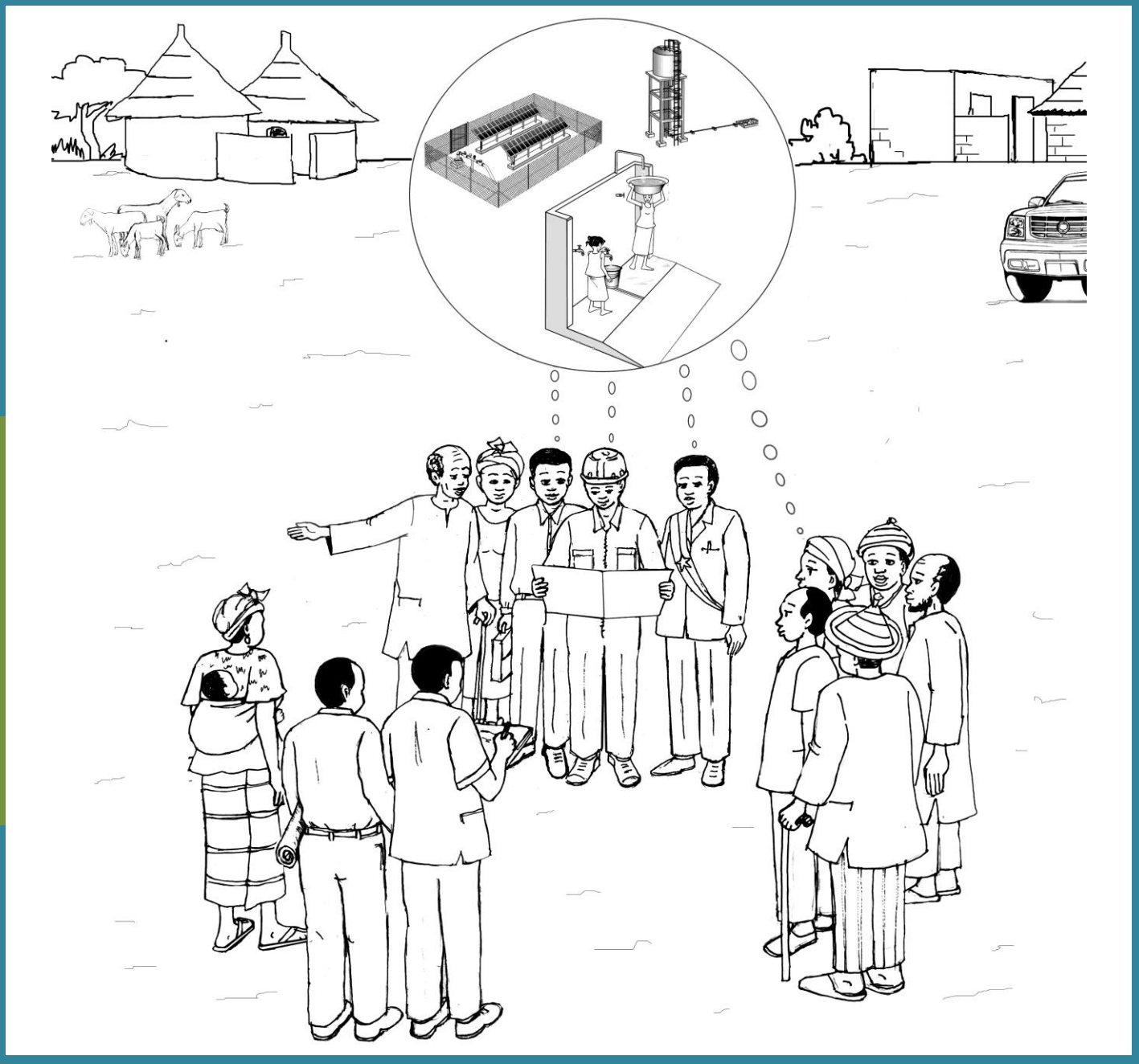
The Global Water Initiative

A Partnership Funded by the Howard G. Buffet Foundation

WEST AFRICA

Assuring Quality: an approach to building long-lasting infrastructure in West Africa

Ref.: 2012-01-E



GWI Technical Series: Hardware Quality

CRS CATHOLIC RELIEF SERVICES

SAHEL CONSULTING

September 2012

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About this series

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Introduction

The quality assurance approach that is already partially in use in many countries, aims to serve as a guideline and to measure our achievement in reaching infrastructure quality. This assumes that both the design of the works and the technological choice of the equipment to be used have been well carried out before implementation starts.

This approach is justified as GWI aims to help vulnerable people to have improved and durable access to water and sanitation. It is necessary to be vigilant during the construction in order to assure the quality of the facilities. GWI keeps the moral responsibility of the quality of the infrastructures funded by him even if the contract has been subcontracted to others. In consequence, the GWI project must retain the responsibility of the technical supervision in order to assure quality service.

The steps below are proposed as elements of the quality approach:

- ✓ Providing a clear outline on the way the works should be carried out (including a detailed review of the quality of the materials);
- ✓ Organizing a touring of the sites (where the works should be accomplished) by the bidders before compiling their bids ;
- ✓ Choosing a skilled/reliable contractor;
- ✓ Establishment of a formal contract for the work;
- ✓ 100% guarantee of any advance of funds;
- ✓ Organizing a start-up meeting between the contracting agency, the controller and the implementing agency, where all the technical requirements of the works will be remind to the implementing agency (and to the controller) ;
- ✓ Checking whether staff skills on the sites and the materials proposed in the technical proposal are in compliance with those agreed in the bidding proposals;
- ✓ Implantation of the work (facilities) in the presence of the beneficiaries, the project and other representative whose presence is requested by the legislation in force in the country (example: commune representative or technical service representative, etc.);
- ✓ The control of the implementing agency's work by a competent/skilled person: supervision on the building site, provisory partial receptions at some key steps while the construction is underway, etc. ;
- ✓ Supervising the technical works by the project and if necessary by the government technical services;
- ✓ Training and involving the communities in the supervision of the works;

- ✓ Holding site meetings (for work running over time)
- ✓ Receipt of the works in the presence of all the parties ;
- ✓ The retention of money for guarantee.

The steps presented above can be gathered into three parts: before, during and after the implementation.

Part 1: Steps or elements to follow before the work implementation

Providing a clear schedule of works delineating how the works should be carried out

Before looking for an implementing agency, it is imperative to clearly define the administrative and technical contours of the works (what are the works and the way they should be carried out?). This will be done by elaborating the invitation of tenders that will be used to call for competition. The technical requirements and the plans being fully included in the invitation of tenders help provide the overall technical elements on the works (type, size, construction method, material to use, quality of the materials, etc.).The quantitative estimates and the details related to the costs (descriptive estimate) contribute to a much bigger precision on the way the works should be carried out. If need be it can called upon a specialized company to provide the technical specifications, the descriptive and quantitative estimates.

Organizing of a touring of the sites (where the works should be accomplished) by the bidders before compiling their bids

To help taking account the work implementation zone parameters during the bids elaboration by the tenders, the work location or zone must be specified in the invitation of tenders and the tenders invited if necessary for a touring of the site or zone of construction before they can present their bids. It is convenient that the owner organize the site touring in order to avoid going for this touring individually with the tenders.

Choosing a competent implementing agency

The commission in charge of selecting the implementing contractor should be able to choose a good (the best) agency if it takes the appropriate time to thoroughly check the technical references of the proposals (on site checks and information collected from the contracting agencies). The references included in the bidding documents are very often inaccurate. The evaluation of the technical proposal

will focus on: the proposed staff (skills and experience); the experience of the implementing agency in carrying out similar projects in the past years; and on the material proposed to carry out the works.

At this step it is important to meet other actors (governmental and NGO) to collect reliable information on the bidding agencies.

The choice of a good contractor should be done thoroughly and is essential to avoid issues which could impact negatively on the quality of the project itself. It also requires keeping the information easily accessible for the purposes of selecting a contractor at a future date. This means identifying those who are performing well, but also more importantly identifying those who should be absolutely avoided in the future.

In selecting the competent implementing agency, it must be considered upstream the habitual requirements that the bids must comply with. These requirements must be specified in the invitation of tenders: administrative requirements documents, bid bond. In addition a performance bond must be provided by the selected company.

Establishment of a formal contract for the work

Since the contract is the basis of the agreement as regards implementation of the work especially on the technical aspects, it is necessary to have a contract approved before work begins. It is primordial to use good contract formats (good models of contract).

100% guarantee of any advance of funds

This disposition guarantees (protects) the project funds.

Any other payment must be done only on the basis of the work really achieved and after provisional acceptance.

Part 2: Steps or elements to follow during the work implementation

Organizing the work with a start-up meeting

A technical meeting on the start-up of the works will help to outline the works requirements. It will also provide an occasion to emphasize/explain the penalty in failing to implement the works as agreed. This will remind the contractor to stick to the technical specifications requirements in every detail.

Checking the conformity of site staff's skills and experience, and company material against those listed in the proposals

It is important when starting the works to make a technical assessment reception of the equipment, materials and staff put in the field. Among other this step helps in particular to make sure that the staff sent to the field is the same identified in the offer. It is the responsibility of the controller to follow, verify it.

Setting out of the work (facilities) in the presence of the beneficiaries, the project and other representative whose presence is requested by the legislation in force in the country (example: commune representative or technical service representative, etc.)

The community's presence avoids errors concerning the location selected for the facilities that can have adverse consequences on the use of the facility, its management and its sustainability.

As the implantation includes technical parts (measurement), the results of the implementation works must be presented to the communities and approved by them (report signed) before the work can be continued.

It is indicated that supervisors from the community also participate in different partial provisional acceptance of work.

Controlling on the works underway on site

The works carried out by the contractor should be mandatorily controlled by a skilled and experienced person. The choice of an independent control should be made also on a competition basis and should follow the same steps as those for the choice of the contractor for the works. The purpose of the control is to make sure that the implementing company thoroughly complies with the technical requirements as stated in the contract.

The activity of the controlling body should include partial provisional acceptance as the works progress. Before making reinforced concrete, for example, it should conducted an inspection of the steel framework and the aggregate that will be used, before allowing the company to make the concrete. There should mandatorily be a reception of the pumps to install (checking of the quality of the parts and their conformity) before they could be installed. We should proceed with a reception of the works already carried out before pursuing with the works, etc.

The different steps requiring partial provisional acceptance of work before pursuing with the works should be listed and clearly stated.

Minutes of each delivery will be made specifying the nature of the work approved. No structure or portion of a work shall be approved with defects contradicting the technical requirements.

Supervising the technical works by the project and if necessary by the government technical services

The project must supervise the works carried out. That should help to raise the control vigilance level and the professional awareness of the company or to catch up with some situations.

Involving the State's technical services competent in the areas of current work may have the advantage of ensuring compliance with standards if it is not already included in the technical requirements set in the invitation of tenders.

Involving the communities in the supervision of the works

Involving the beneficiary communities in the supervision activities will help achieve a greater ownership of the infrastructures and make sure that the contractor is serious in his construction role. To achieve that objective, the community people who have been officially chosen for this activity should be trained and sensitized: they should be explained the way the works are carried out (examples: number of blocks to obtain with a bag of cement, quality of sand and gravel to use, etc.) and its importance on the sustainability of the facility. A good training through the use of explicit pictures should be enough.

Posters should also be put in place to inform future users on the level of services expected and the technical features.

Holding site meetings (for work running over time)

During the execution of the work site meetings are required. Because they allow the different actors (project, technical service, client, community, design office, company) to discuss about the difficulties encountered during the implementation and to make proposals for solutions.

These meetings also allow detecting technical problems early.

Part 3: Steps or elements to follow at the end of the work.

The reception of the work in the presence of all the parties

The provisional acceptance of work and the definitive reception must be done in the presence of all the stakeholders including the communities.

No work will be received with defects contradicting the technical requirements and preventing its normal operation. All needed repairs must be completed before definitive acceptance/ final payment for each newly built infrastructure.

The how and the why of the different tests (if any has to) during the reception must be clearly explained to the communities.

During the provisional acceptance process, the principle of the warranty period should be clearly understood by beneficiaries and mechanisms for appeal to the company for corrections in case of equipment malfunction during this period must be well defined and brought to their attention.

Applying the retention money principle

The retention money principle to be applied at the temporary reception step allows managing a given amount of money to use for the correction of mistakes or imperfections identified during the retention period.

It is recommended to retain a period long enough to enable to see the occurrence of any defects that may exist. The amount of the retention money for guarantee varies between countries (5-10%).

It is strongly recommended to make sure to have a good work instead of looking for reparations that are often difficult to carry out.

Conclusion

The quality assurance approach presented below reminds the main disposition to undertake in order to ensure effective implementation of the infrastructures. The steps listed are not exhaustive and can be improved. The important thing is to effectively implement these steps. The checklist in appendix helps to monitor this implementation.

Annex: Check-list for the monitoring of the implementation of the quality assurance approach

Provide a clear schedule of works delineating how the works should be carried out

Steps / precaution	Yes	No	Observation
Is the nature of the work clearly defined?			
Are the technical requirements clearly defined?			
Are there plans for each part of the work?			
Is there a descriptive estimate of the work?			
Are there BoQ's of the work?			

Organize or facilitate a touring of the sites (where the works should be accomplished) by the bidders before compiling their bids

Steps / precaution	Yes	No	Observation
The work location/zone is specified to those tendering			
A tour of the site/zone of the work is organized or facilitated.			

Choosing a competent implementing agency

Steps / precaution	Yes	No	Observation
A tendering process is organized to choose the implementing agency			
The technical references (experiences) of each tender are checked with the different owners of the works they have previously carried out.			
Reliable information on the agencies that are presenting bids has been obtained from other actors (governmental and NGO)			
A list of "good" and "bad" implementing agencies is regularly kept/updated			
Is a bid bond required from tenders?			
Is a performance bond required from the selected company?			

Establish a formal contract for the work

Steps / precaution	Yes	No	Observation
Is a clear contract approved before the work begins?			
Is this contract in compliance with national standards?			

Require a 100% guarantee of any advance of funds

Steps / precaution	Yes	No	Observation
Is any advanced funds (if it is foreseen) 100% guaranteed?			

Organize the work with a start-up meeting

Steps / precaution	Yes	No	Observation
Is a technical meeting organized on start of the works?			
The work requirements have been outlined during this meeting			

Check the conformity of site staff skills & experience, and company material against those listed in the bid

Steps / precaution	Yes	No	Observation
The technical assessment acceptance of the equipment has been made			
The assessment of the staff placed in the field has been made to make sure that the staff sent to the field is of the calibre identified in the bid			
The quality of the materials has been checked before their use			

The setting out of the facilities is done in the presence of the beneficiaries, the project and the other representatives whose presence is required by the national legislation in force (example: commune representative or technical service representative, etc.)

Steps / precaution	Yes	No	Observation
Is the community represented and consulted during the work/facility setting out?			
Is a setting out report elaborated?			
Has the setting out of the facilities been approved by the community representative and the setting out report signed?			

Control of site-works underway

Steps / precaution	Yes	No	Observation
The works carried out by the contractor are controlled by a skilled and experienced person / structure			
The controller (a person or a structure) have been selected in accordance with the rules (after a bidding process)			
A list of the partial provisional acceptances to be conducted has been drafted (and attached to the invitation of tenders).			
The community representatives participate in the partial provisional acceptance of each part of the works.			
An official record is produced for each partial provisional acceptance.			

Supervision (by the project and if necessary the government technical services) of the works

Steps / precaution	Yes	No	Observation
Is the project supervising the work?			
A supervising check list is prepared before making a supervisory visit.			
Is supervision by government services foreseen and organized?			

Involve the communities in the supervision of the works.

Steps / precaution	Yes	No	Observation
The beneficiary community representatives are involved in the work supervision.			
The beneficiary community representatives have been trained to supervise the work			
The community is informed of the exact nature of the work to be carried out (type of facility, quantities, location, etc.)			
Public information (postings) is made to provide information on the exact nature of the work and the changes occurred in the course of the implementation.			

Hold periodic site meetings (for work running over time)

Steps / precaution	Yes	No	Observation
Site meetings are organized during the work implementation			
The community representatives are part of the site meetings			
The technical services are invited to participate to site meetings			
During the site meetings technical visits of all the works are conducted.			

Organize the reception of the work in the presence of all stakeholders

Steps / precaution	Yes	No	Observation
The community representatives and the government technical services participate to the provisional acceptance of the work.			
The works provisionally accepted are without defects which contradict the technical requirements and/or prevent their normal operation			
The how and the why of the different tests (if any) during the provisional acceptance have been clearly explained to the communities.			
The principle of the warranty period has been clearly explained to the beneficiary community.			
The details (phone number and physical address of the contractor and of the project) are given to the communities to allow them to call for help if the equipment installed does not working well.			

Apply the retention money principle

Steps / precaution	Yes	No	Observation
A retention bond is applied			

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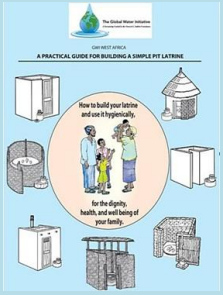

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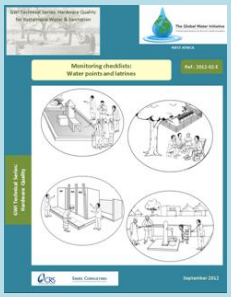

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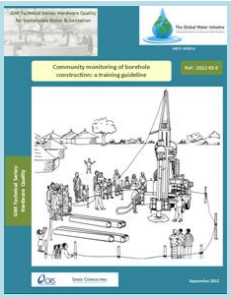

Making the right choice: comparing your rural water technology options.

ref.: 2012-07-E

These documents are also available in French.

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Introduction

Who is this Guide for?

This guide is intended for those planning the development of basic rural water supply systems. It has been developed for West Africa but can be adapted for other areas. It assumes local participation where users are not only beneficiaries, but are also consulted in the process of selecting an appropriate technology for their particular community. The Guide seeks to provide the key elements of information that will allow community people to make an informed decision regarding which technology and water supply system best fits their situation.

Identifying those villages within a Commune that most need a new water supply:

In order to include a given village in a Commune-wide water supply, the Technical Services will identify which villages most lack water from their records. A physical survey of the area then follows to confirm which villages have a poor water supply. A final list of the villages to be prioritised for that year is drawn up by the Commune.

The next step is village level discussion. The community is visited by the elected Commune leaders and the technical officials in charge of water. Together with the villagers, they carry out a guided discussion on the various water technology options and jointly decide which type of water supply best suits that particular community.

Choosing the right technology is vital:

Encouraging communities to carefully weigh up and consider the main factors before choosing a technology is very important. The discussions should centre around the main variables. Discussions should include the population size and the physical distribution of that population, the service level needed, community customs & use of water (i.e. animals in large numbers competing with humans for water & needing a lot of water all at the same time), where the ground water is found in this area & the possible means of abstracting the water, if a given type of supply being considered will provide a high enough yield, the level of Technical Services available and if these are near enough to help solve any problems with the complexity of that particular type of water supply, the availability of maintenance & repair people for any pumping equipment, and finally the cost of the system and deciding if the community can afford to sustain it, with external technical and financial support, such as from local government, technical services, NGOs, associations, diaspora, twinning with cities abroad, etc.

Using this Guide in the field:

This Guide is designed for the use of those who facilitate these community discussions in the village. They must already have both the technical knowledge to interpret the information, and the facilitation skills to transmit technical information to communities. This must be done in such a way that the community can fully understand the options opened to them and make an informed choice.

The key components of this Guide:

Each water supply option is laid out in four sections:

1. The basic technical description of the water system
2. The level of service (water quality, quantity, etc.)
3. The cost considerations of both the capital investment and the life-cycle costs/affordability of that technology
4. The technical skills required from both within and from outside the community for day-to -day maintenance and repairs.

1. BOREHOLE FITTED WITH HAND/FOOT PUMP

Description

This technology is a narrow hole drilled by a drilling machine down to where groundwater is found in sufficient quantities (maybe as deep as 100 meters plus).It is not the depth of the borehole that determines if a hand/foot pump is suitable, but rather the level to which water reaches within the borehole. Most hand/foot pumps can pump to the depth of 45 to 60 meters. If the water level is lower than this it is unlikely that such a pump is the right solution. A cement superstructure is built to protect both the borehole and the pump from damage and pollution.

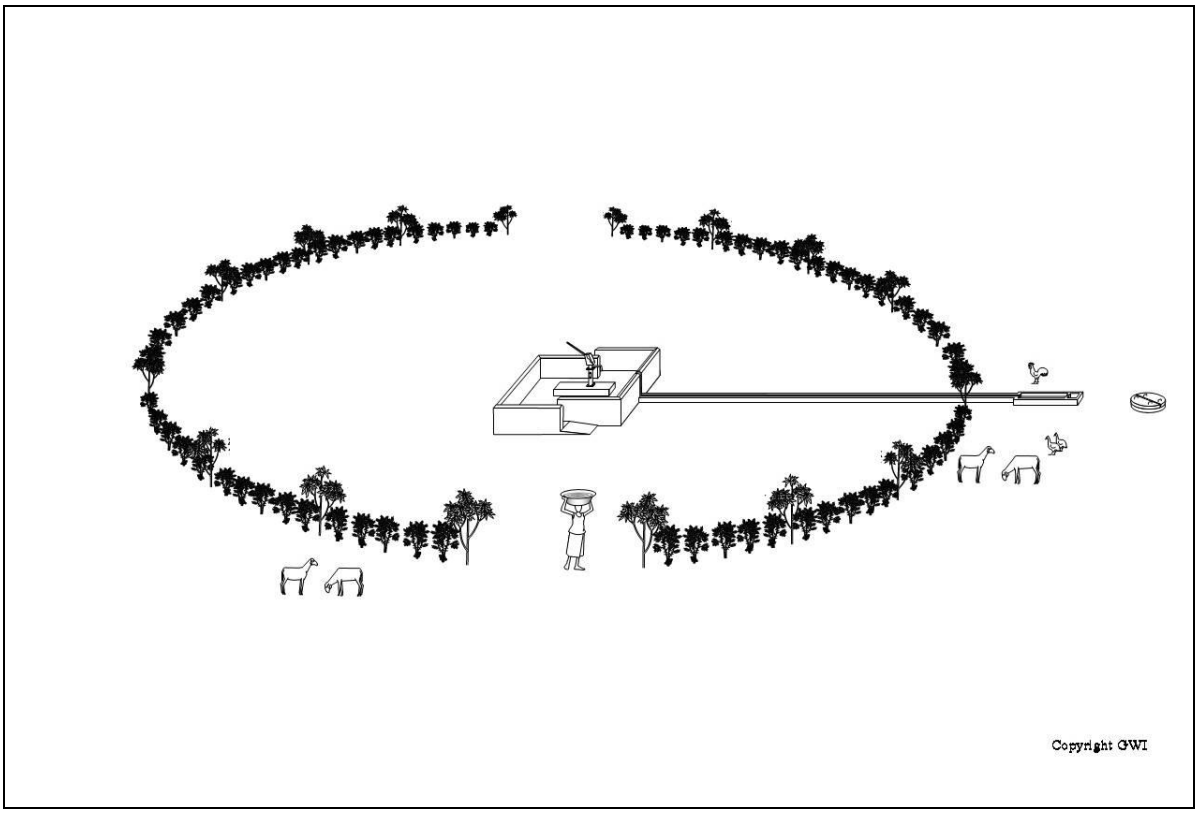

Figure 1: borehole with hand pump

Where to find groundwater

Boreholes that will yield water cannot be drilled at random. Groundwater is not found in all places. A specialist (hydrologist) must find an area below the ground where water is likely to be found. This choice of location must be made after rigorous research but gives no guarantee of drilling being successful.

For example, in sedimentary soils water can be fairly easily located, but in rocks water can only be found where the rock is fractured.

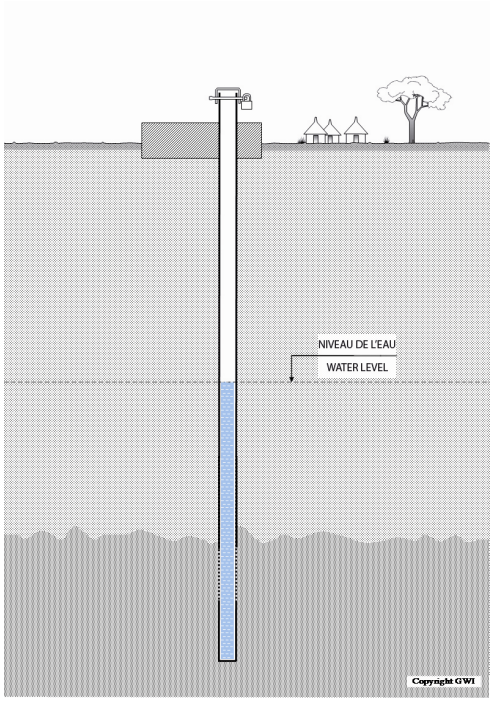

Figure 2: siting in sedimentary soils

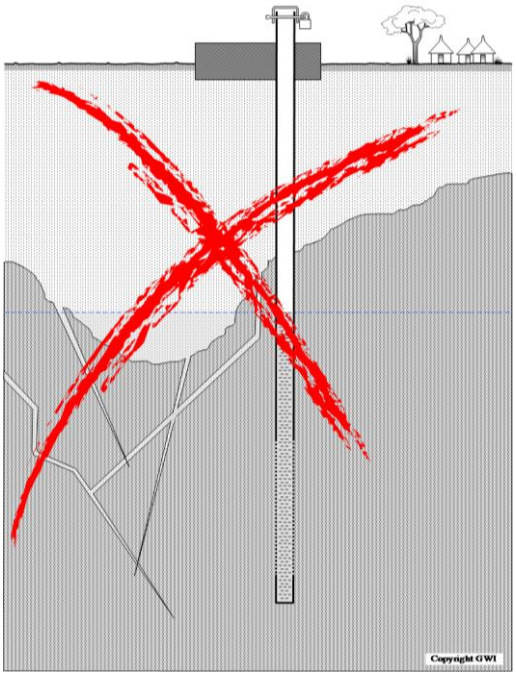

Figure 3: wrong siting in fractured rock

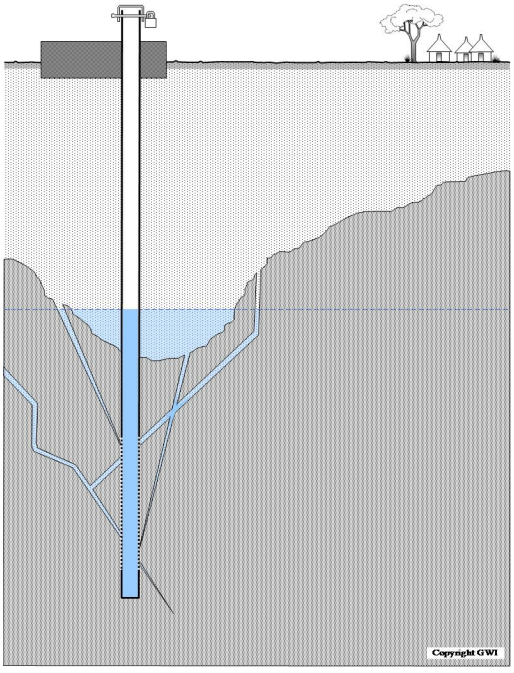

Figure 4: right siting in fractured rock

Once the borehole is drilled, the amount of water it produces (yield) is measured. The yield must be within the minimum national recommended standard (700 litres/hour in Burkina Faso) to make it worth installing a pump. If the yield is too low the borehole cannot be 'developed' and will be sealed over or 'capped'.

Lining the borehole

The borehole is lined with a perforated casing (a pipe with holes that allows water to enter from the sides) at the level of the water influx. The other parts and the lowest part of the casing are not perforated and the bottom is closed with a cap.

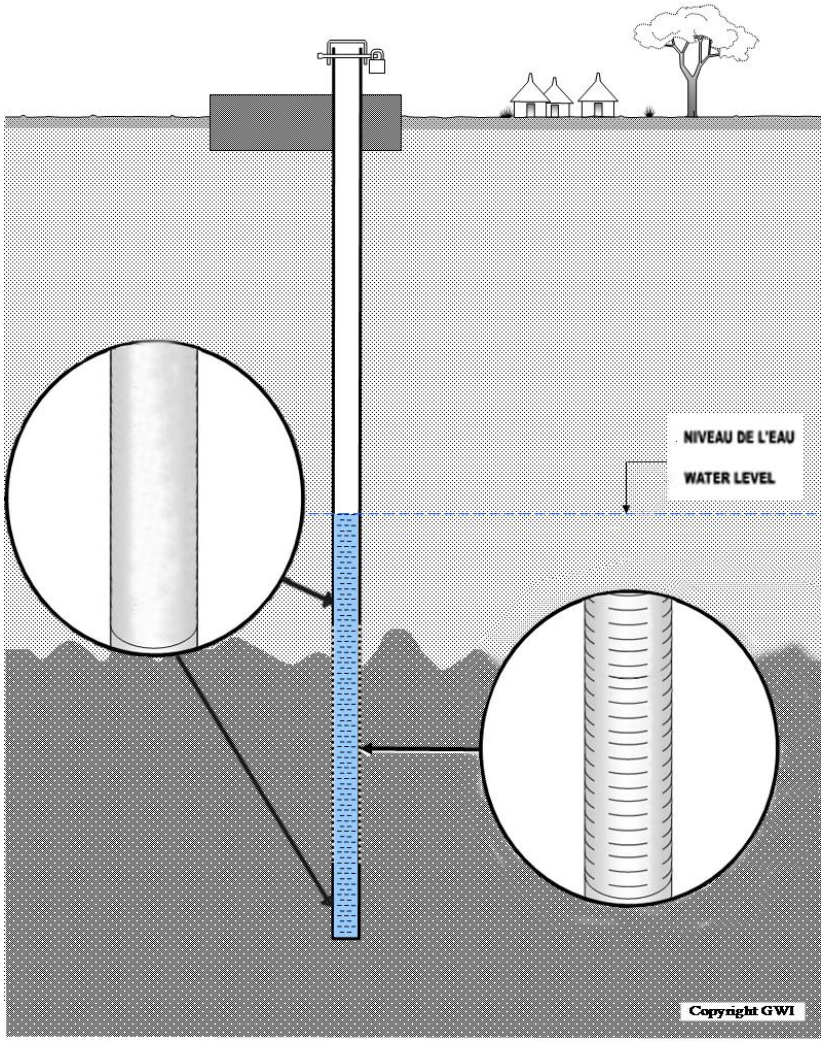

Figure 5: borehole casing and screen

Selecting the hand/foot-pump

A pumping system such as a manual/foot pump, allows users to draw water from the borehole. There are many types of pumps. The most common in West Africa are:

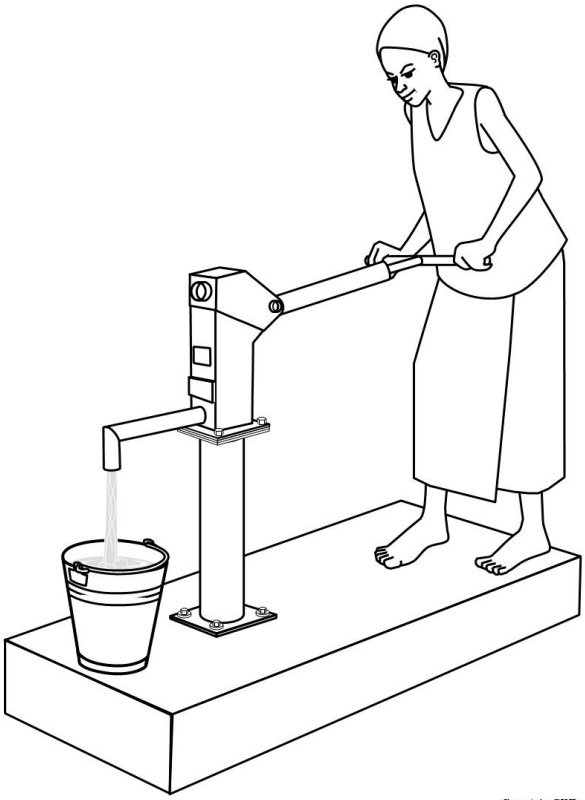

Figure 6: Afridev pump

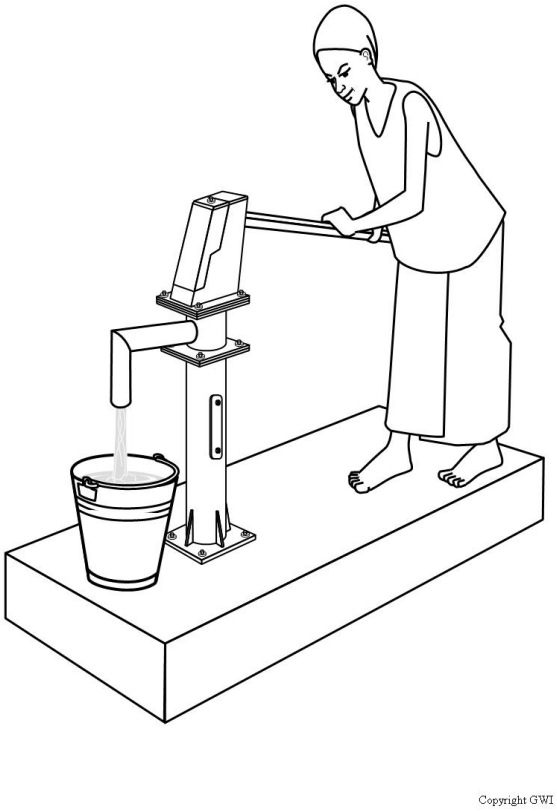

Figure 7: India Mark II pump

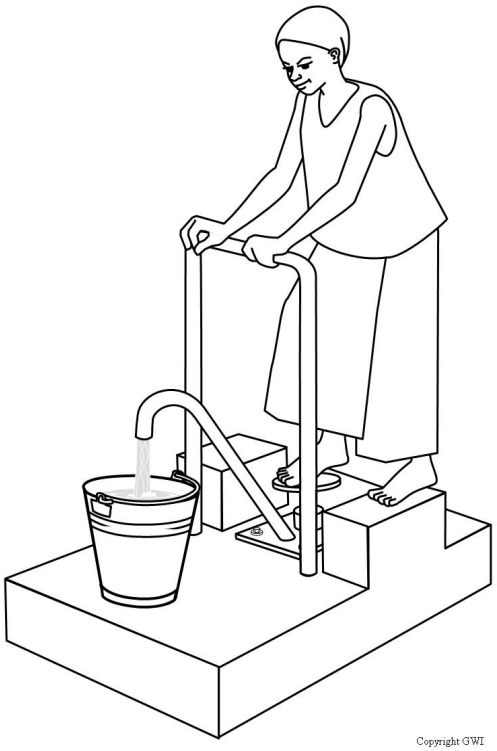

Figure 8: Vergnet pump

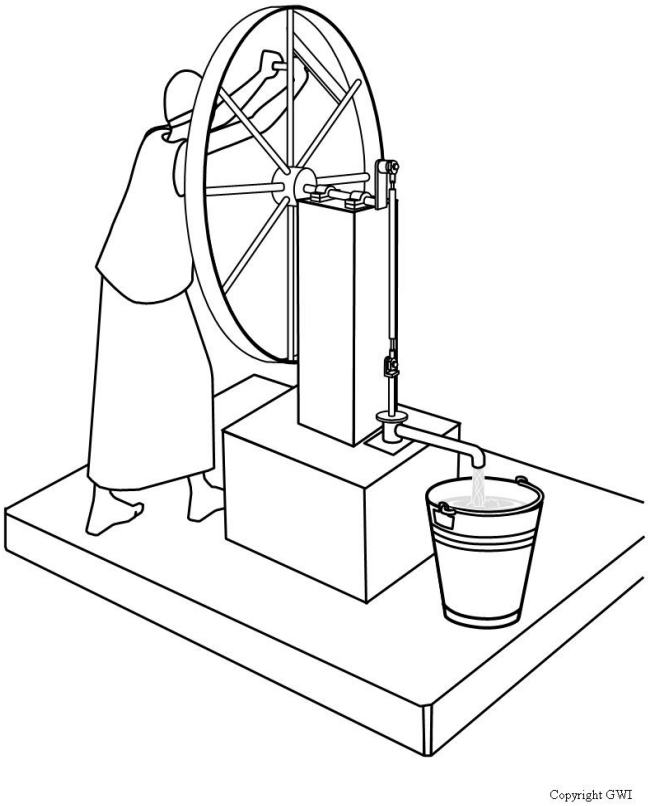

Figure 9: Volonta pump

The Superstructure

Cement structure must be built around the borehole and pump. It will include:

- concrete foundations;
- A concrete apron ;
- A low wall;
- A drain to carry water to the trough and/or the soak-away pit;
- A soak-away pit;
- A cattle drinking trough.

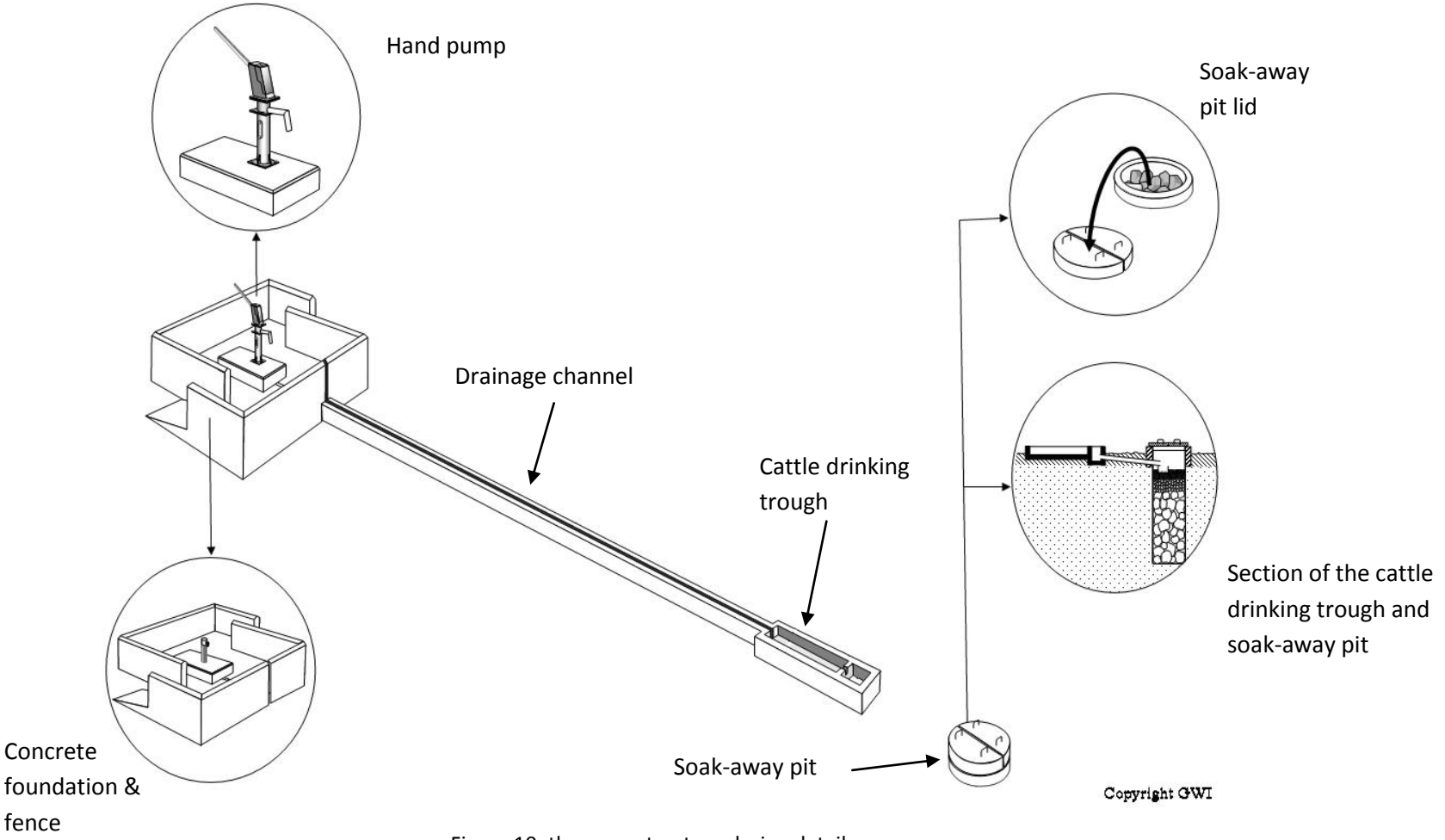

Figure 10: the superstructure design details

Water Service level

Water quality

Groundwater delivered by a borehole is generally of good quality. The water comes principally from rainwater that is filtered through the various layers in the ground. However, though the water may be free of bacterial contamination, it can be unfit for human consumption because of naturally occurring chemical contaminants (i.e. arsenic). Sometimes the water can be polluted by harmful bacteria or harmful chemicals as a result to human activity. Laboratory tests for water quality (both chemical and bacteriological) must be done to see if the water is fit to be used as drinking water for humans.

Water Flow

The yield is the amount of water that can be taken from the borehole over a given period of time. It varies depending on the nature and the capacity of the groundwater that feeds the borehole. The maximum yield of the borehole will be determined using the data collected during the pumping trial once the borehole has been fully developed.

However, the capacity of the borehole to deliver enough water will also depend on the capacity of the pump. For example, hand-pumps are capable of pumping about 5 -10m3 maximum per day (25 - 50 barrels of 200 litres per day).

Level of service

With a hand/foot pump, water drawing is time-consuming. Water-point users need to pump one at a time.

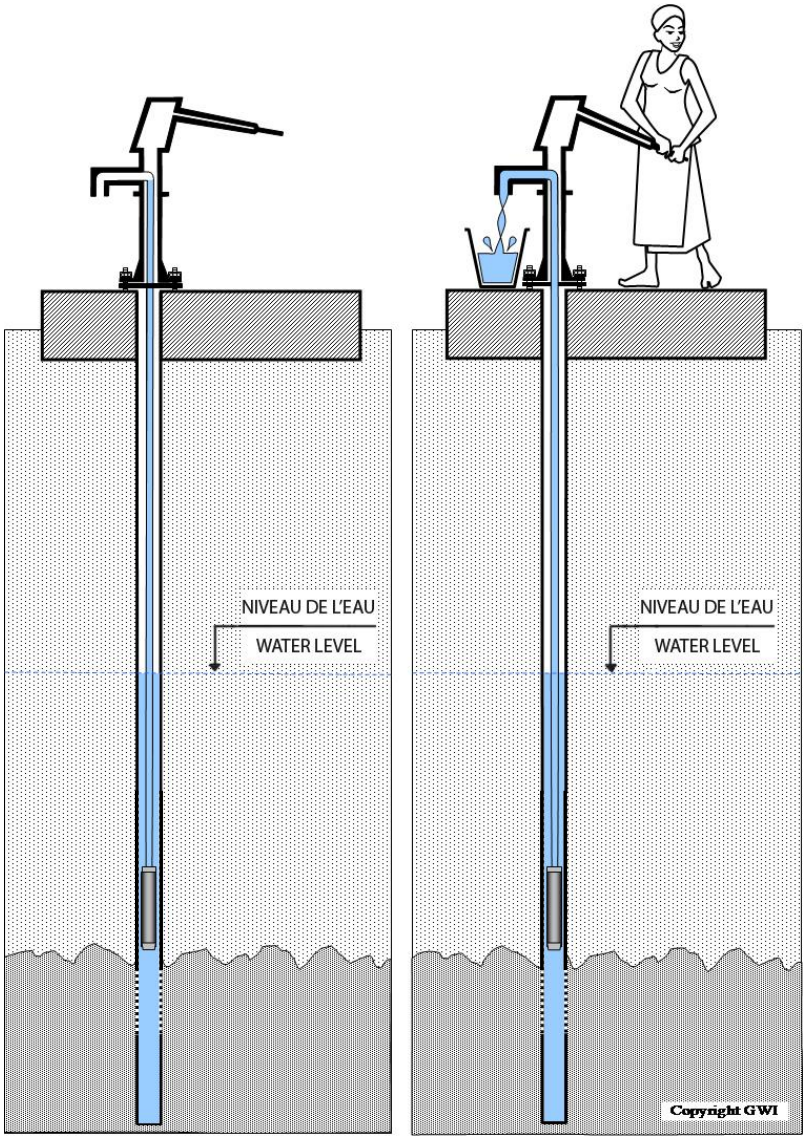

Figure 11: drawing water from a borehole with a hand pump

These pumps are designed for domestic water (drinking, cooking, washing, and personal hygiene). Occasionally a few animals or small vegetable gardens may also be watered.

Costs

Boreholes with hand pumps are expensive not just to build but also to look after once they are in use. We expect such a water supply to last for 15 years before it needs major rehabilitation. This 15 year cost responsibility belongs to the community.

There are three types of main costs of the borehole and hand/foot pump supply:

What?	How much?	When?	Who funds?
Borehole and pump capital expenditure (Capital Expenditure: CapEx).	About 7,0000,000 CFA ($ 14,000 US) in Burkina Faso. Varies depending on the depth.	One off at start	External donor and community cost share.
Ongoing operation and maintenance expenditure including small repairs (Operation and Maintenance: Expenditure, OpManEx).	About 140,000 CFA ($280 US) / year in Burkina Faso for an India Mark II pump. Varies depending on the type of pump.	Ongoing from day one.	Community.
Major repairs and spares replacement (Capital maintenance expenditure: CapManEx).		From the 5th to 7th year after the new pump was installed	Community, commune, and other external supports.

Operation and Maintenance

A well maintained pump will still need to have key parts replaced as they wear. This replacement cost is built into the "ongoing operation and maintenance expenditure" above.

Major rehabilitation of a borehole can be very expensive and may largely cost more than most communities would be able to pay for without external support.

The people skills required

Good organisation is necessary for the management of the water-point: Key groups are the Water Users' Association (WUA), the Water-point Management Committee (WPMC), etc.

Insuring proper operation and maintenance of the borehole and pump requires the following tasks to be carried out:

From within the Community:

- Fund raising according to a specific budget (a transparent and accountable system);
- Preventative maintenance of a) the pump - day to day maintenance carried out (village pump care takers) and b) the superstructure (village mason)

- Organisation of water point users and information.
- Monitoring.

From outside the community:

- Regular pump maintenance / spare replacement / repairs (area mechanic);
- Supply of spare parts;
- Major repairs on superstructure;
- Technical assistance to monitor, troubleshoot, and train.

In conclusion:

It is important to make sure that the community has understood the key aspects of this technology. After you have presented the factual information above, the following questions can help guide the conversation with the community and will allow specific questions, doubts, and points of clarification to be discussed.

Q1.	:	Is water from a borehole with a hand/foot pump always clean?
Q2	:	If the pump breaks, can we draw water out of the borehole with a bucket?
Q3	:	How many people at a time can draw water?
Q4	:	What are the main elements of a borehole?
Q5	:	What is the community responsibility to ensure operation and maintenance of a borehole?
Q6.	:	How much money does the community need to collect each year to maintain a borehole?
Q7	:	How many households would be using this pump? So how much would each household have to pay each year? And how much each month?
Q8	:	What resources would you need from outside your village to keep this pump alive?
Q9	:	What advantages and disadvantages do you see to a borehole with hand/foot pump for your community?

2. BOREHOLE AND GRAVITY DISTRIBUTION WITH SUBMERSIBLE PUMP

Description

This supply consists of a source of water (generally a borehole), an electric submersible pump powered by solar energy, a diesel generator or electric mains a water tower and a gravity distribution network and multiple tap-stands. This relies on a high yielding borehole, delivering a minimum of 5m3 per hour.

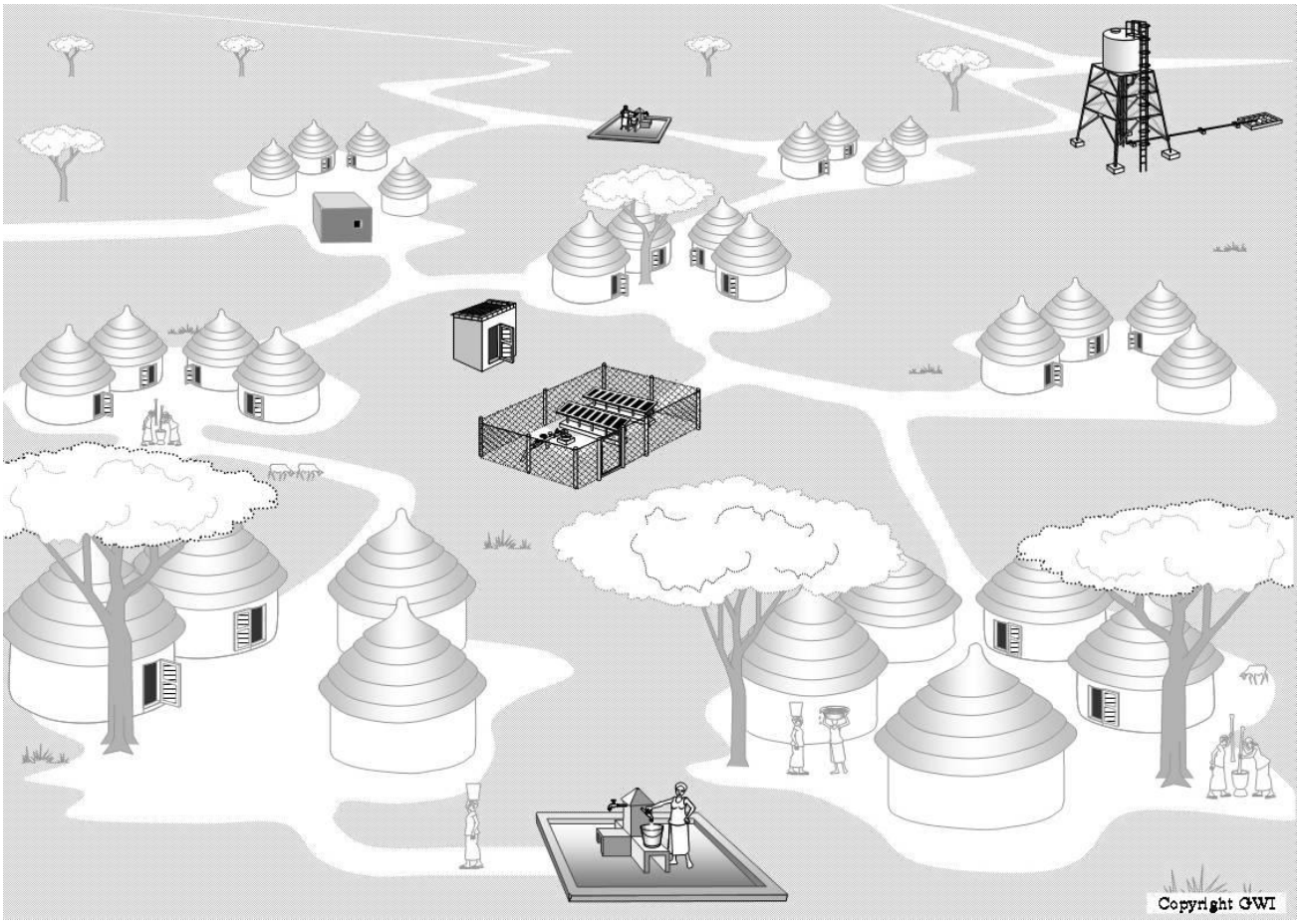

Figure 12: a solar powered village water supply system

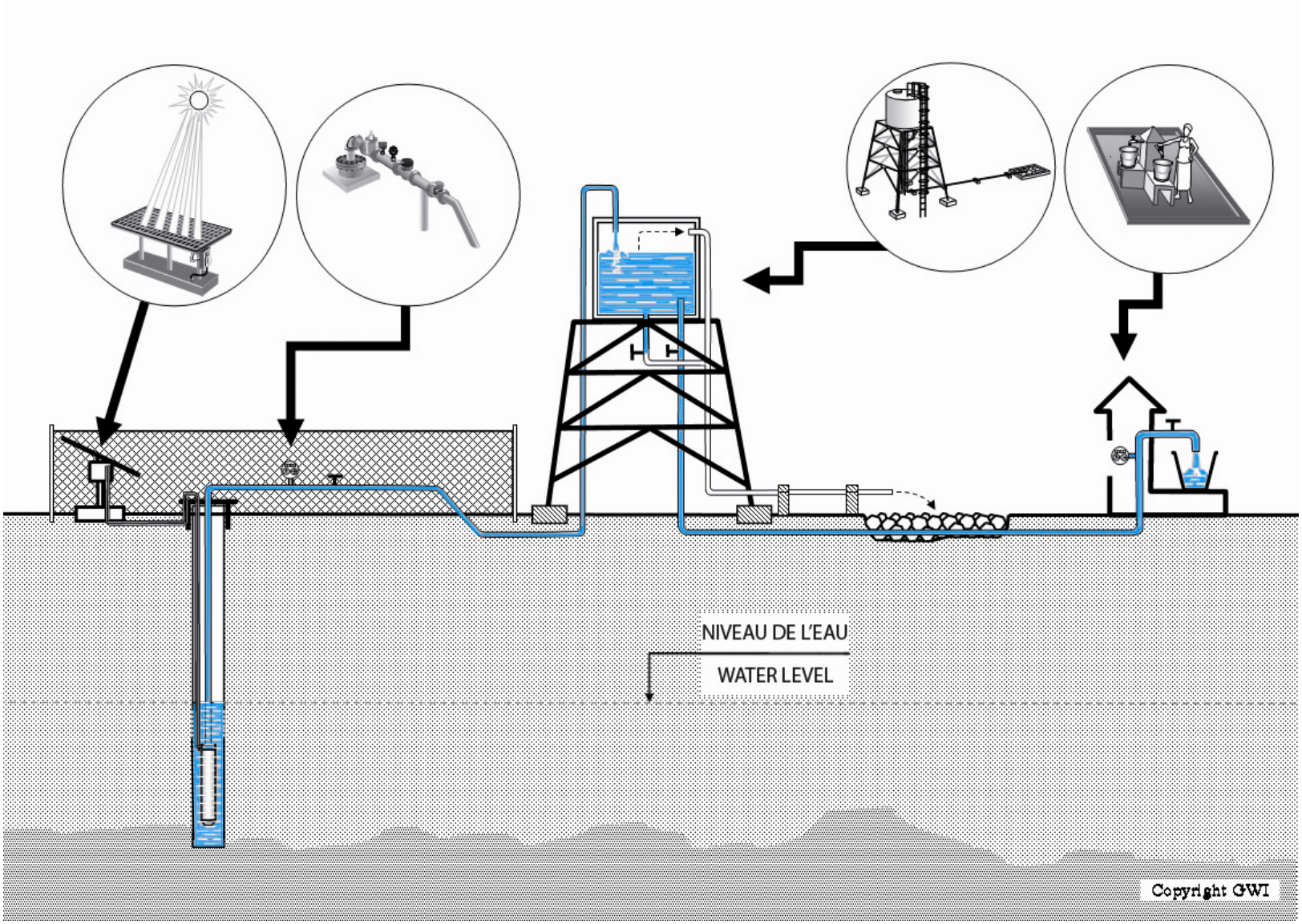

Figure 13: the technical components of the solar powered village system

Where to find groundwater

Boreholes that will yield water cannot be drilled at random. Groundwater is not found in all places. A specialist (hydrologist) must find an area below the ground where water is likely to be found. This choice of location must be made after rigorous research, but gives no guarantee of drilling being successful.

For example, in sedimentary soils water can be fairly easily located, but in rocks water can only be found where the rock is fractured.

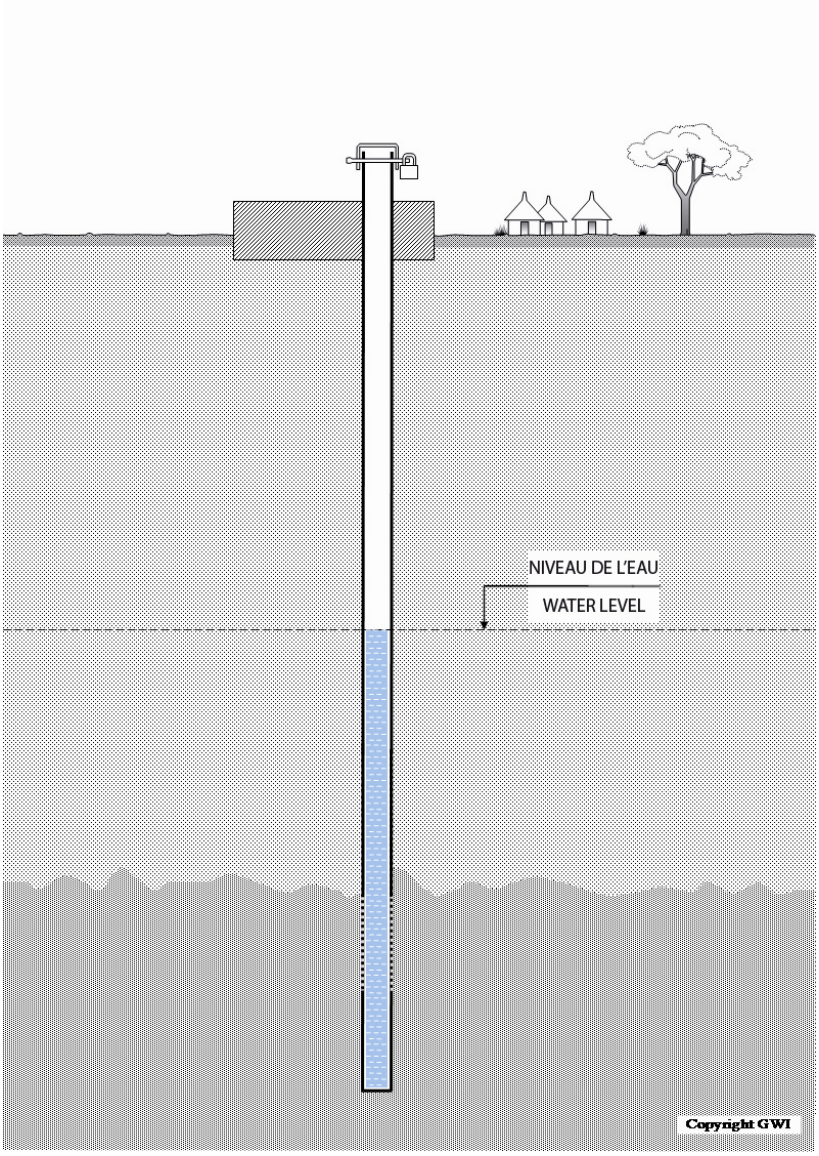

Figure 14: siting in sedimentary soils

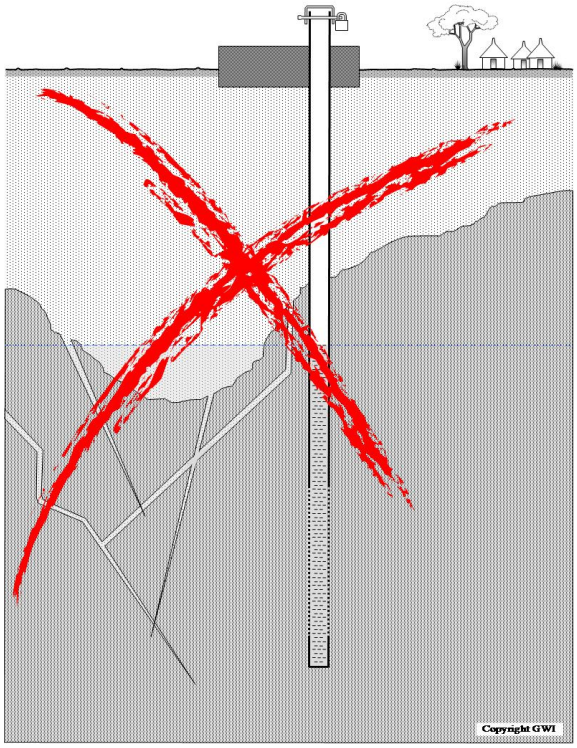

Figure 15: wrong siting in fractured rock

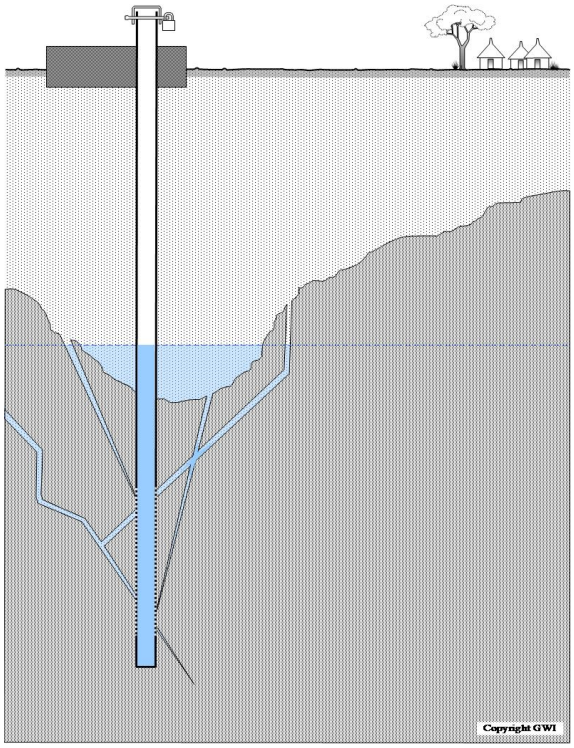

Figure 16: right siting in fractured rock

Once the borehole is drilled, the amount of water it produces (yield) is measured. The yield must be at least 5m3/hour to justify installing an electric pump and such an expensive infrastructure. Should a borehole be drilled that yields too little water for an electric pump, but enough water to meet the minimum national recommended standard (generally 1m3 / h or sometimes less depending on the country or case related to the hydrogeological conditions encountered), a hand/foot pump can be installed. If the yield is too low for either an electric or a hand/foot pump, the borehole cannot be 'developed' and will be sealed over or 'capped'.

Lining the borehole

The borehole is lined with a perforated casing (a pipe with holes that allows water to enter from the sides) at the level of the water influx. The top part and the lowest part of the casing are not perforated and the bottom is closed with a cap.

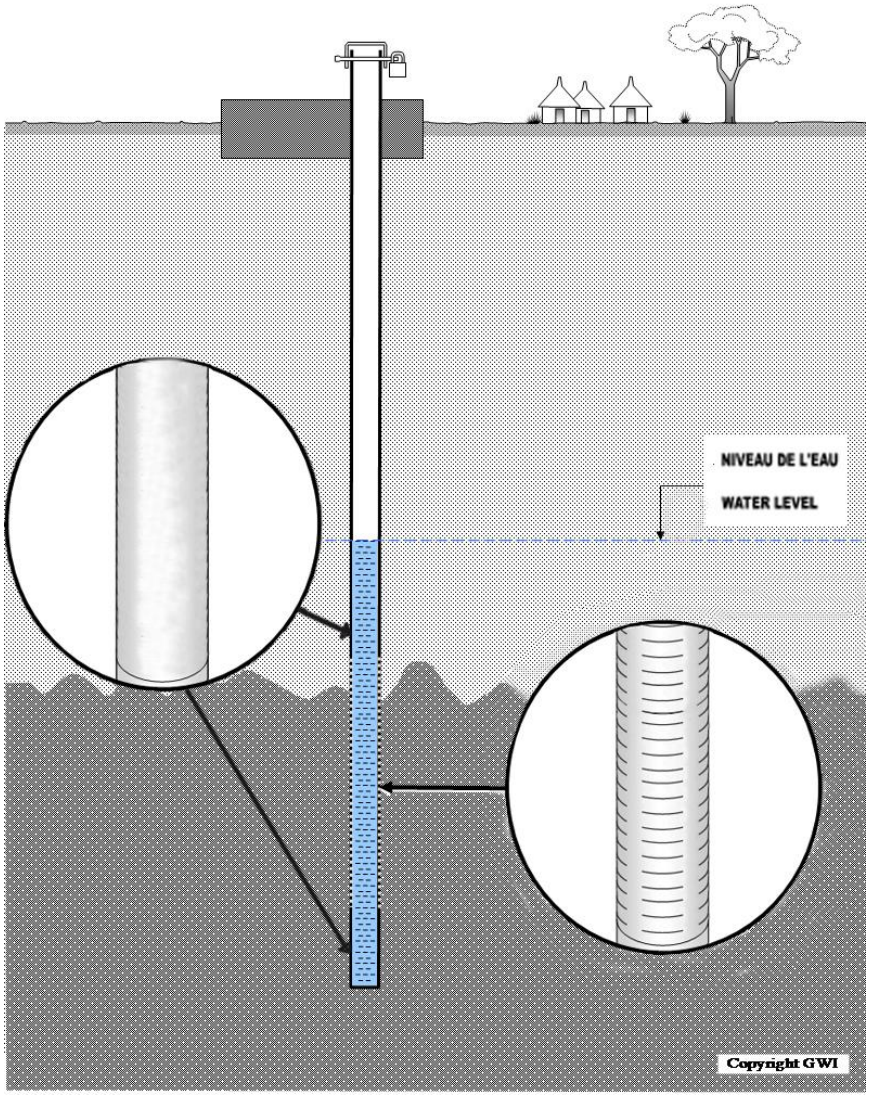

Figure 17: borehole casing and screen

The electric submersible pump

The submersible pump is placed in the water yielding part of the borehole and pumps water up to fill the water tower from where it is distributed by gravity to the water points along the distribution network.

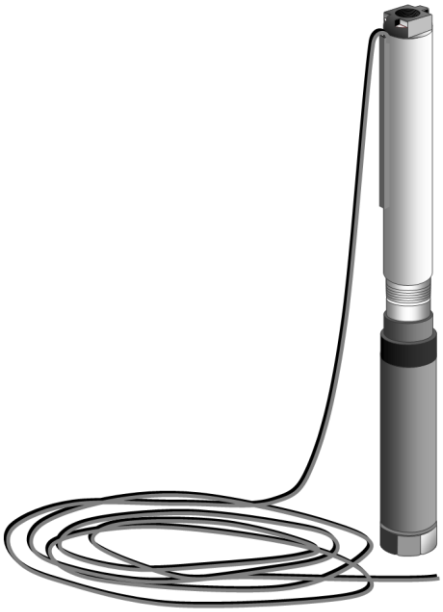

Figure 18: electric submersible pump

Source of energy

A source of energy is necessary to provide electricity to the pump. It can be powered by solar energy, a generator (diesel) or electric mains. The more powerful the pump, the more energy it requires.

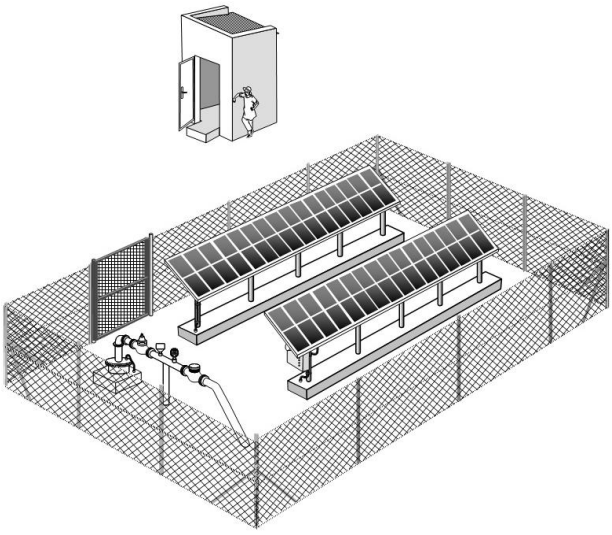

Figure 19: solar power supply to a submersible pump

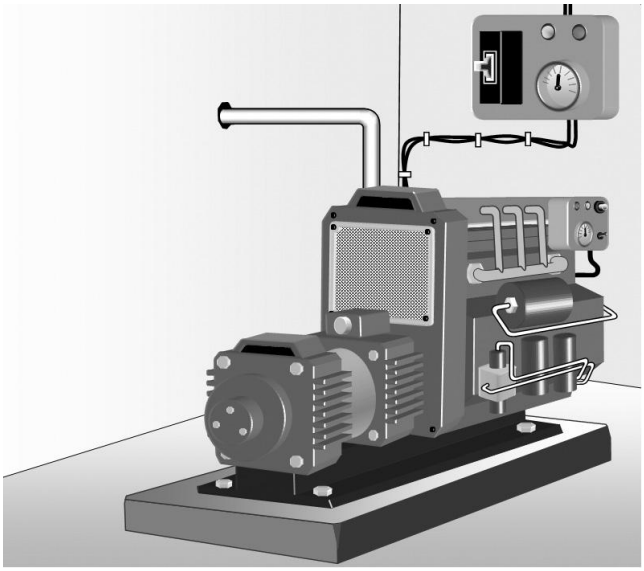

Figure 20: diesel power supply to a submersible pump

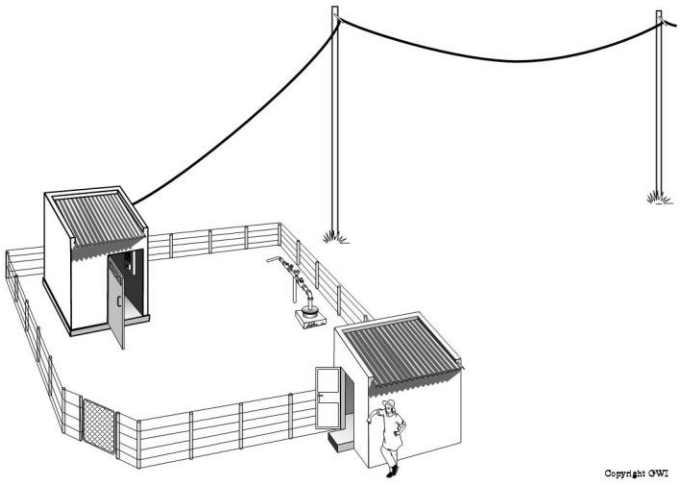

Figure 21: electric mains power to a submersible pump

The Water tower

When the system is designed, the location of the water tower will ideally be placed nearby on raised ground. Where the area is flat, a decision has to be taken whether to raise the tank on a stand or place the tank at a distance on higher grounds. It allows storage of water and gravity distribution to tap-stands.

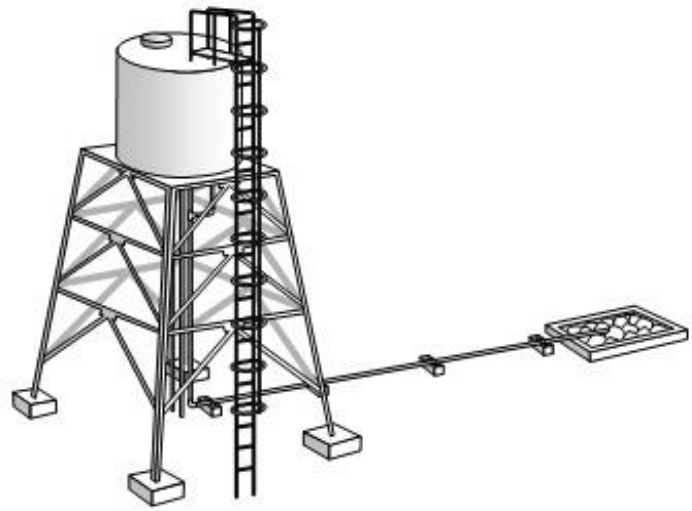

Figure 22: a water tower with its overflow and drainage system

Water supply and distribution network

The pipes are buried in a 80 cm trench running from the borehole to the water tower and then from the water tower to the water points.

Tap-stands

Tap-stands are installed in various points according to the engineering design, which has taken into account equitable distribution. There are several design options, the best of which make water fetching easier. The most common are illustrated below.

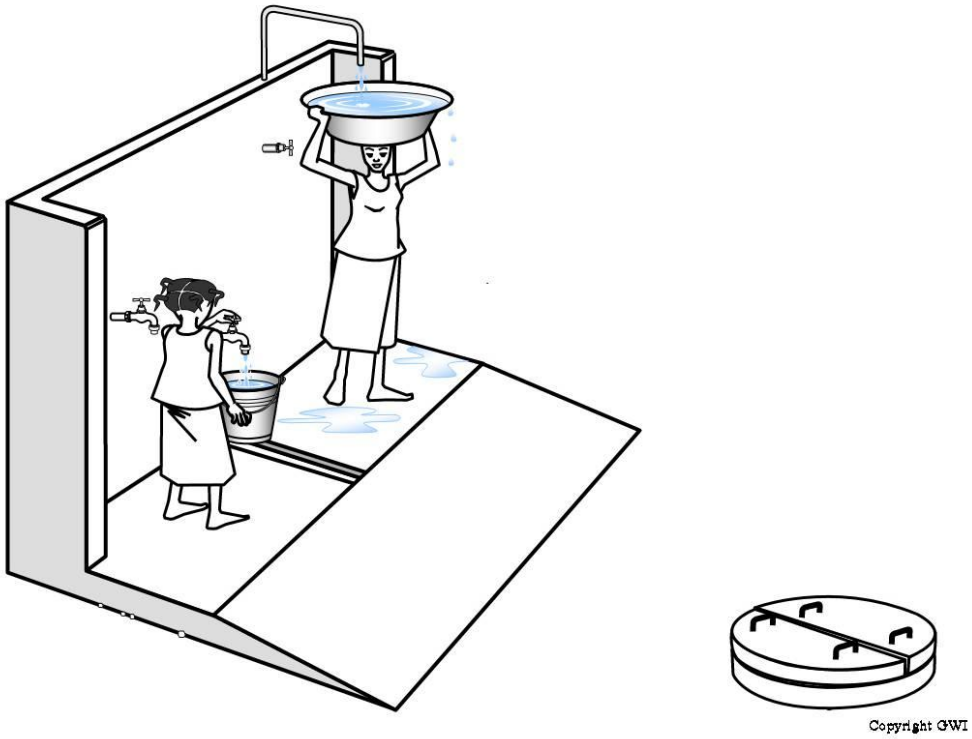

Figure 23: multiple levels taps make water fetching easier

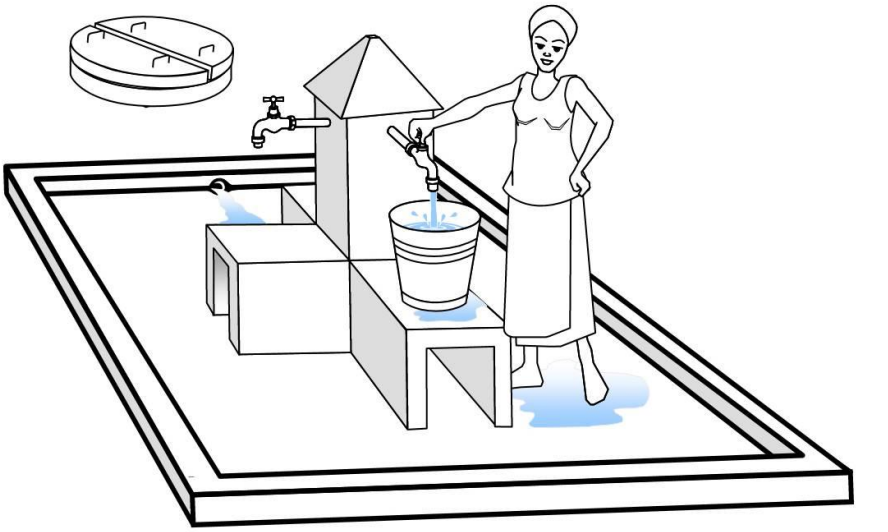

Figure 24: taps with raised bucket stands

Water Service level

Water quality

Groundwater delivered by a borehole is generally of good quality. The water comes principally from rainwater that is filtered through the various layers in the ground. However, though the water may be free of bacterial contamination, it can be unfit for human consumption because of naturally occurring chemical contaminants (i.e. arsenic). Sometimes the water can be polluted by harmful bacteria or harmful chemicals as a result to human activity. Laboratory tests for water quality (both chemical and bacteriological) must be done to see if the water is fit to be used as drinking water for humans.

Water Flow

For a borehole, the yield is the amount of water that can be taken from the borehole over a given period of time. It varies depending on the nature and the capacity of the groundwater that feeds the borehole. The maximum yield of the borehole will be determined during the pumping trial once the borehole has been fully developed.

However, the real operating yield will depend on the capacity of the pump used.

Level of service

Having several water-points dispersed in the village cuts down user water fetching time.

Costs

A borehole and gravity distribution system with a submersible pump is very expensive, not just to install but also to look after once it is in use. We expect such a water supply to last for 25 years before it needs major rehabilitation. This 25 year cost responsibility belongs to the community.

There are three types of main costs of this system:

What?	How much?	When?	Who funds?
Entire system capital expenditure. (Capital Expenditure: CapEx).	Around 40,000,000 CFA ($80,000 US) to 60,000,000 f CFA ($ 120,000 US) in Burkina Faso for small size systems.	One off at start.	External donor and community cost share.
Ongoing operation and maintenance expenditure including small repairs. (Operation and Maintenance: Expenditure. OpManEx).	Around 1,000,000 CFA ($2,000 US) to 1,500,000 CFA ($3,000 US) / year in Burkina Faso for a system using solar energy.	Ongoing from day one.	Community.
Major repairs, major parts and spares replacement. (Capital maintenance expenditure: CapManEx).		From the 5 th or 7th year depending on the source of energy used.	Community, commune, and other external supports.

Capital investment

The cost for the design and construction of this system varies depending on the depth of the borehole, the type of energy used (solar, diesel, electric mains), the size of the distribution network, the water storage and the number of water points. An indication of when specific parts of the system may need replacing follows.

Item	Expected lifespan
Submersible pump	7 years
Inverter (case of solar system with a pump using AC)	10 years
Standpipes	20 years
Diesel engine or Solar panels Electric mains (electric board)	5-7 years 25 years 30 years
Water tower	25 years
Water supply and distribution network	25 years
Borehole	30 years

Operation and Maintenance

Operation costs include the water point management (watchman, water point management team, other).

This system is complex and needs looking after regularly. The following operation and maintenance is needed:

From within the community:

- A watchman for security of the overall system;
- Solar panel and borehole enclosure: washing the solar panels daily with water, checking security of the gate and fence…
- Turning the pump on and off and reporting any faults
- Overall inspection: chamber covers in place, leaks on pipeline, main valves and taps on tap-stands…
- Minor repairs on structure: village mason ;
- Water fee collection and safe keeping;
- Etc.

From outside the community:

- Repairs on water supply and distribution network: plumber;
- Major repairs - on concrete structure, mason – on diesel generator, mechanic – on electrical system, specialist electrician, etc.
- Repaint water tower (if made of metal) with protective anti-rust paint;

- Replacement of worn taps;
- Etc.

Major rehabilitation of this system can be very expensive and may largely cost more than most communities would be able to pay for without external support.

The people skills required

Good organisation is necessary for the management of the system. Key groups are the Water Users' Association (WUA), the Water-point Management Committee (WPMC), sub-contracted private operators, etc.

Water-point management includes raising funds for servicing and maintenance, organizing water-point users and accountability to community, etc.

In conclusion:

It is important to make sure that the community has understood the key aspects of this technology. After you have presented the factual information above, the following questions can help guide the conversation with the community and will allow specific questions, doubts, and points of clarification to be discussed.

Q1.	:	Is water from a borehole always clean?
Q2	:	If the system breaks, can we draw water out of the borehole with a bucket?
Q3	:	How many people at a time can draw water?
Q4	:	What are the main elements of the system?
Q5	:	What is the community responsibility to ensure operation and maintenance of the system?
Q6.	:	How much money does the community need to collect each year to maintain the system?
Q7	:	How many households would be using this system? So how much would each household have to pay each year? And how much each month?
Q8	:	What resources would you need from outside your village to keep this system alive?
Q9	:	What advantages and disadvantages do you see to this type of system for your community?

3. IMPROVED HAND-DUG WELL WITH PULLEYS

Description

This is a hand-dug well fully lined with concrete, with a frame to mount several pulleys, a superstructure to protect the well and a lid to cover the well when it is not in use.

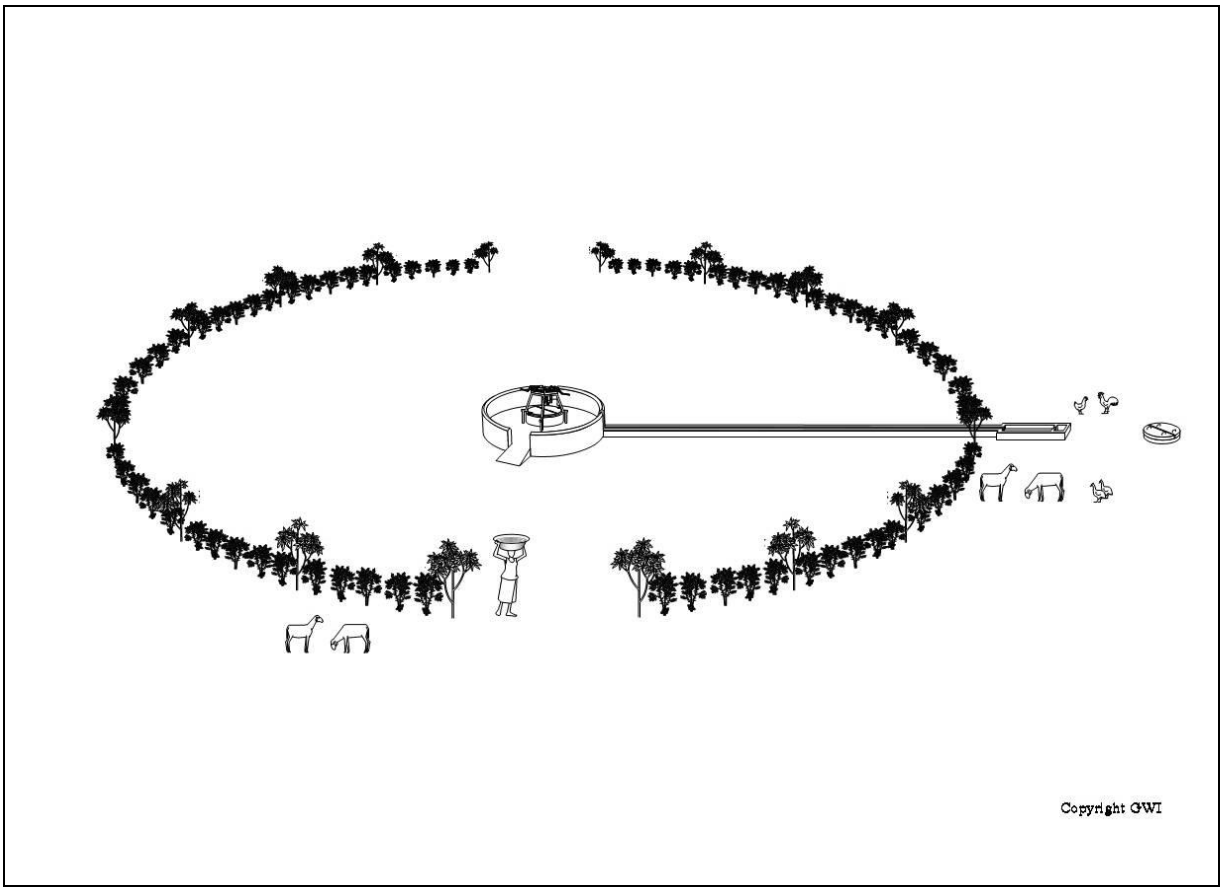

Figure 25: a hand dug well with windlasses

Lined well

A large diameter well is dug into the aquifer. It is lined to its full depth with a reinforced concrete lining.

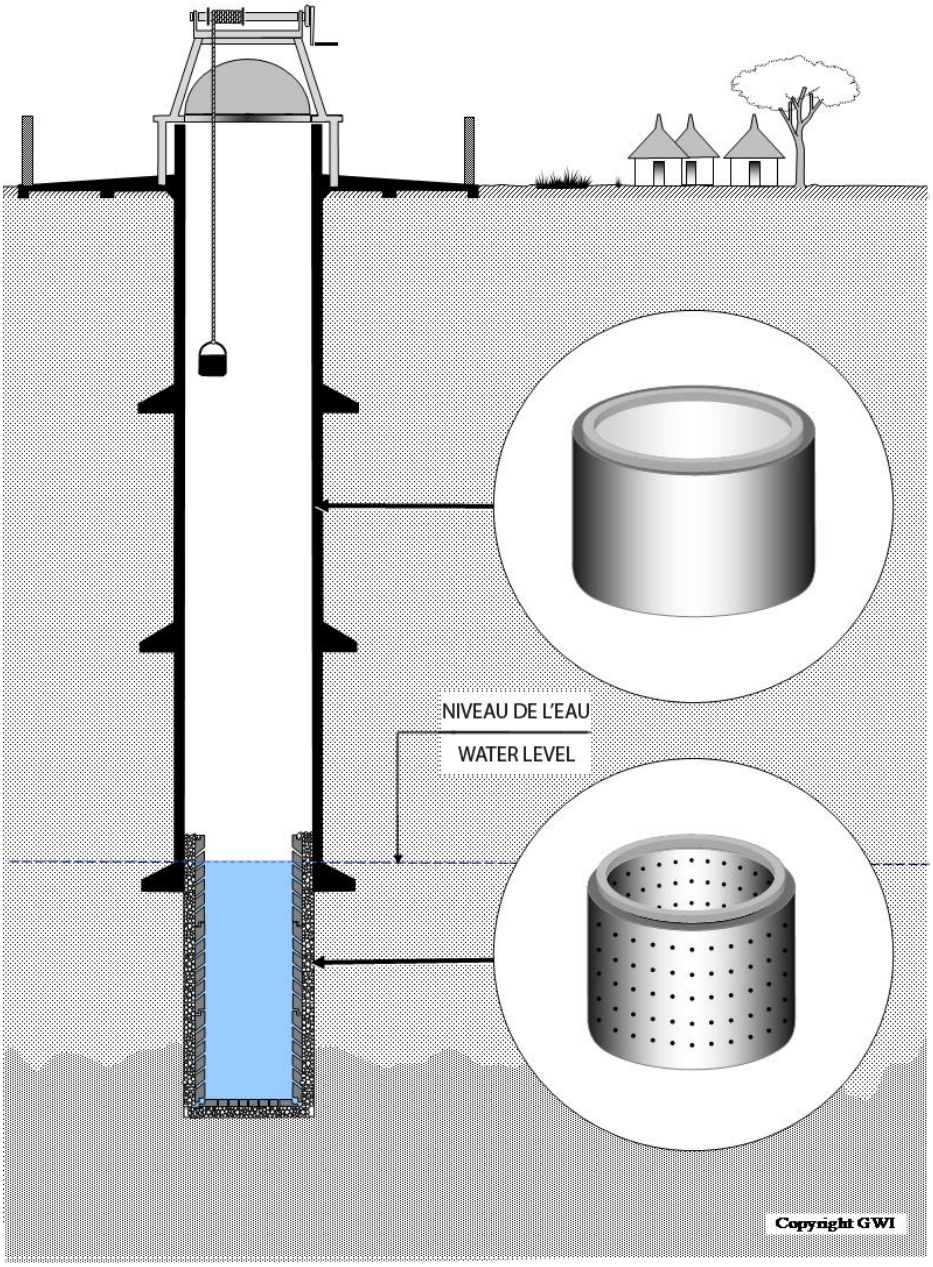

Figure 26: how water gets into the well

Two types of lining are used. In a 2-meter hand-dug well, 1.80 m diameter lining rings are used to line the hole above the water level and 1.40 m diameter perforated rings are used to line below the water level.

To hold the well lining steady, it must be anchored properly above ground and at several points inside the well shaft (usually every 10 meters).

The Superstructure

The well must be protected with:

- concrete foundations;
- a concrete apron and well head with a cover ;
- the frame on which the pulleys/windlass are mounted;
- a low wall/fence;
- a drain to carry water to the livestock trough;
- a soak-away pit.

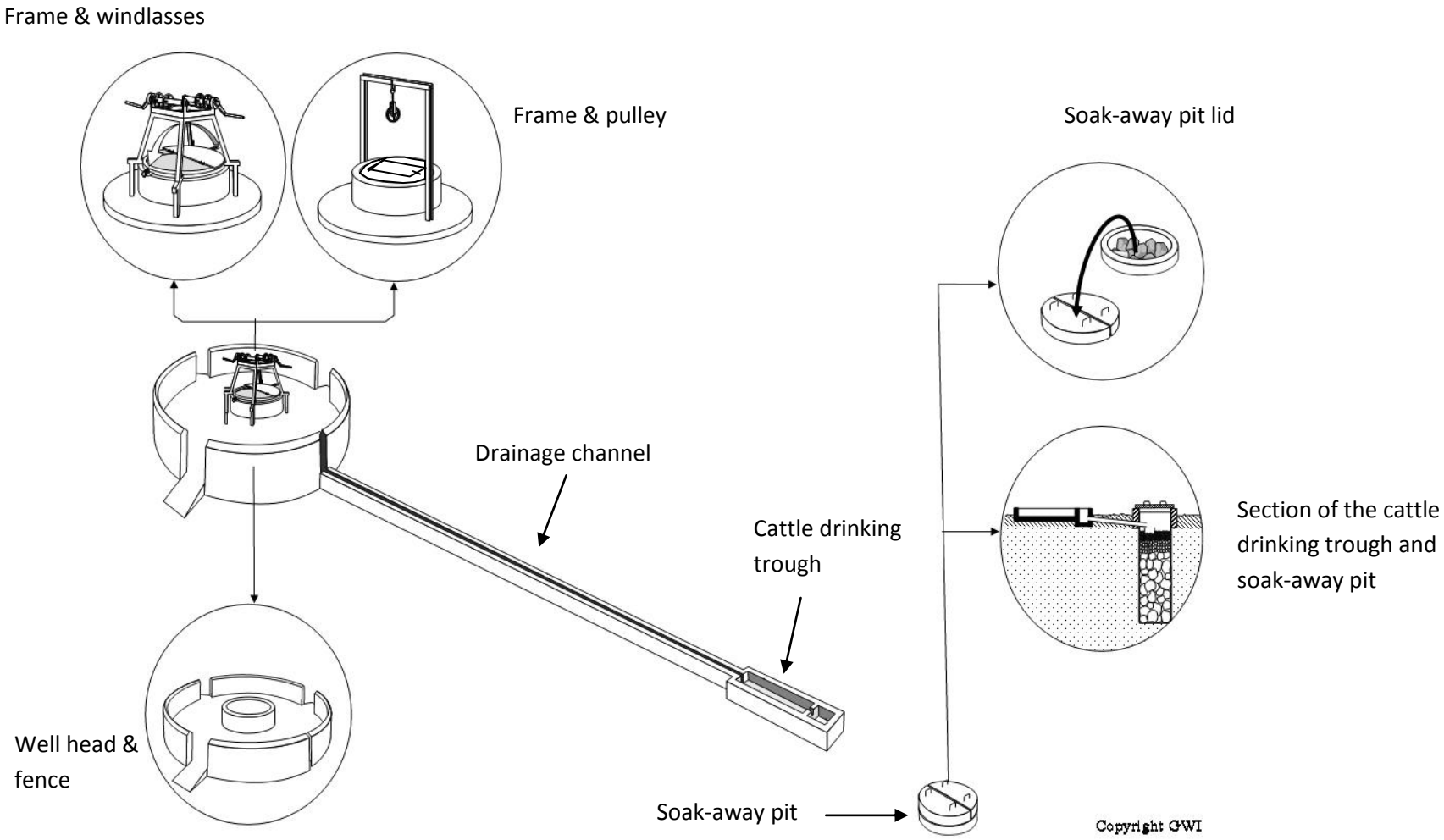

Figure 27: the superstructure design details

Getting water out of the well

A series of pulleys or windlasses mounted on a frame allow several people to fetch water at the same time.

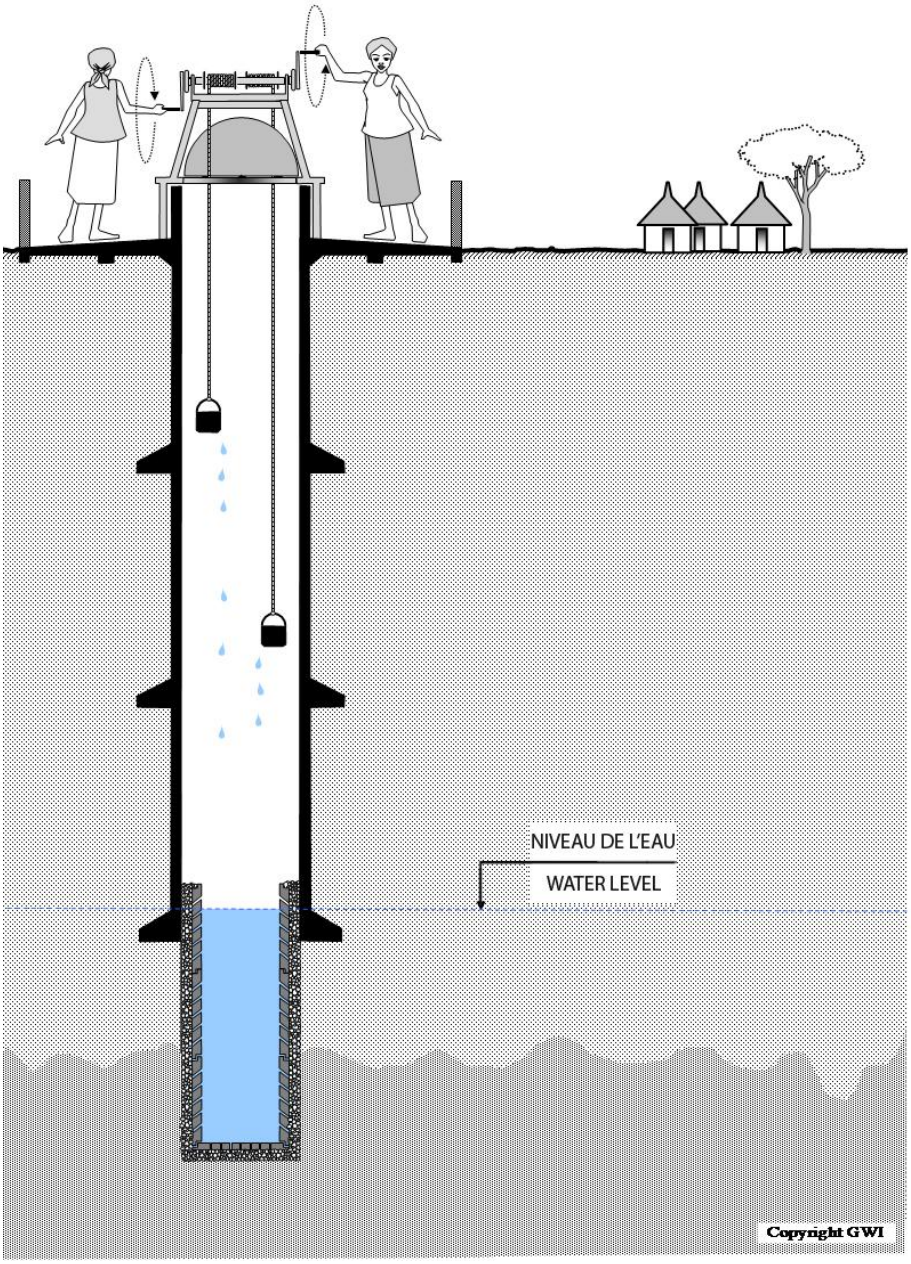

Figure 28: water drawing with windlasses

Water Service level

Water quality

Groundwater from a hand-dug well is generally of good quality. The water comes from rainwater that is filtered through the various layers in the ground. However, though the water may be free of bacterial contamination, it can be unfit for human consumption because of naturally occurring chemical contaminants (i.e. arsenic). Sometimes the water can be polluted by harmful bacteria or harmful chemicals as a result to human activity. Laboratory tests for water quality (both chemical and bacteriological) must be done to see if the water is fit to be used as drinking water for humans.

It is important to note that hand-dug wells can easily be polluted: by the rope and buckets that are used to lift the water out of well, dust and any other material that may fall into the well.

Water Flow

The yield is the amount of water that can be taken from the well over a given period of time. It varies depending on the nature and the capacity of the groundwater that feeds it. The daily capacity of the well is assessed when it is dug and varies from one well to another.

Level of service

How much water can be abstracted from the well relies both on the rate of recharge and the speed at which people can physically draw the water. This water can be used for any purpose (drinking, cooking, washing, animal watering and small vegetable gardens) but it should sometimes be treated if it is to be used for drinking purposes. However, due to the limited rate of water recharge, some types of uses will be given priority.

Costs

Improved hand-dug wells are expensive to build but are low cost once they are in use. We expect such a water supply to last for 20 years before it needs major rehabilitation. This cost responsibility belongs to the community.

There are three types of main costs:

What?	How much?	When?	Who funds?
Lined hand-dug well with pulleys or windlasses capital expenditure. (Capital Expenditure: CapEx).	About 7,500,000 CFA ($ 15,000) in Burkina Faso for a30 meters depth well	One off at start	External donor and community cost share
Ongoing operation and maintenance expenditure including small repairs. (Operation and Maintenance: Expenditure, OpManEx).	Reliable data not available. The expenditure must take account a certain actions*	Ongoing from day one.	Community,
Major repairs and spares replacement. (Capital maintenance expenditure: CapManEx).		Normally there should be no major repairs before 5 years if the structure is properly built.	Community, commune, and other external supports

**: The actions are: replacing rope, pulleys (or windlasses), maintenance and repairs of the water lifting frame, minor repairs on the concrete rings or on the superstructure, periodic de-watering and disinfection of the well, major repairs on the superstructure, the concrete rings (porous and not porous), gravel packing, periodic technical visits of the well.*

Operation and Maintenance

A well maintained improved hand-dug well with pulleys or windlasses will need to have key parts replaced as they wear. This replacement cost is built into the "ongoing operation and maintenance expenditure" above.

Major rehabilitation can be expensive and may cost more than most communities would be able to pay for without external support.

The people skills required

Good organisation is necessary for the management of the well: Key groups are the Water Users' Association (WUA), the Water-point Management Committee (WPMC), etc.

Insuring proper operation and maintenance of the well requires the following tasks to be carried out:

From within the Community:

- Fund raising according to a specific budget (a transparent and accountable system);
- Preventative maintenance of the water lifting equipment
- Small masonry repairs
- Organisation of water point users and information.
- Monitoring.

From outside the community:

- Periodic de-watering and sanitization of the well
- Regular pump maintenance / spare replacement / repairs (area mechanic);
- Supply of spare parts;
- Major repairs on superstructure, concrete lining and gravel packing;
- Deepening the well in case of a marked drop in the water table;
- Technical assistance to monitor, troubleshoot, and train.

In conclusion:

It is important to make sure that the community has understood the key aspects of this technology. After you have presented the factual information above, the following questions can help guide the conversation with the community and will allow specific questions, doubts, and points of clarification to be discussed.

Q1.	:	Is water from a well always clean?
Q2	:	If the pulleys/windlasses break down, can we draw water out of the well with a bucket?
Q3	:	How many people at a time can draw water?
Q4	:	What are the main elements of an improved well?
Q5	:	What is the community responsibility to ensure operation and maintenance of an improved well?

Q6. : How much money does the community need to collect each year to maintain an improved well?

Q7 : How many households would be using this improved well? So how much would each household have to pay each year? And how much each month?

Q8 : What resources would you need from outside your village to keep this improved well alive?

Q9 : What advantages and disadvantages do you see to an improved well for your community?

4. IMPROVED HAND-DUG WELL WITH HAND/FOOT PUMP

Description

This is a hand-dug well fully lined with concrete, equipped with a hand/foot pump. Most hand/foot pumps can pump to the depth of 45 to 60 meters. If the water level is lower than this it is unlikely that such a pump is the right solution. A cement superstructure is built to protect both the well and the pump from damage and pollution.

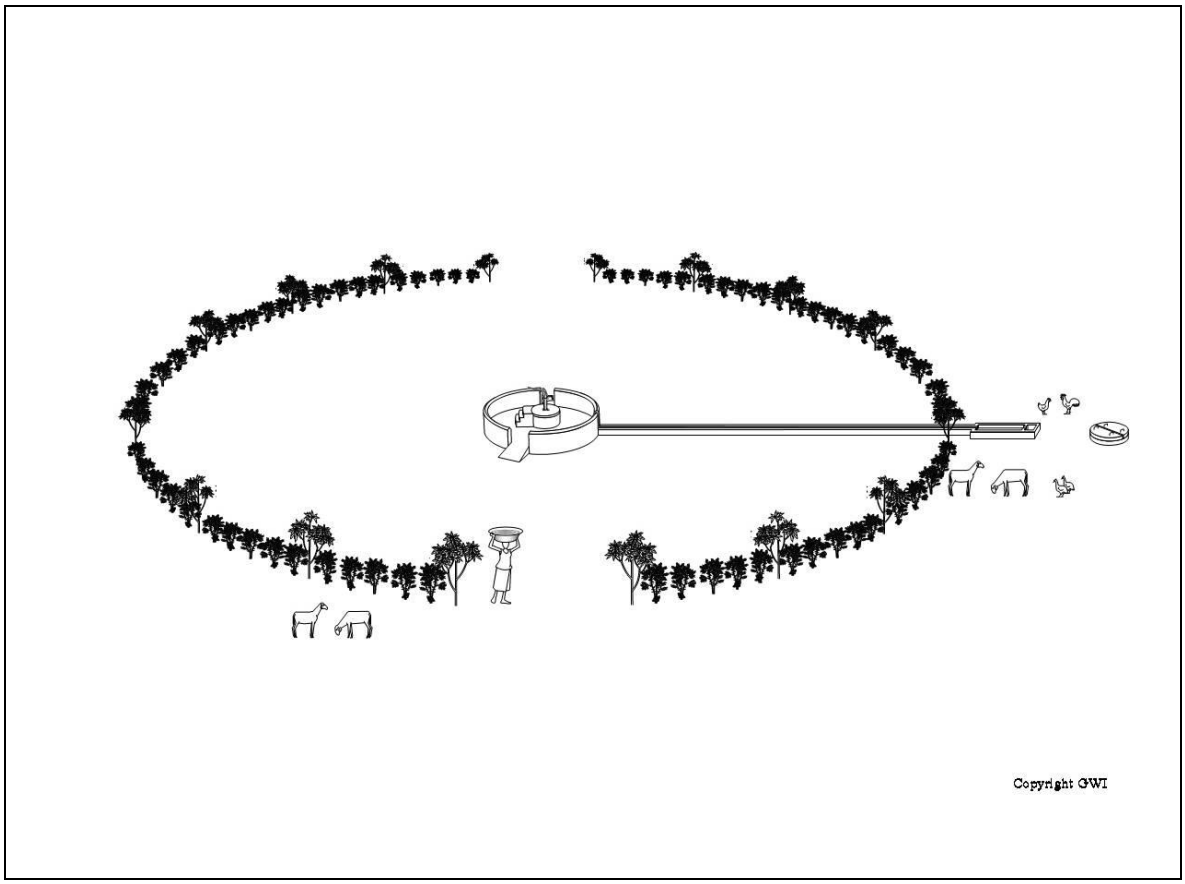

Figure 29: hand dug well with hand pump

Lined well

A large diameter well is dug into the aquifer. It is lined to its full depth with a reinforced concrete lining.

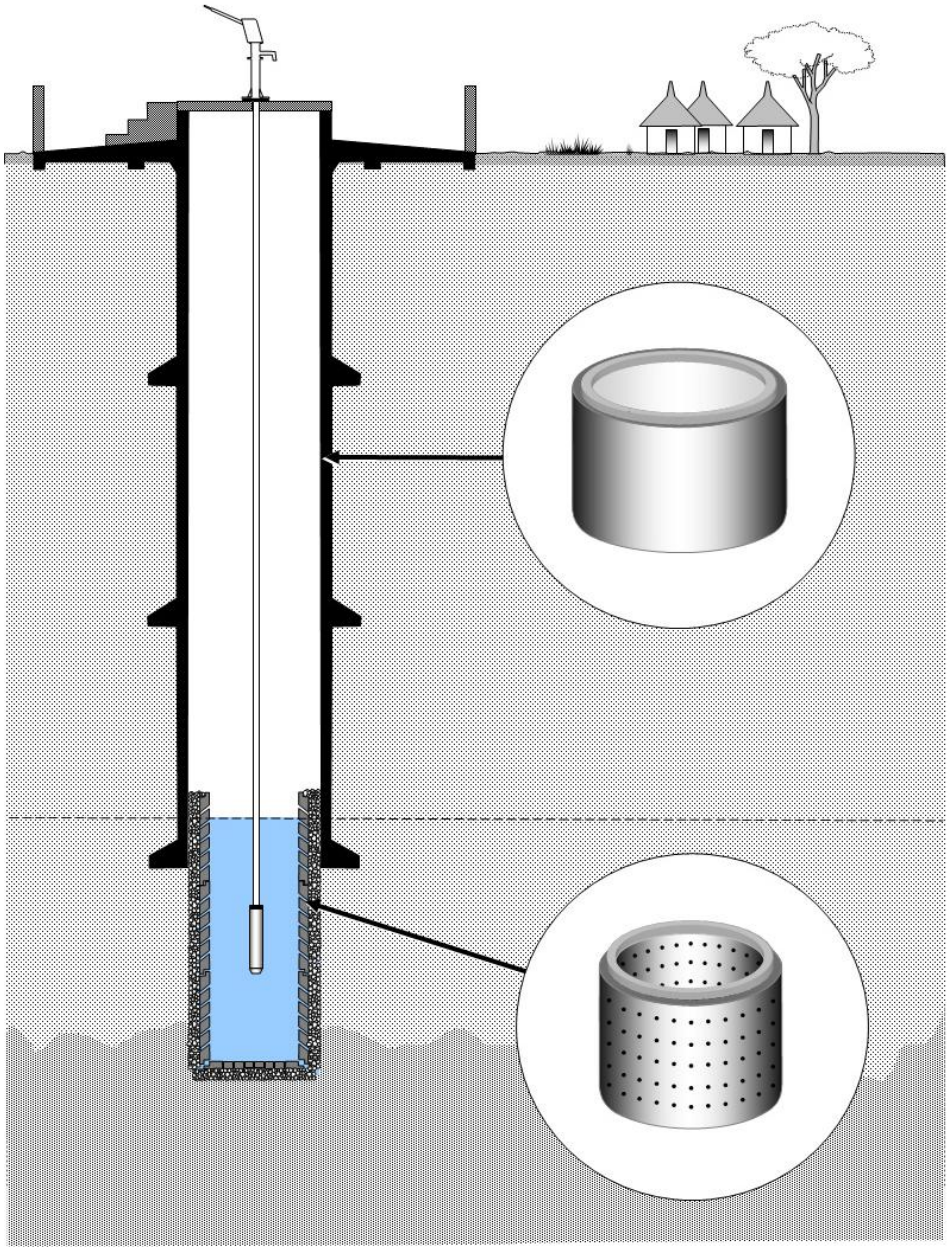

Figure 30: how water gets into the well

Two types of lining are used. In a 2-meter hand-dug well, 1.80 m diameter lining rings are used to line the hole above the water level and 1.40 m diameter perforated rings are used to line below the water level.

To hold the well lining steady, it must be anchored properly above ground and at several points inside the well shaft (usually every 10 meters).

The Superstructure

The well must be protected with:

- concrete foundations;
- a concrete apron and well head with a reinforced concrete slab on which the pump is mounted.
- a low wall/fence
- a drain to carry water to the livestock trough and soak-away pit.

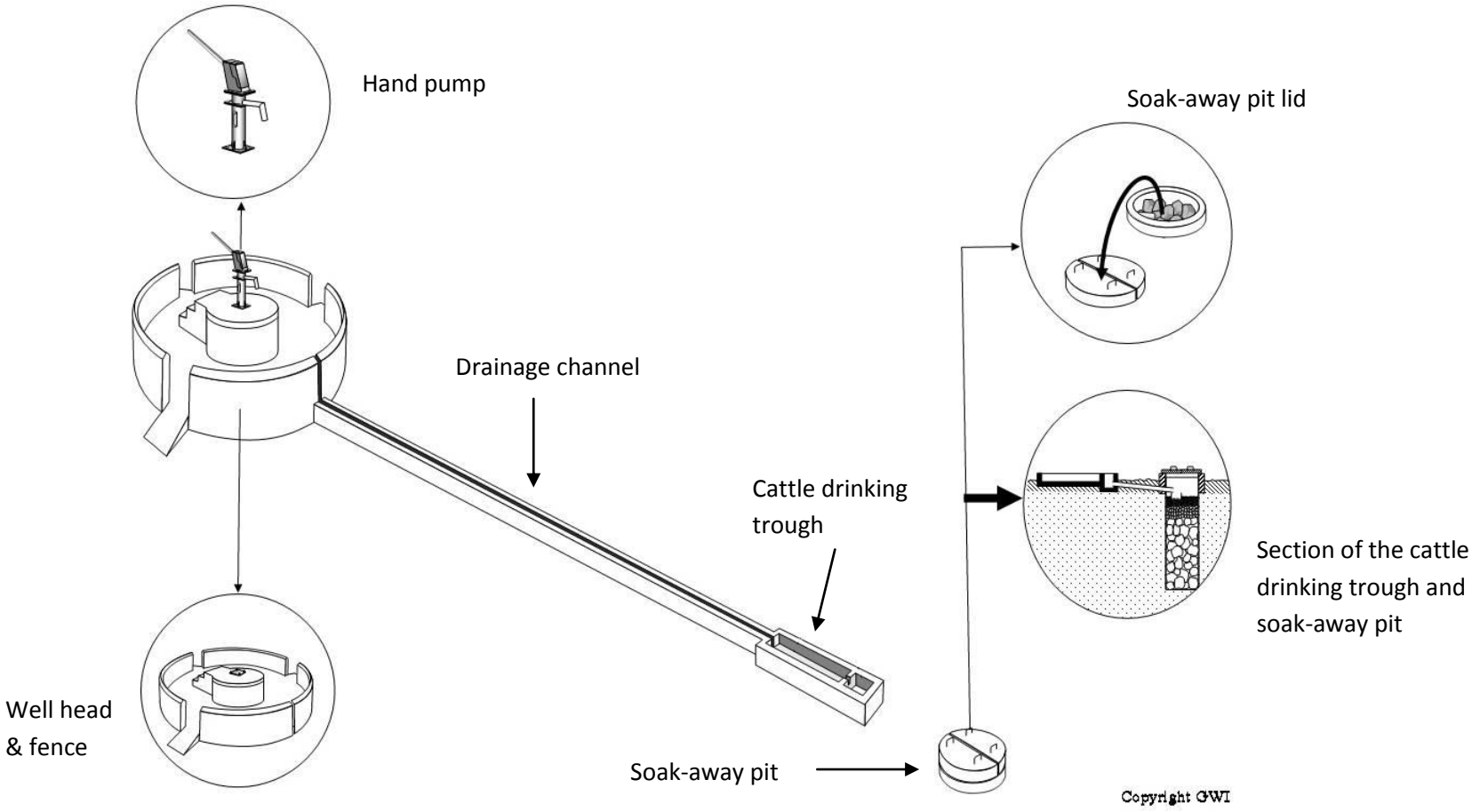

Figure 31: the superstructure design details

Selecting the hand/foot-pump

A pumping system such as a manual/foot pump allows users to draw water from the well. There are many types of pumps. The most common in West Africa are:

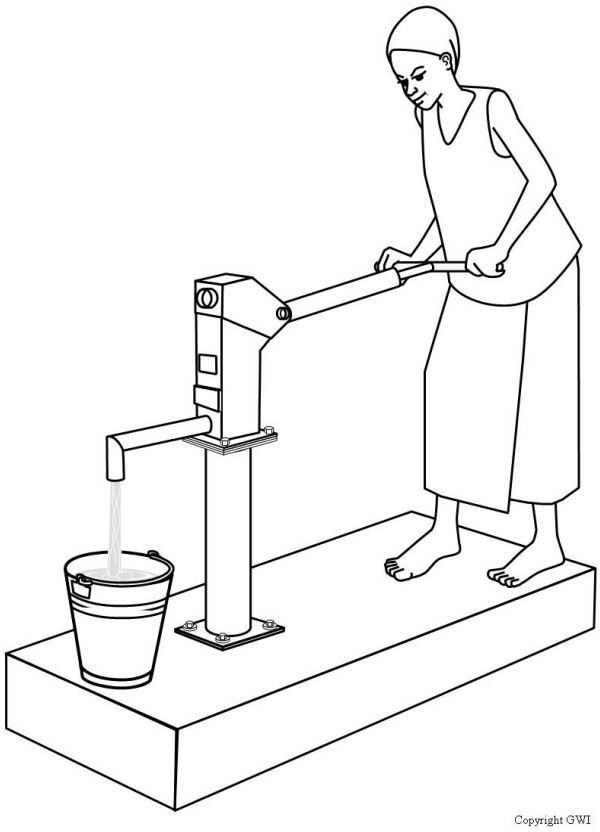

Figure 33: Afridev pump

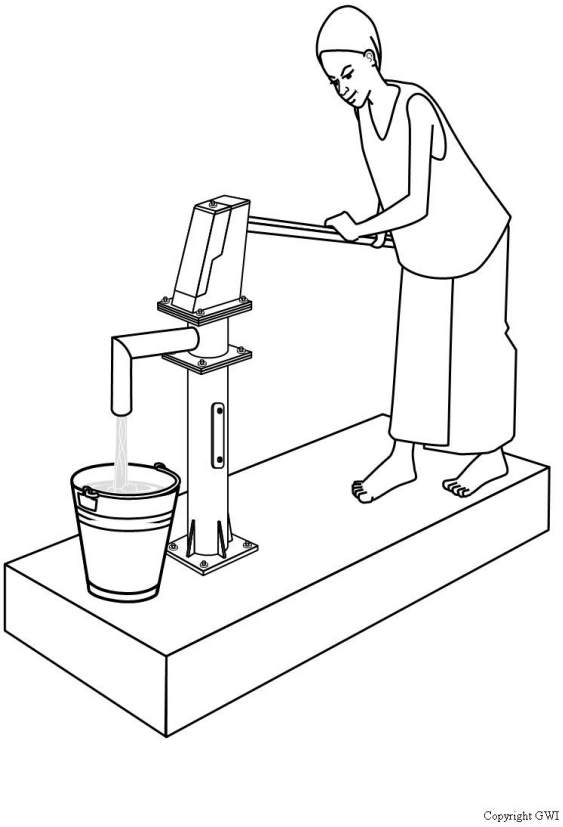

Figure 34: India Mark II pump

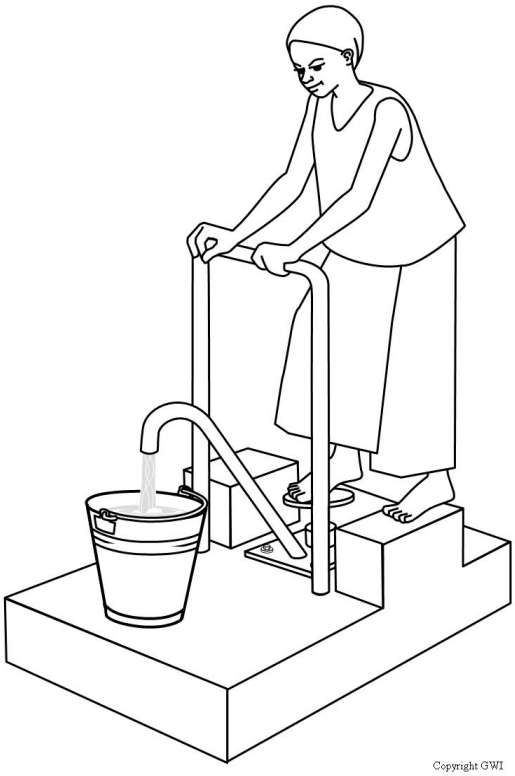

Figure 35: Vergnet pump

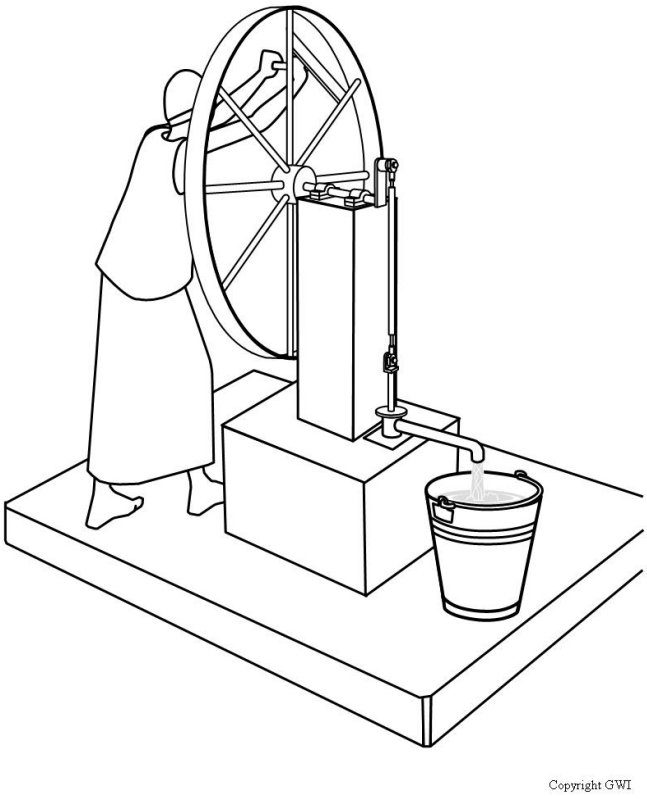

Figure 36: Volonta pump

Water Service level

Water quality

Groundwater from a hand-dug well is generally of good quality. The water comes from rainwater that is filtered through the various layers in the ground. However, though the water may be free of bacterial contamination, it can be unfit for human consumption because of naturally occurring chemical contaminants (i.e. arsenic). Sometimes the water can be polluted by harmful bacteria or harmful chemicals as a result to human activity. Laboratory tests for water quality (both chemical and bacteriological) must be done to see if the water is fit to be used as drinking water for humans.

Water Flow

The yield is the amount of water that can be taken from the well over a given period of time. It varies depending on the nature and the capacity of the groundwater that feeds it. The daily capacity of the well is assessed when it is dug and varies from one well to another.

Level of service

With a hand/foot pump, water drawing is time-consuming. Water-point users need to pump one at a time.

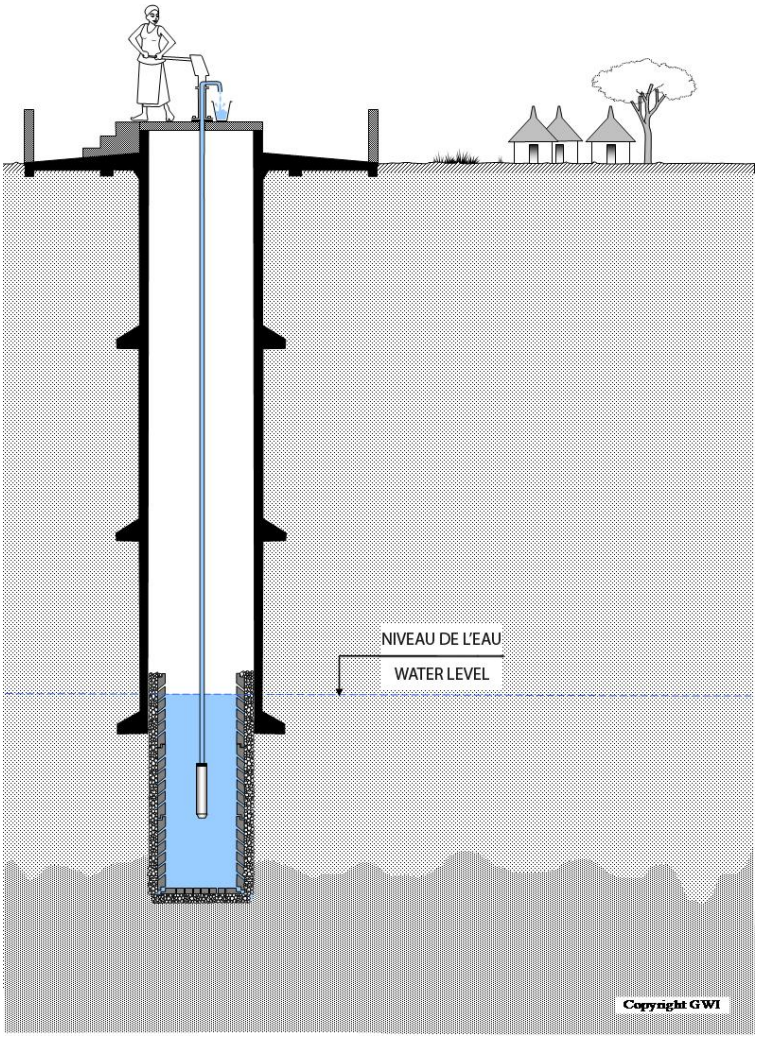

Figure 37: water drawing

These pumps are designed for domestic water (drinking, cooking, and washing, and personal hygiene). Occasionally a few animals or small vegetable gardens may also be watered.

Costs

Lined wells with hand pumps are expensive not just to build but also to look after once they are in use. We expect such a water supply to last for 15 years before it needs major rehabilitation. This 15 year cost responsibility belongs to the community.

There are three types of main costs of the well and hand/foot pump supply:

What?	How much?	When?	Who funds?
Lined hand-dug well with hand/foot pump capital expenditure. (Capital Expenditure: CapEx).	About 8,500,000 CFA ($ 17,000) in Burkina Faso for a 30 meters depth well	One off at start	External donor and community cost share
Ongoing operation and maintenance expenditure including small repairs. (Operation and Maintenance: Expenditure, OpManEx).	About 140,000 CFA ($280 US) / year in Burkina Faso for an India Mark II pump +the costs for the maintenance of the well (*)	Ongoing from day one.	Community,
Major repairs and spares replacement. (Capital maintenance expenditure: CapManEx).		From the 5th to 7th year.	Community and commune

(*)*: the maintenance of the well includes: minor repairs on the concrete rings or on the superstructure, periodic de-watering and disinfection of the well, major repairs on the superstructure, the concrete rings (porous and not porous), gravel packing, periodic technical visits of the well.*

Operation and Maintenance

A well maintained hand-dug well with pump will still need to have key parts replaced as they wear. This replacement cost is built into the “ongoing operation and maintenance expenditure” above.

Major rehabilitation can be expensive and may cost more than most communities would be able to pay for without external support.

The people skills required

Good organisation is necessary for the management of the well: Key groups are the Water Users' Association (WUA), the Water-point Management Committee (WPMC), etc.

Insuring proper operation and maintenance of the well and hand/foot pump requires the following tasks to be carried out:

From within the Community:

- Fund raising according to a specific budget (a transparent and accountable system);
- Preventative maintenance of a) the pump - day to day maintenance carried out (village pump caretakers) and b) the superstructure (village mason)
- Small masonry repairs
- Organisation of water point users and information.
- Monitoring.

From outside the community:

- Periodic de-watering and sanitization of the well
- Regular pump maintenance / spare replacement / repairs (area mechanic);
- Supply of spare parts;
- Major repairs on superstructure, well concrete lining and gravel packing;
- Deepening the well in case of a marked drop in the water table
- Technical assistance to monitor, troubleshoot, and train.

In conclusion:

It is important to make sure that the community has understood the key aspects of this technology. After you have presented the factual information above, the following questions can help guide the conversation with the community and will allow specific questions, doubts, and points of clarification to be discussed.

Q1.	:	Is water from a well with a hand/foot pump always clean?
Q2	:	If the pump breaks, can we draw water out of the well with a bucket?
Q3	:	How many people at a time can draw water?

Q4	:	What are the main elements of this system?
Q5	:	What is the community responsibility to ensure operation and maintenance of this system?
Q6.	:	How much money does the community need to collect each year to maintain this system?
Q7	:	How many households would be using this pump? So how much would each household have to pay each year? And how much each month?
Q8	:	What resources would you need from outside your village to keep this pump alive?
Q9	:	What advantages and disadvantages do you see to a well with hand/foot pump for your community?

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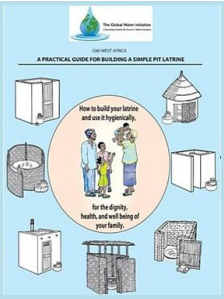
The GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation:

A practical guide for building a simple pit latrine.

ref.: 2011-01-E



Contracting for water point construction: Provisional and final acceptance forms.

ref.: 2012-04-E

Assuring Quality: an approach to building long-lasting infrastructure in West Africa.

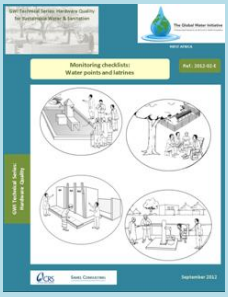
ref.: 2012-01-E

The essential steps before handing-over a borehole (with hand pump) to the community.

ref.: 2012-05-E

Monitoring checklists: water points and latrines.

ref.: 2012-02-E



Community monitoring during the construction of a gravity-fed, solar powered water supply: a training guideline.

ref.: 2012-06-E

Community monitoring of borehole construction: a training guideline.

ref.: 2012-03-E

Making the right choice: comparing your rural water technology options.

ref.: 2012-07-E

These documents are also available in French.

The main authors are Lambert Zounogo P. Nikiema (CRS), Sue Cavanna (Sahel Consulting) and Jean-Philippe Debus (CRS).

The Global Water Initiative
A Partnership Funded by the Howard G. Buffet Foundation

GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation

The Global Water Initiative

A Partnership Funded by the Howard G. Buffet Foundation

WEST AFRICA

Contracting for water point construction: Provisional and final acceptance forms.

Ref.: 2012-04-E

GWI Technical Series: Hardware Quality

CRS CATHOLIC RELIEF SERVICES

SAHEL CONSULTING

September 2012

Table of contents

About this series

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** is a Global Water Initiative tool that was developed in West Africa by Catholic Relief Services (CRS) and Sahel Consulting as a response to common difficulties in rural water & sanitation projects.

Each document in the series addresses a particular aspect of technology choice, design, build and maintenance. All these aspects are important in delivering a reliable and lasting community water/sanitation resource within an increasingly decentralised context.

We aim to influence those with the power and responsibility to get water and sanitation to the rural poor.

We also want to influence the communities themselves to become proactive and break away from their past role as passive beneficiaries.

The tools have been designed and field tested for use with communities, development workers, commune leaders and government technical services. They focus specifically on gaining an informed understanding that will lead these key decision makers to choosing the correct technology, supervising construction to assure quality, putting in place correct operation and maintenance systems, and assuring that revenue generated is adequate to keep that service going.

These tools are not a method in themselves, they presume that anyone using them is already engaged in a robust participatory process.

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** includes:

A practical guide for building a simple pit latrine	ref.: 2011-01-E
Assuring Quality: an approach to building long-lasting infrastructure in West Africa	ref.: 2012-01-E
Monitoring checklists : water points and latrines	ref.: 2012-02-E
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Please use any of the documents freely. They can be downloaded from http://www.crsprogramquality.org/publications/tag/water-manualsuser-guides.

We would be most interested to receive feedback from you on the usefulness of this material.

The series is published in French and English. If you translate the material into another language please send a copy to lambert.nikiema@crs.org, jeanphilippe.debus@crs.org, suecavanna@sahelconsulting.org.uk.

Acknowledgements

This document was developed by Lambert Zounogo P. NIKIEMA (CRS), Sue CAVANNA (Sahel Consulting), and Jean-Philippe DEBUS (CRS), the Hardware Quality team of the Global Water Initiative (GWI) in West Africa.

GWI project staff from all five GWI countries contributed ideas during the early development stages, and most importantly tested the material in the field. We are indebted to them.

The generous support and encouragement of the Howard G. Buffett Foundation has made this publication possible.

Illustrations:

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- François Xavier COULIBALY, Toussiana, Burkina Faso (illus_faso@yahoo.fr).

About the Global Water Initiative

The Global Water Initiative (GWI), supported by the Howard G. Buffett Foundation addresses the challenge of providing long term access to clean water and sanitation, as well as protecting and managing ecosystem services and watersheds, for the poorest and most vulnerable people dependent on those services. Water provision under GWI takes place in the context of securing the resource base and developing new or improved approaches to water management, and forms part of a larger framework for addressing poverty, power and inequalities that particularly affect the poorest

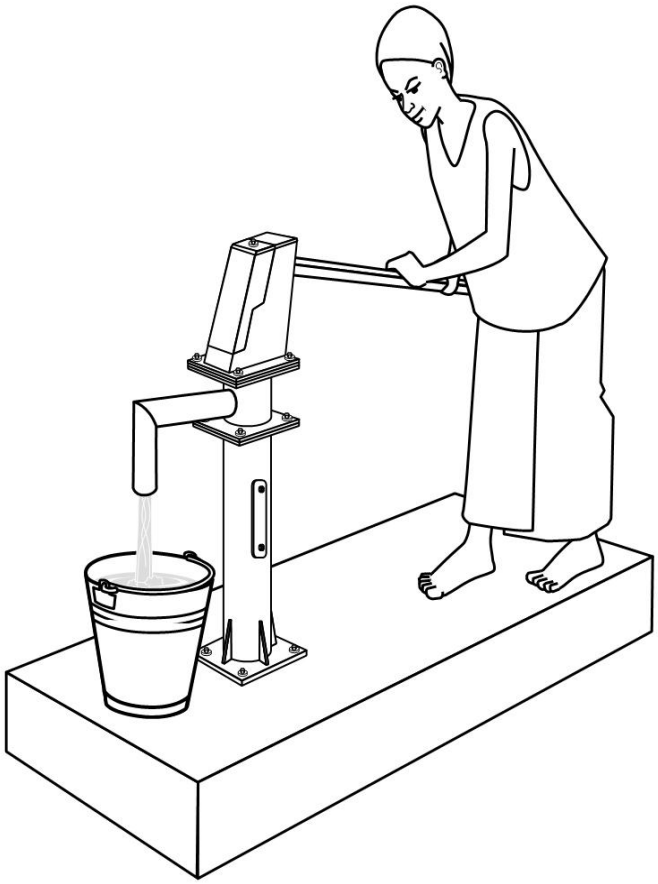
populations. This means combining a practical focus on water and sanitation delivery with investments targeted at strengthening institutions, raising awareness and developing effective policies.

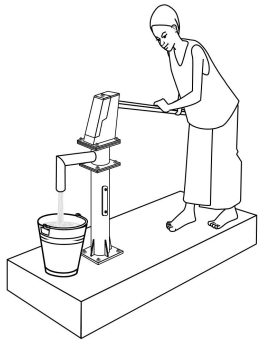
The Regional GWI consortium for West Africa includes the following partners:

- International Union for the Conservation of Nature (IUCN)
- Catholic Relief Services (CRS)
- CARE International
- SOS Sahel (UK)
- International Institute for Environment and Development (IIED).

GWI West Africa covers five countries: Burkina Faso, Ghana, Mali, Niger and Senegal. Some activities also take place around the proposed Fomi dam in Guinea. For more information on the GWI, please visit: www.globalwaterinitiative.com.

1. BOREHOLE FITTED WITH HAND/FOOT PUMP: PROVISIONAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Borehole coordinates (DMS units) : X (Long): …… °……’…… .” Y (Lat.): …… ° …… ’……”

GENERAL INFORMATION

Date of provisional acceptance: ……/……/……	Yield after full development: …… m3/h
Date borehole drilling/rehabilitation completed: ……/……/……	Date pump installed: ……/……/……
Date superstructure construction completed: ……/……/……	
Note: Attach the technical information on the borehole, on the pump acceptance and on the pump installation.	

SUPERSTRUCTURE DIMENSIONS

Concrete foundation	**Concrete apron**	**Walls**	**Drainage channel**	**Water trough**	**Soak away pit**
Length/Diam:……m	Length/Diam:……m	Length:……m	Length:……m	Length:……m	Depth:……m
Width:……m	Width:……m	Thickness:……m	Width:……m	Width:……m	Length/Diam: ……m
Height:……m	Height:……m	Height:……m	Height:……m	Height:……m	Width: ……m
			Depth:……m	Depth:……m	

INFORMATION ON THE SUPERSTRUCTURE

Have the contractual dimensions of the different parts of the infrastructure been respected?

Concrete foundation: Yes ☐ No ☐	Concrete apron: Yes ☐ No ☐	Fence/ Wall: Yes ☐ No ☐	Drainage Channel: Yes ☐ No ☐
Water trough: Yes ☐ No ☐	Soak away: Yes ☐ No ☐	Settling tank: Yes ☐ No ☐	Yes ☐ No ☐

STATE OF THE SUPERSTRUCTURE

Test the resistance of the concrete: with a hammer give 2 little blows on the different parts of the superstructure and see how it responds.

Concrete foundation:	Good state ☐	Cracked ☐	Big cracks ☐	Other: .....
Concrete aprons:	Good state ☐	Cracked ☐	Big cracks ☐	Other: .....
Wall:	Good state ☐	Cracked ☐	Big cracks ☐	Other: .....
Channel:	Good state ☐	Cracked ☐	Big cracks ☐	Other: .....
Water trough:	Good state ☐	Cracked ☐	Big cracks ☐	Other: .....
Soak-away pit:	Good state ☐	Cracked ☐	Big cracks ☐	Other: .....
Cover slabs:	Good state ☐	Cracked ☐	Big cracks ☐	Other: .....

Other comments:

.....

.....

INFORMATION ON THE PUMP

Pump Make and Model: ……..……	Pump serial N°: ……	Date of installation: ……../……../……
Depth of installation: ……m	General appearance of the pump: ……	
Pump fixing: Good ☐ Unsteady ☐ Bad ☐ Other comments: ……		
Leakage test (to be conduct after stopping the pump for 30 minutes):		
The water comes out after ……pump strokes	Is there leaking? Yes ☐ No ☐	
Yield test: Begin the yield test after the pump has been in use continuously. Give pump strokes during approximately 1 minute (approximately 40 pump strokes) while collecting the water in a bucket. Quantity of water collected >10 liters? Yes ☐ No ☐		

Ask to the users if the pump has broken down since it was installed? Yes ☐ No ☐
Number of breakdowns?: …….. Nature of breakdowns?: ……..

WATER QUALITY

Water quality: Clear ☐ Turbid ☐ Presence of particles ☐ Presence of odour ☐
Control of sand content: Pump 10 litres of water in a bucket (the volume of the bucket should be higher than 10 litres), give a rotation movement (with one hand) to the water until you obtain a Vortex. Let the water stabilize in the bucket and measure the diameter of sand patch in the bucket (It must not exceed 1 cm). Diameter of sand patch > 1 cm? Yes ☐ No ☐
Other comments: ……

VERIFICATION OF THE EXISTENCE OF PARTIALS PROVISIONAL ACCEPTANCES OR TECHNICAL DOCUMENTS

Are the partials provisional acceptances documents or the technical documents of the different elements mentioned below available?

		Observations			Observations
Borehole :	Yes ☐ No ☐		**Hand pump:**	Yes ☐ No ☐	
water quality analysis by a laboratory:	Yes ☐ No ☐		**Yield testing data and interpretation:**	Yes ☐ No ☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

……

……

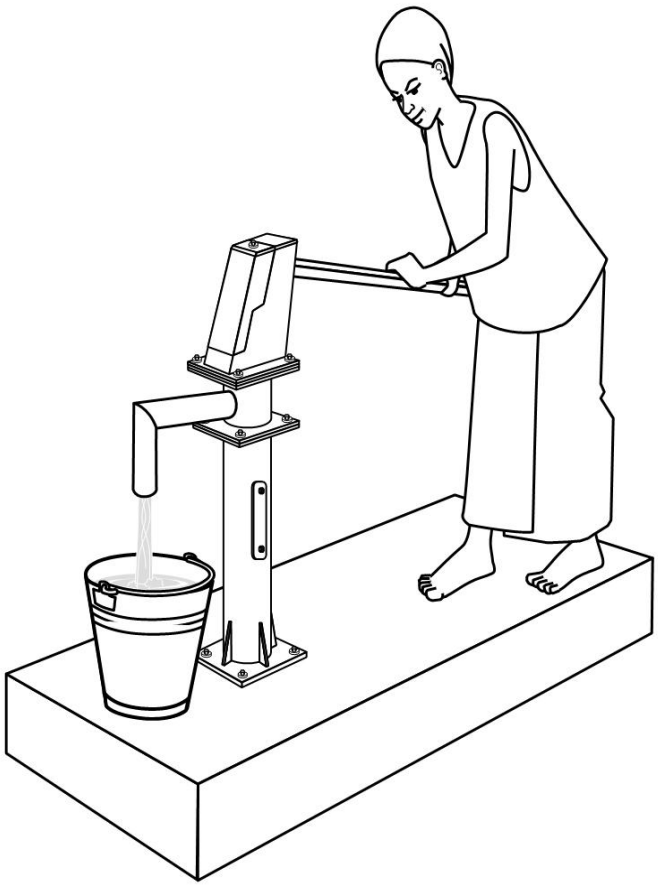
……

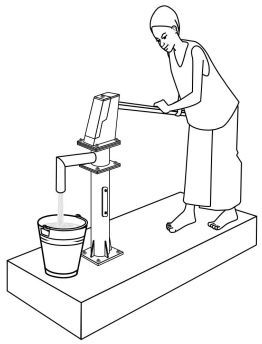
……

NAMES & SIGNATURES

For Contractor	For the Consultant	For Water Management Committee/Community	For the project	For Water services	For the Commune
_____	_____	_____	_____	_____	_____

2. BOREHOLE FITTED WITH HAND/FOOT PUMP: FINAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Borehole coordinates (DMS units) : X (Long): …… °……’…… .” Y (Lat.): …… ° …… ’……”

GENERAL INFORMATION

Date of final completion:……/……/……	Water level in the borehole at the final completion: ……m/ground
Date of provisional acceptance: ……/……/……	
Note: Attach a copy of the provisional acceptance and copies of technical information on the borehole and the hand pump.	

STATE OF THE SUPERSTRUCTURE

Test the resistance of the concrete: with a hammer give 2 little blows on the different parts of the superstructure and see how it responds.

Concrete foundation:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……
Concrete aprons:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……
Wall:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……
Channel:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……
Water trough:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……
Soak-away pit:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……
Cover slab:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……

Other comments:

……

……

INFORMATION ON THE PUMP

Pump Make and Model: ……	Pump serial N°: ……	Date of the provisional acceptance: ……/……/……
General appearance of the pump: ……		
Pump fixing: Good ☐ Bad ☐ Unsteady ☐ Other comments: ……		
Leakage test (to be conduct after stopping the pump for 30 minutes):		
The water comes out after ……pump strokes	Is there leaking? Yes ☐ No ☐	
Yield test: Begin the yield test after the pump has been in use continuously. Give pump strokes during approximately 1 minute (approximately 40 pump strokes) while collecting the water in a bucket. Quantity of water collected >10 liters? Yes ☐ No ☐		

Ask users if the pump has broken down since the provisional acceptance? Yes ☐ No ☐
Number of breakdowns?: …… Nature of breakdowns?: ……

WATER QUALITY

Water quality: Clear ☐ Turbid ☐ Presence of particles ☐ Presence of odour ☐
Control of sand content: Pump 10 litres of water in a bucket (the volume of the bucket should be higher than 10 litres), give a rotation movement (with one hand) to the water until you obtain a Vortex. Let the water stabilize in the bucket and measure the diameter of sand patch in the bucket (It must not exceed 1 cm). Diameter of sand patch > 1 cm? Yes ☐ No ☐
Other comments: ……

VERIFICATION OF THE EXISTENCE OF PROVISIONAL ACCEPTANCE OR TECHNICAL DOCUMENTS

Are the provisional acceptance documents or the technical documents of the different elements mentioned below available?

		Observations			Observations
Borehole :	Yes ☐ No ☐		**Hand pump:**	Yes ☐ No ☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

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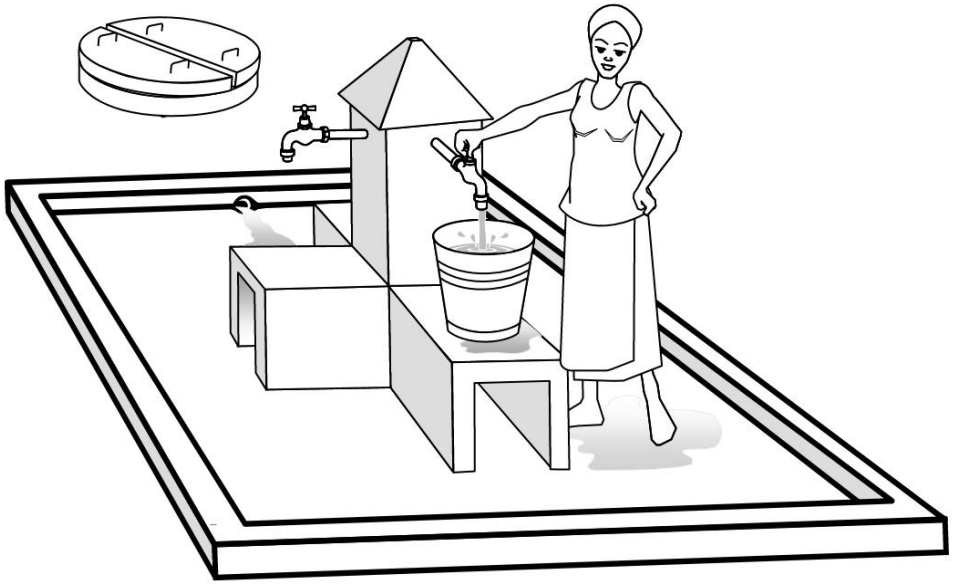
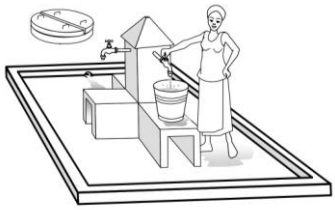
NAMES & SIGNATURES

For Contractor	**For the Consultant**	**For Water Management Committee/Community**	**For the project**	**For Water services**	**For the Commune**
_____	_____	_____	_____	_____	_____

3. BOREHOLE AND GRAVITY DISTRIBUTION WITH SUBMERSIBLE PUMP POWERED BY SOLAR ENERGY: PROVISIONAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Borehole coordinates (DMS units) : X (Long): …… °……’…… .” Y (Lat.): …… ° …… ’……”

GENERAL INFORMATION

Date of provisional acceptance: ……/……/……	
Date of borehole drilling/rehabilitation completed: ……/……/……	Yield after full development: …… m3/h
Date of piped water network construction completion: ……/……/……	Average flow through operating: ……
Note: Attach copies of each technical acceptance made (borehole, solar generator, electric pump, inverter, water tower, water network, etc.)	

BOREHOLE & PLATFORM

Water level in the borehole : ……m/sol Concrete apron characteristics: Length/diam…… Width …… Height ……	Is the borehole protected against seepage of surface water? Yes ☐ No ☐

State of the concrete foundation :

Good ☐ Cracked ☐ Big cracks ☐ Other: ……

State of the water meter on the borehole:

Good?	Yes ☐ No ☐	New?	Yes ☐ No ☐	Functioning correctly?	Yes ☐ No ☐		

SOLAR GENERATOR

Solar panels

Do the solar panels meet the specified characteristics in the design documents?	Yes ☐ No ☐	Is the number of the solar panels as specified in the design and contract documents?	Yes ☐ No ☐	Are the solar panels new?	Yes ☐ No ☐
Are the solar panels in a good state (no breaks, no visible damage)?	Yes ☐ No ☐	Is the inclination of the solar panels correct?	Yes ☐ No ☐		

Solar panel wiring

Are the wires (type, section) in accordance with those specified?	Yes ☐ No ☐	Are the wire connections well-made and all within connection boxes?	Yes ☐ No ☐
Are the wire connections well tightened? (pull some wires at random)	Yes ☐ No ☐	Is the "earthing" in place and has it been connected well?	Yes ☐ No ☐

Solar panel stands

Are the stands in accordance with those specified in the design and contract (type of material)?	Yes ☐ No ☐	Are the stands protected against corrosion?	Yes ☐ No ☐

Are the stands vertical?	Yes ☐ No ☐	Are the stands well aligned?	Yes ☐ No ☐	Are the stands well fixed? (test by shaking)	Yes ☐ No ☐
Are the foundations for the solar panel stands of the correct dimensions?	Yes ☐ No ☐	Are the concrete foundations for the stands of good quality?	Yes ☐ No ☐		

Solar panel enclosure

Is the fencing material in accordance with the material specified in the design?	Yes ☐ No ☐	Is the gauge of the wire mesh fencing in accordance with that specified in the design?	Yes ☐ No ☐
Is the height of the fencing in accordance with the height specified in the design?	Yes ☐ No ☐	Are the foundation dimensions of the stand post for the fencing correct?	Yes ☐ No ☐

Are the stand-posts of the fencing well fixed in concrete?	Yes ☐ No ☐	Are the concrete foundations of the stands of good quality?	Yes ☐ No ☐
Is the lock /padlock of the fencing enclosure being used?	Yes ☐ No ☐	Is the lock or the padlock of the fencing enclosure of the specified quality?	Yes ☐ No ☐

INVERTER AND SUBMERSIBLE ELECTRIC PUMP

Does the pump yield as much as the expected yield in the design specifications (measure the yield using the water meter on the borehole platform)?	Yes ☐ No ☐				
Does the inverter have the characteristics specified in the design?	Yes ☐ No ☐	Is the inverter working?	Yes ☐ No ☐	Is the inverter properly fixed in place?	Yes ☐ No ☐

ELEVATED WATER TANK

Water tank volume: ……m3 Height under the tank: ……..m

Is the tank capacity as specified?	Yes ☐ No ☐	Is the height under the tank in accordance with the specified height?	Yes ☐ No ☐
Is there a washout pipe?	Yes ☐ No ☐	Is there an overflow pipe?	Yes ☐ No ☐
Are the washout and the distribution valves working and in a good state?	Yes ☐ No ☐	Does the water tank have a good coat of paint (if it is made of metal)?	Yes ☐ No ☐
Does the water tank have any leaks?	Yes ☐ No ☐	Is the concrete foundation for the water tank stand of good quality?	Yes ☐ No ☐

PUBLIC STAND-POSTS

What is the total number of public stand-posts in the gravity system? : ……

Is the number of public stand-post constructed in accordance with the number in the design?	Yes ☐ No ☐	Have the stand-posts been built where they were actually designed to be built?	Yes ☐ No ☐
Are the designs of the public stand-posts and of the other parts in accordance with the plans?	Yes ☐ No ☐	Are the dimensions of the different parts in the designs respected in what was actually built?	Yes ☐ No ☐
Are all the water meters new?	Yes ☐ No ☐	Are all the water meters working well?	Yes ☐ No ☐
Are all the taps new?	Yes ☐ No ☐	Are all the taps working well?	Yes ☐ No ☐

STATE OF THE PUBLIC STAND-POSTS

<u>Test the resistance of the concrete</u>: with a hammer give 2 little blows on the different parts of the superstructure and see how it reacts

Taps:	No leaks ☐	Leaks ☐	Other: ……				
Water meters:	No leaks ☐	Leaks ☐	Other: ……				
Tap plinths:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……			
Concrete aprons:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……			
Drainage channels:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……			
Soak-away:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……			
Soak-away concrete slab:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……			
Inspection chamber:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……			
Inspection chamber slab:	Good state ☐	Cracked ☐	Big cracks ☐	Other: ……			

<u>Other comments</u>:

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WATER DELIVERY AND DISTRIBUTION NETWORK

Has the trenching for the pipes been correctly back- filled? Yes ☐ No ☐	Are there any leaks in the network? Yes ☐ No ☐
Are there marker posts at acceptable intervals showing where the pipe-lines are laid? Yes ☐ No ☐	Other comments: .....

WATER QUALITY

Water quality:	Clear ☐	Turbid ☐	Presence of particles ☐	Presence of odour ☐
Other comments:				

VERIFICATION OF THE EXISTENCE OF PARTIALS PROVISIONAL ACCEPTANCES OR TECHNICAL DOCUMENTS

Are the partials provisional acceptances documents or the technical documents of the different elements of the system mentioned below been shown?

		Observations			Observations
Borehole :	Yes ☐ No ☐		**Solar generator:**	Yes ☐ No ☐	
Electric pump:	Yes ☐ No ☐		**Inverter:**	Yes ☐ No ☐	
Water tower:	Yes ☐ No ☐		**Distribution network :**	Yes ☐ No ☐	
Water quality analysis by a laboratory:	Yes ☐ No ☐		**Yield testing data and interpretation:**	Yes ☐ No ☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

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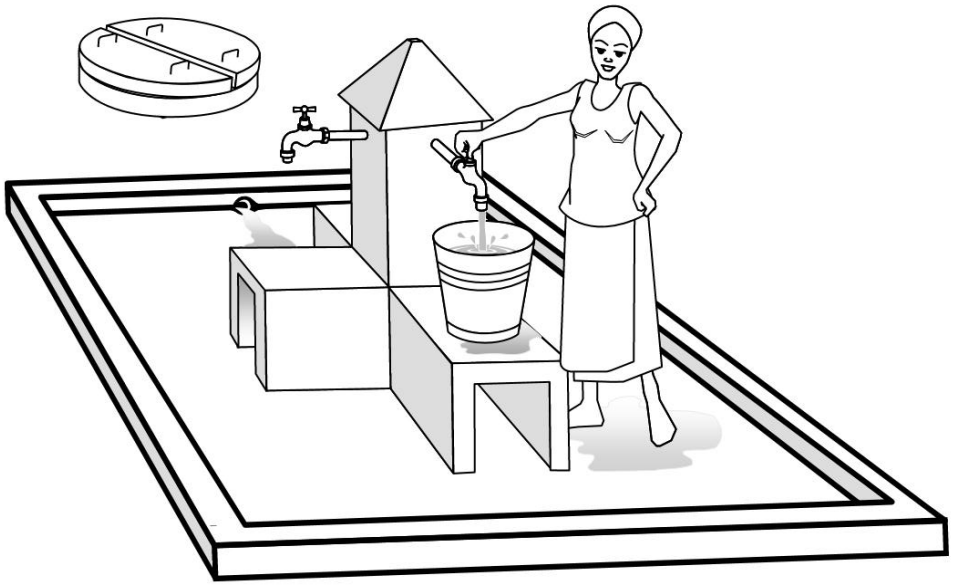
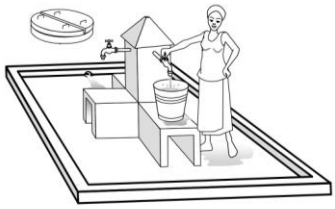
NAMES & SIGNATURES

For Contractor	For the Consultant	For Water Management Committee/Community	For the project	For Water services	For the Commune
_____	_____	_____	_____	_____	_____

4. BOREHOLE AND GRAVITY DISTRIBUTION WITH SUBMERSIBLE PUMP POWERED BY SOLAR ENERGY: FINAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Borehole coordinates (DMS units) : X (Long): …… °……’…… .’’ Y (Lat.): …… ° …… ’……’’

GENERAL INFORMATION

Date of final completion:……/……/……	Water level in the borehole at the final completion: ……m/ground
Date of provisional acceptance: ……/……/……	
Note: Attach a copy of the provisional acceptance, copies of technical information on the system, and a copy of the final acceptance of the solar generator.	

STATE OF THE BOREHOLE PLATFORM

Concrete foundation	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Water meter on the borehole	Working	☐	Not working	☐	Other: ……		

Other comments: ……

……

STATE OF THE SOLAR GENERATOR

Solar panels/ cells:	Normal working	☐	Failure	☐	Other: ……		
Solar panel wires:	Good state	☐	impaired	☐	Other: ……		

Other comments: ……

……

STATE OF THE SOLAR PANELS STANDS AND OF THE ENCLOSURE

Foundations of the solar panel stands:	Good state ☐	Cracked ☐	Other: ……
Foundations of the fencing stand-posts:	Good state ☐	Cracked ☐	Other: ……

Other comments: ……

……

STATE OF THE INVERTER AND OF THE SUBMERSIBLE ELECTRIC PUMP

Does the pump yield as much as the expected yield in the design specifications? Yes ☐ No ☐
(measure the yield using the water meter on the borehole platform)

Is the Inverter working? Working ☐ Not working ☐ Other: ……

Other comments: ……

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STATE OF THE ELEVATED WATER TANK

Concrete of the platform:	Good state ☐	Cracked ☐	Other: ……
Pipes:	Leaks ☐	No leak ☐	Other: ……
Tank:	Leaks ☐	No leak ☐	Other: ……
Valves:	Working ☐	Not working ☐	Other: ……
Tank interior paint:	Good state ☐	Deteriorated ☐	Other: ……
Tank exterior and other parts paint:	Good state ☐	Deteriorated ☐	Other: ……

Other comments: ……

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STATE OF THE PUBLIC STAND-POSTS

Taps:	No leaks ☐		Leaks ☐		Other: ……			
Water meters:	No leaks ☐		Leaks ☐		Other: ……			
Tap plinths:	Good state ☐		Cracked ☐		Big cracks ☐		Other: ……	
Concrete aprons:	Good state ☐		Cracked ☐		Big cracks ☐		Other: ……	
Drainage channels:	Good state ☐		Cracked ☐		Big cracks ☐		Other: ……	
Soak-away:	Good state ☐		Cracked ☐		Big cracks ☐		Other: ……	
Soak-away concrete slab:	Good state ☐		Cracked ☐		Big cracks ☐		Other: ……	
Inspection chamber:	Good state ☐		Cracked ☐		Big cracks ☐		Other: ……	
Inspection chamber slab:	Good state ☐		Cracked ☐		Big cracks ☐		Other: ……	

Other comments:

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STATE OF THE WATER DISTRIBUTING NETWORK

State of pipe distribution network : Leaking ☐ No leaks ☐ Other: ……

Other comments: ……

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WATER QUALITY

Water quality:	Clear ☐	Turbid ☐	Presence of particles ☐	Presence of odour ☐
Other comments: ……				

VERIFICATION OF THE EXISTENCE OF PROVISIONAL ACCEPTANCE DOCUMENTS

Are copy of provisional acceptance and other technical documents been shown?

		Observations			Observations
Borehole final acceptance:	Yes ☐ No ☐		**Solar generator final acceptance:**	Yes ☐ No ☐	
Electric pump final acceptance:	Yes ☐ No ☐		**Inverter final acceptance:**	Yes ☐ No ☐	
Water tower final acceptance:	Yes ☐ No ☐		**Distribution network final acceptance:**	Yes ☐ No ☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

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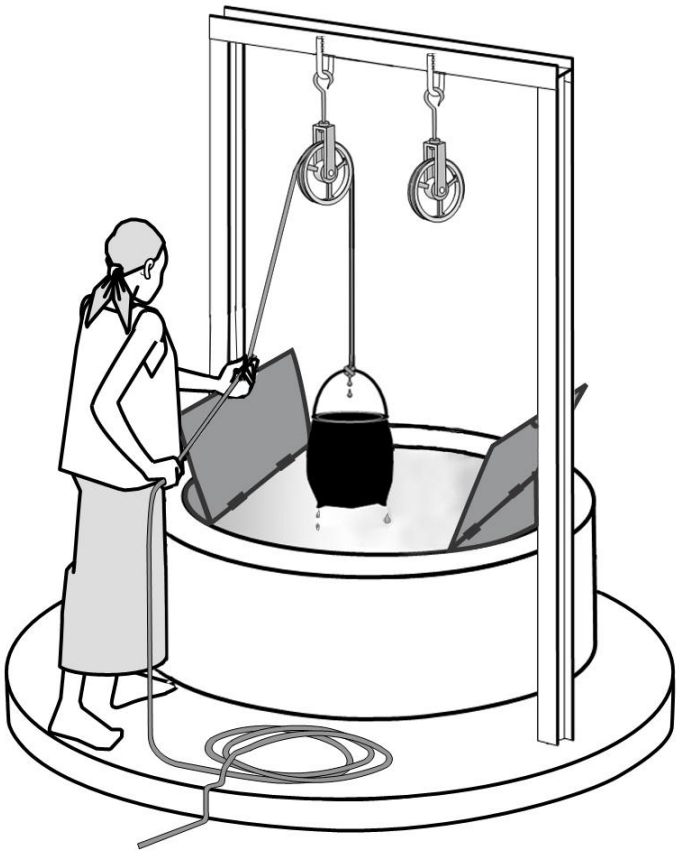
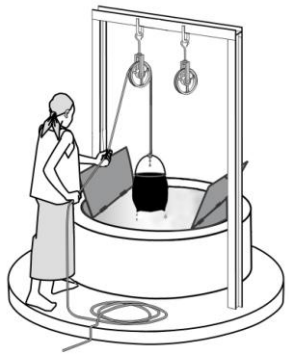
NAMES & SIGNATURES

For Contractor	For the Consultant	For Water Management Committee/Community	For the project	For Water services	For the Commune
_____	_____	_____	_____	_____	_____

5. IMPROVED HAND-DUG WELL WITH PULLEYS: PROVISIONAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Well coordinates (DMS units) : X (Long): …… °……’…… .” Y (Lat.): …… ° …… ’……”

GENERAL INFORMATION

Date of provisional acceptance: ……/……/……	Daily volume usable: ……m3/h
Date well construction completed: ……/……/……	
Date superstructure construction completed: ……/……/……	
Note: attach the technical information sheet on this well, including the superstructure plans.	

STATE OF THE WELL AT THE PROVISIONAL ACCEPTANCE

Total depth of the well : ……m	Water level: ……m/ground
Depth of the top of the perforated concrete part of the well lining : ……m/ground	

SUPERSTRUCTURE DIMENSIONS

Headwork	**Concrete apron**	**Fencing Walls**	**Drainage channel**	**Water trough**	**Soak away pit**
Length/Diam:…..m	Length/Diam:……m	Length:……m	Length:……m	Length:……m	Length/Diam: ……m
Width:……m	Width:……m	Thickness:……m	Width:……m	Width:……m	Width: ……m
Height:……m	Height:……m	Height:……m	Height:……m	Height:……m	Depth:……m
			Depth:……m	Depth:……m	Subfoundation
				Thickness:……m	Height:……m

INFORMATION ON THE HEADWORKS, THE CONCRETE RINGS, AND THE POROUS CONCRETE RINGS

Have the contractual dimensions of the different parts been respected?

Height of the headworks	Yes ☐ No ☐	**Thickness of the headworks**	Yes ☐ No ☐	**Diameter of the concrete ring**	Yes ☐ No ☐	**Height of the concrete ring**	Yes ☐ No ☐
Thickness of the concrete ring	Yes ☐ No ☐	**Diameter of the porous concrete ring**	Yes ☐ No ☐	**Height of the porous concrete ring**	Yes ☐ No ☐	**Thickness of the porous concrete ring**	Yes ☐ No ☐

STATE OF THE HEADWORKS, CONCRETE RINGS AND POROUS CONCRETE RINGS

Headworks:	Good ☐	Cracked ☐	Big cracks ☐	Other: .....
Concrete ring:	Good ☐	Cracked ☐	Big cracks ☐	Other: .....
Porous concrete ring:	Good ☐	Cracked ☐	Big cracks ☐	Other: .....

Other comments: .....

.....

INFORMATION ON THE SUPERSTRUCTURE

Have the contractual dimensions of the different parts of the infrastructure been respected?

Entrance	Yes ☐ No ☐	**Concrete apron**	Yes ☐ No ☐	**Fence/ Wall**	Yes ☐ No ☐	**Drainage Channel**	Yes ☐ No ☐	**Water trough**	Yes ☐ No ☐
Soakaway	Yes ☐ No ☐	**Inspection chamber**	Yes ☐ No ☐	**Does the well have a cover?**		Yes ☐ No ☐			

STATE OF THE SUPERSTRUCTURE

Test the resistance of the concrete: with a hammer give 2 little blows on the different parts of the superstructure and see how it responds.

Concrete apron:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Fencing wall:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Drainage channel:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Water trough:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Slab cover for soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Inspection chamber concrete:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Inspection chamber cover slab:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Well cover:	Good	☐	Bad state	☐	Other: ……		

Other comments: ……

……

WATER LIFTING DEVICE

Is there a water lifting frame?	Yes	☐	Are the characteristics of the material (type, thickness ...) of the water lifting frame in accordance with the specified characteristics?	Yes	☐
	No	☐		No	☐
Is the water lifting frame well protected (e.g. with a good layer of paint)?	Yes	☐	Are the dimensions of the water lifting frame in accordance with the specified dimensions?	Yes	☐
	No	☐		No	☐
Is the water lifting frame well fixed?	Yes	☐	Are the characteristics of the material of the pulleys in accordance with the specified characteristics?	Yes	☐
	No	☐		No	☐
Is the number of pulleys in accordance with the number requested?	Yes	☐	Other comments: ……		
	No	☐			

WATER QUALITY

Water quality: .....Clear	☐	Turbid	☐	Presence of particles	☐	Presence of odour	☐
Other comments:							

VERIFICATION OF THE EXISTENCE OF PARTIALS PROVISIONAL ACCEPTANCES OR TECHNICAL DOCUMENTS

Are the partials provisional acceptances documents or the technical documents of the different elements mentioned below available?

			Observations				Observations
Well :	Yes	☐		**Water lifting frame:**	Yes	☐	
	No	☐			No	☐	
water quality analysis by a laboratory:	Yes	☐		**Yield testing data and interpretation:**	Yes	☐	
	No	☐			No	☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

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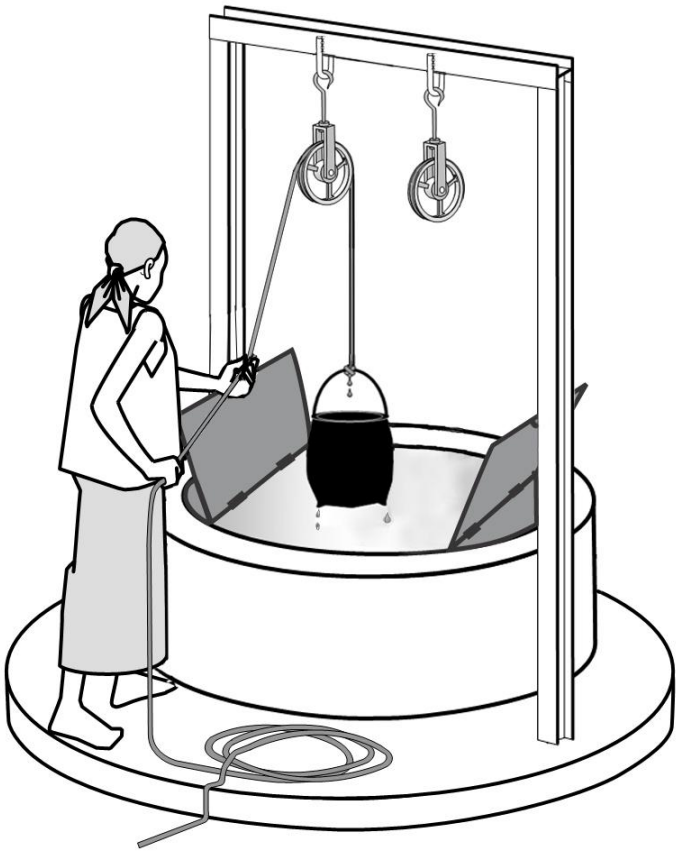
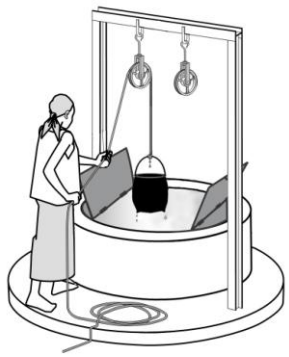
NAMES & SIGNATURES

For Contractor	**For the Consultant**	**For Water Management Committee/Community**	**For the project**	**For Water services**	**For the Commune**
_____	_____	_____	_____	_____	_____

6. IMPROVED HAND-DUG WELL WITH PULLEYS: FINAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Well coordinates (DMS units) : X (Long): …… °……’…… .’’ Y (Lat.): …… ° …… ’……’’

GENERAL INFORMATION

Date of final completion:……/……/……	Water rest level at the final completion:……m/ground
Date of provisional acceptance: ……/……/……	**Note: Attach a copy of the provisional acceptance document and technical information sheet on this well.**

STATE OF THE CONCRETE RINGS, THE POROUS CONCRETE RINGS, THE HEADWORKS AND THE SUPERSTRUCTURE

Concrete ring:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Porous concrete ring:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Headworks:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Concrete apron:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Fencing wall:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Drainage channel:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Water trough:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Slab cover for soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Inspection chamber concrete:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Inspection chamber cover slab:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Well cover:	Good	☐	Bad	☐	Other: ……		

Other comments: .....

.....

STATE OF THE WATER LIFTING DEVICE

State of the lifting frame:	Good ☐		Broken ☐	
Lifting frame fixing:	Strong ☐		Unsteady or out of place ☐	

Other comments:

.....

.....

WATER QUALITY

Water quality: .....Clear ☐	Turbid ☐	Presence of particles ☐	Presence of odour ☐
Other comments:			

VERIFICATION OF THE EXISTENCE OF PROVISIONAL ACCEPTANCE OR TECHNICAL DOCUMENTS

Are the provisional acceptance documents or the technical documents of the different elements mentioned below available?

		Observations			Observations
Well :	Yes ☐ No ☐		**Superstructure and water lifting frame:**	Yes ☐ No ☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

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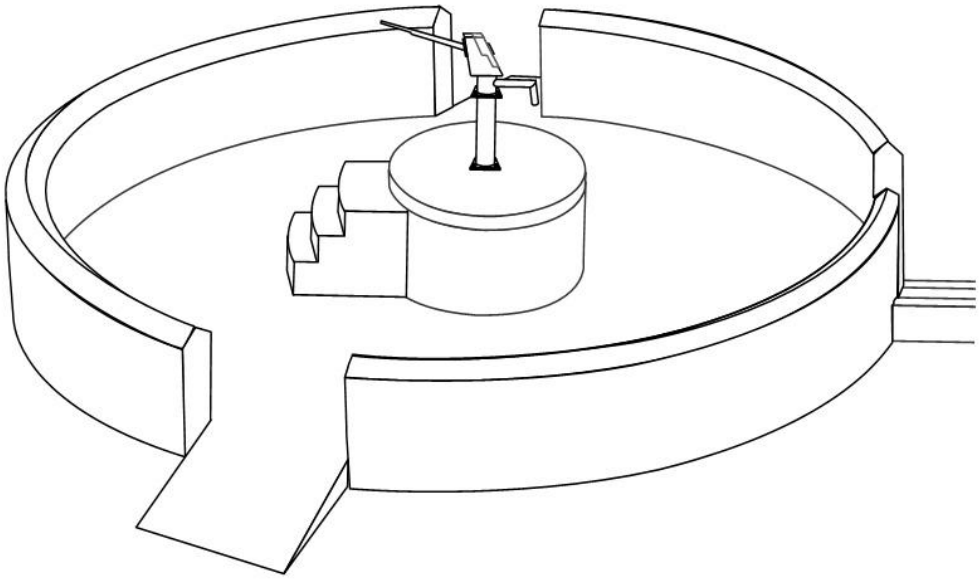
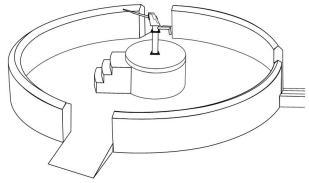
NAMES & SIGNATURES

For Contractor	For the Consultant	For Water Management Committee/Community	For the project	For Water services	For the Commune
_____	_____	_____	_____	_____	_____

7. IMPROVED HAND-DUG WELL WITH HAND/FOOT PUMP: PROVISIONAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Well coordinates (DMS units) : X (Long): …… °……’…… .” Y (Lat.): …… ° …… ’……”

GENERAL INFORMATION

Date of provisional acceptance: ……/……/……	Daily volume usable: ……m3/h
Date well construction completed: ……/……/……	Date pump installed: ……/……/……
Date superstructure construction completed: ……/……/……	
Note: attach the technical information sheet on this well, including the superstructure plans and the pump installation form.	

STATE OF THE WELL AT THE PROVISIONAL ACCEPTANCE

Total depth of the well : ……m	Water rest level: ……m/ground
Depth of the top of the perforated concrete part of the well lining : ……m/ground	

SUPERSTRUCTURE DIMENSIONS

Headwork	**Concrete apron**	**Fencing Walls**	**Drainage channel**	**Water trough**	**Soak away pit**
Length/Diam:…..m	Length/Diam:……m	Length:……m	Length:……m	Length:……m	Length/Diam: ……m
Width:……m	Width:……m	Thickness:……m	Width:……m	Width:……m	Width: ……m
Height:……m	Height:……m	Height:……m	Height:……m	Height:……m	Depth:……m
			Depth:……m	Depth:……m	Subfoundation
				Thickness:……m	Height:……m

INFORMATION ON THE HEADWORKS, THE CONCRETE RINGS, AND THE POROUS CONCRETE RINGS

Have the contractual dimensions of the different parts been respected?

Height of the headworks	Yes ☐ No ☐	**Thickness of the headworks**	Yes ☐ No ☐	**Diameter of the concrete ring**	Yes ☐ No ☐	**Height of the concrete ring**	Yes ☐ No ☐
Thickness of the concrete ring	Yes ☐ No ☐	**Diameter of the porous concrete ring**	Yes ☐ No ☐	**Height of the porous concrete ring**	Yes ☐ No ☐	**Thickness of the porous concrete ring**	Yes ☐ No ☐

STATE OF THE HEADWORKS, CONCRETE RINGS AND POROUS CONCRETE RINGS

Headworks:	Good ☐	Cracked ☐	Big cracks ☐	Other: .....
Concrete ring:	Good ☐	Cracked ☐	Big cracks ☐	Other: .....
Porous concrete ring:	Good ☐	Cracked ☐	Big cracks ☐	Other: .....

Other comments: .....

.....

INFORMATION ON THE SUPERSTRUCTURE

Have the contractual dimensions of the different parts of the infrastructure been respected?

Entrance	Yes ☐ No ☐	**Concrete apron**	Yes ☐ No ☐	**Fence/ Wall**	Yes ☐ No ☐	**Drainage Channel**	Yes ☐ No ☐	**Water trough**	Yes ☐ No ☐
Soakaway	Yes ☐ No ☐	**Inspection chamber**	Yes ☐ No ☐	**Does the well have a cover?**			Yes ☐ No ☐		

STATE OF THE SUPERSTRUCTURE

Test the resistance of the concrete: with a hammer give 2 little blows on the different parts of the superstructure and see how it responds.

Concrete apron:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Fencing wall:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Drainage channel:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Water trough:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Slab cover for soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Inspection chamber concrete:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Inspection chamber cover slab:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……..
Well cover:	Good	☐	Bad state	☐	Other: ……		

Other comments: ……

……

INFORMATION ON THE PUMP

Pump Make and Model: ……	Pump serial N°: ……	Date of installation: ……../……../……
Depth of installation: ……m	General appearance of the pump: ……	
Pump fixing: Good ☐ Unsteady ☐ Bad ☐ Other comments: ……		
Leakage test(to be conduct after stopping the pump for 30 minutes):		
The water comes out after ……pump strokes	Is there leaking? Yes ☐ No ☐	
Yield test: Begin the yield test immediately after the pump has been in use continuously. Give 40 pump strokes during approximately 1 minute while collecting the water in a bucket. Quantity of water collected >10 liters? Yes ☐ No ☐		

Ask to the users if the pump has broken down since the provisional acceptance? Yes ☐ No ☐
Number of breakdowns?: ..... Nature of breakdowns?: .....

WATER QUALITY

Water quality: .....Clear ☐ Turbid ☐ Presence of particles ☐ Presence of odour ☐
Other comments: .....

VERIFICATION OF THE EXISTENCE OF PARTIALS PROVISIONAL ACCEPTANCES OR TECHNICAL DOCUMENTS

Are the partials provisional acceptances documents or the technical documents of the different elements mentioned below available?

		Observations			Observations
Well :	Yes ☐ No ☐		**Hand pump:**	Yes ☐ No ☐	
Water quality analysis by a laboratory:	Yes ☐ No ☐		**Yield testing data and interpretation:**	Yes ☐ No ☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

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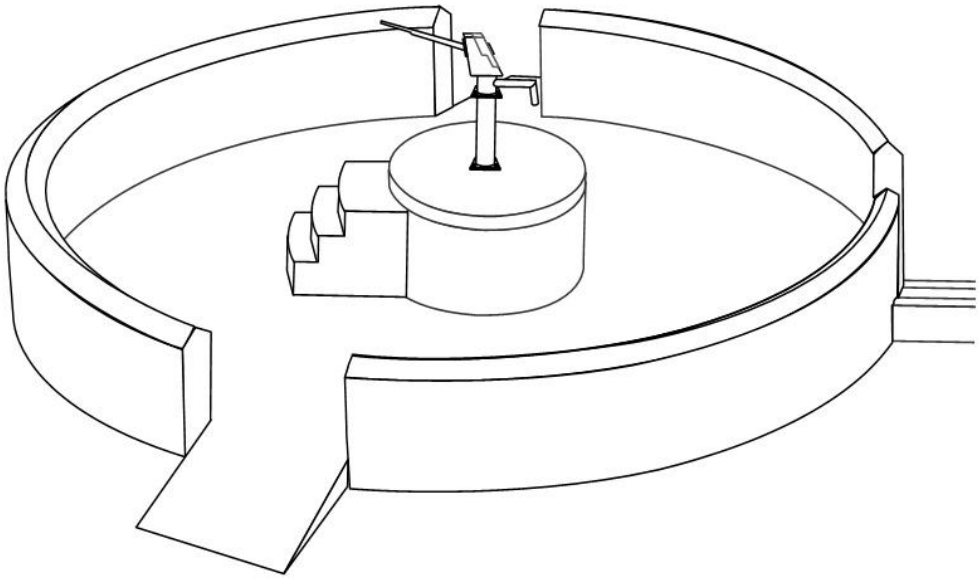
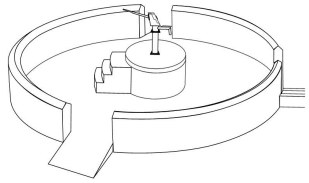
……
……
……

NAMES & SIGNATURES

For Contractor	For the Consultant	For Water Management Committee/Community	For the project	For Water services	For the Commune
_____	_____	_____	_____	_____	_____

8. IMPROVED HAND-DUG WELL WITH HAND/FOOT PUMP: FINAL ACCEPTANCE FORM



	Country: …… Region: …… Province: …… Commune: …… Village: …… Hamlet: ……	N°: Name of Contractor: …… …… Well coordinates (DMS units) : X (Long): …… °……’…… .” Y (Lat.): …… ° …… ’……”

GENERAL INFORMATION

Date of final completion:……/……/……	Water rest level at the final completion:……m/ground
Date of provisional acceptance: ……/……/……	**Note: Attach a copy of the provisional acceptance, copies of technical information on the well and the hand pump.**

STATE OF THE CONCRETE RINGS, THE POROUS CONCRETE RINGS, THE HEADWORKS AND THE SUPERSTRUCTURE

Concrete ring:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Porous concrete ring:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Head works:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Concrete apron:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Fencing wall:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Drainage channel:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Water trough:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Slab cover for soak-away:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Inspection chamber concrete:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Inspection chamber cover slab:	Good	☐	Cracked	☐	Big cracks	☐	Other: ……
Well cover:	Good	☐	Bad state	☐	Other: ……		

Other comments: ……

……

INFORMATION ON THE PUMP

Pump Make and Model: ……	Pump serial N°: ……	Date of the provisional acceptance: ……../……../……
General appearance of the pump: ……		
Pump fixing: Good ☐ Unsteady ☐ Bad ☐ Other comments: ……		
Leakage test(to be conduct after stopping the pump for 30 minutes):		
The water comes out after ……pump strokes	Is there leaking? Yes ☐ No ☐	
Yield test: Begin the yield test immediately after the pump has been in use continuously. Give 40 pump strokes during approximately 1 minute while collecting the water in a bucket. Quantity of water collected >10 liters? Yes ☐ No ☐		

Ask the users if the pump has broken down since the provisional acceptance? Yes ☐ No ☐
Number of breakdowns?: …… Nature of breakdowns?: ……

WATER QUALITY

Water quality: Clear ☐ Turbid ☐ Presence of particles ☐ Presence of odour ☐
Other comments: ……

VERIFICATION OF THE EXISTENCE OF PROVISIONAL ACCEPTANCE OR TECHNICAL DOCUMENTS

Are the provisional acceptance documents or the technical documents of the different elements mentioned below available?

		Observations			Observations
Well :	Yes ☐ No ☐		**Hand pump:**	Yes ☐ No ☐	

GENERAL COMMENTS/ CORRECTIONS TO BE MADE / WORKS TO REDO

……

……

……

……

NAMES & SIGNATURES

For Contractor	For the Consultant	For Water Management Committee/Community	For the project	For Water services	For the Commune
_____	_____	_____	_____	_____	_____

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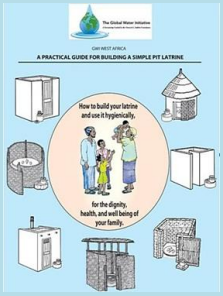
The GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation:

A practical guide for building a simple pit latrine.

ref.: 2011-01-E



Contracting for water point construction: Provisional and final acceptance forms.

ref.: 2012-04-E

Assuring Quality: an approach to building long-lasting infrastructure in West Africa.

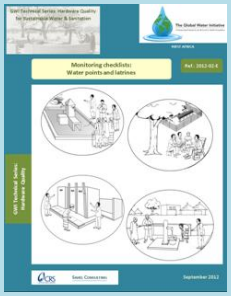
ref.: 2012-01-E

The essential steps before handing-over a borehole (with hand pump) to the community.

ref.: 2012-05-E

Monitoring checklists: water points and latrines.

ref.: 2012-02-E



Community monitoring during the construction of a gravity-fed, solar powered water supply: a training guideline.

ref.: 2012-06-E

Community monitoring of borehole construction: a training guideline.

ref.: 2012-03-E

Making the right choice: comparing your rural water technology options.

ref.: 2012-07-E

These documents are also available in French.

The main authors are Lambert Zounogo P. Nikiema (CRS), Sue Cavanna (Sahel Consulting) and Jean-Philippe Debus (CRS).

The Global Water Initiative
A Partnership Funded by the Howard G. Buffet Foundation

GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation

The Global Water Initiative

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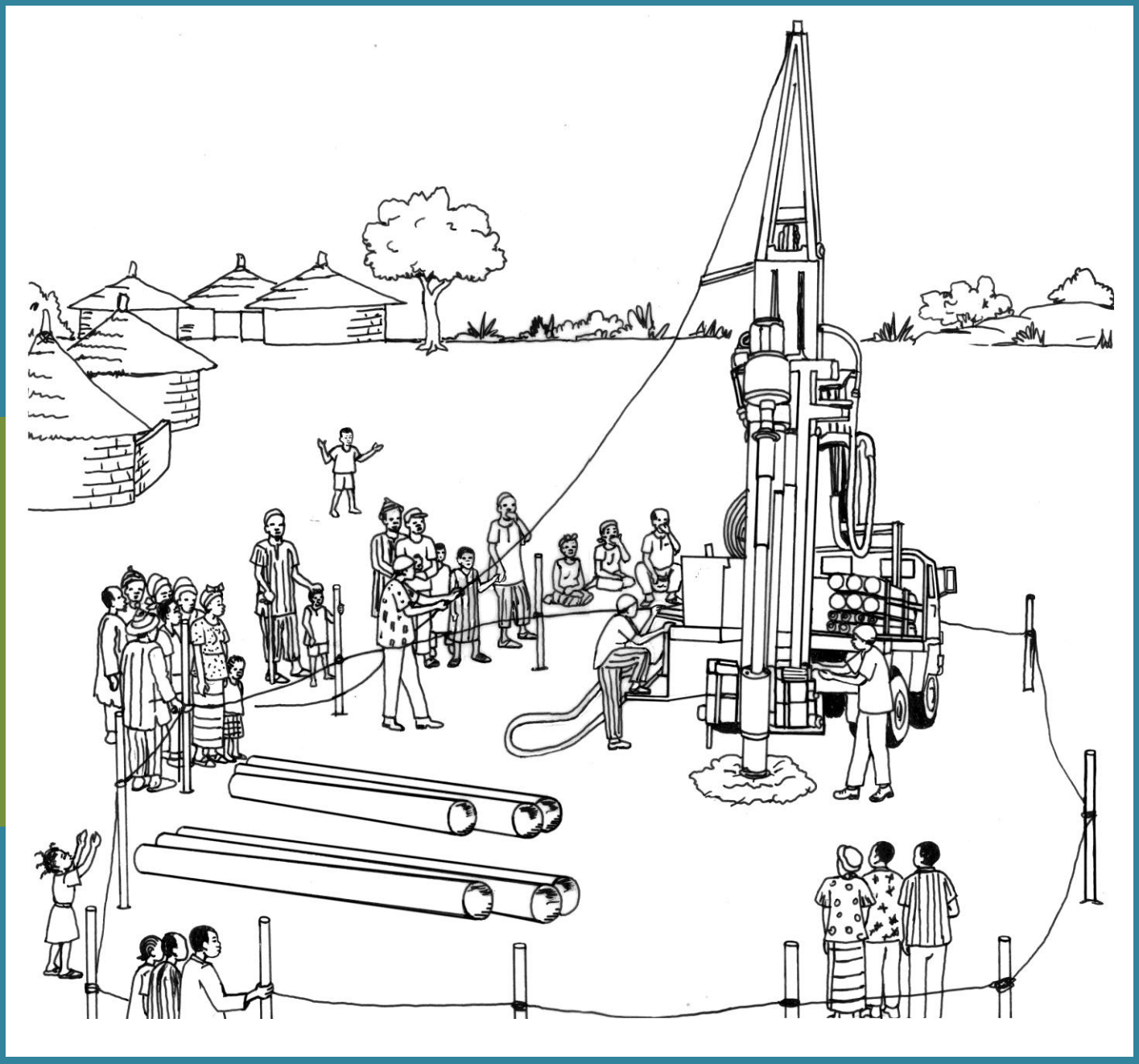
WEST AFRICA

Community monitoring of borehole construction: a training guideline

Ref.: 2012-03-E



GWI Technical Series: Hardware Quality

CRS CATHOLIC RELIEF SERVICES

SAHEL CONSULTING

September 2012

Table of contents

About this series

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** is a Global Water Initiative tool that was developed in West Africa by Catholic Relief Services (CRS) and Sahel Consulting as a response to common difficulties in rural water & sanitation projects.

Each document in the series addresses a particular aspect of technology choice, design, build and maintenance. All these aspects are important in delivering a reliable and lasting community water/sanitation resource within an increasingly decentralised context.

We aim to influence those with the power and responsibility to get water and sanitation to the rural poor.

We also want to influence the communities themselves to become proactive and break away from their past role as passive beneficiaries.

The tools have been designed and field tested for use with communities, development workers, commune leaders and government technical services. They focus specifically on gaining an informed understanding that will lead these key decision makers to choosing the correct technology, supervising construction to assure quality, putting in place correct operation and maintenance systems, and assuring that revenue generated is adequate to keep that service going.

These tools are not a method in themselves, they presume that anyone using them is already engaged in a robust participatory process.

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** includes:

A practical guide for building a simple pit latrine	ref.: 2011-01-E
Assuring Quality: an approach to building long-lasting infrastructure in West Africa	ref.: 2012-01-E
Monitoring checklists : water points and latrines	ref.: 2012-02-E
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Please use any of the documents freely. They can be downloaded from http://www.crsprogramquality.org/publications/tag/water-manualsuser-guides.

We would be most interested to receive feedback from you on the usefulness of this material.

The series is published in French and English. If you translate the material into another language please send a copy to lambert.nikiema@crs.org, jeanphilippe.debus@crs.org, suecavanna@sahelconsulting.org.uk.

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GWI project staff from all five GWI countries contributed ideas during the early development stages, and most importantly tested the material in the field. We are indebted to them.

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- François Xavier COULIBALY, Toussiana, Burkina Faso (illus_faso@yahoo.fr).

About the Global Water Initiative

The Global Water Initiative (GWI), supported by the Howard G. Buffett Foundation addresses the challenge of providing long term access to clean water and sanitation, as well as protecting and managing ecosystem services and watersheds, for the poorest and most vulnerable people dependent on those services. Water provision under GWI takes place in the context of securing the resource base and developing new or improved approaches to water management, and forms part of a larger framework for addressing poverty, power and inequalities that particularly affect the poorest populations. This means combining a practical focus on water and sanitation delivery with investments targeted at strengthening institutions, raising awareness and developing effective policies.

The Regional GWI consortium for West Africa includes the following partners:

- International Union for the Conservation of Nature (IUCN)
- Catholic Relief Services (CRS)
- CARE International
- SOS Sahel (UK)
- International Institute for Environment and Development (IIED).

GWI West Africa covers five countries: Burkina Faso, Ghana, Mali, Niger and Senegal. Some activities also take place around the proposed Fomi dam in Guinea. For more information on the GWI, please visit: www.globalwaterinitiative.com.

Introduction

Even though the construction of a community water supply is most often supervised and monitored by an experienced technical person, problems with the quality of implementation may occur where the community is a helpless by-stander without the basic knowledge to know if the work is being carried out to a high quality or not. Community involvement in infrastructure supervision allows the community to understand and oversee the implementation of infrastructure, and contributes also to the community's sense of ownership and enables future management. Thus the community does not just receive a finished product but is involved in the work during the construction phase. To allow communities to play this supervisory role, building their capacity is important to enable them to understand the basic principles.

Training objective

The training aims to provide essential practical information to communities on the different phases of installing borehole equipped with hand/foot pump: the critical aspects of each phase, the quality of materials to be used and the quality of implementation that is expected. The overall goal is to prepare the community to understand what a good quality borehole equipped with a hand/foot pump should be like and how to intervene when these minimal standards are not met.

Specific training objectives

The training will permit participants to understand:

1. the different phases in implementing a borehole equipped with a hand/foot pump;
2. what implementation of each phase consists of;
3. the key determining elements of each phase;
4. How to evaluate the quality of the infrastructure at each step; and what to do in case the infrastructure is being poorly constructed.

Expected results

At the end of this training, participants should:

1. Know the different phases of constructing borehole equipped with hand/foot pump;
2. Know how the infrastructure is implemented at each phase;

3. Know the determinative elements of each phase;
4. Be capable to assess the quality of the infrastructure at each step;
5. Have a clear idea of what to do in cases where construction is poorly implemented.

Training methodology

The training consists of several modules, representing the different steps in constructing a borehole with a hand pump. The training modules are presented in the order that borehole implementation takes place.

For each module, the following specific objectives will be fully addressed before moving on to the following module.

The sessions will include practical demonstrations to allow participants to better understand the topics of that module. To make the training more participatory, participants will be asked in prelude to discuss and describe their experience in relation to issues covered in each module.

Training content

There are five main steps to constructing and equipping boreholes with hand pumps:

- ✓ Social aspects of implementation (Module 1)
- ✓ Practical implementation (Module 2)
- ✓ Drilling and lining the well (Module 3)
- ✓ Pump installation (Module 4)
- ✓ Constructing the superstructure (Module 5)

The training will be carried out in modules relating to each of these steps.

Module 1: Social aspects of implementation

Involve the whole village via the Water User Association (WUA) when selecting the areas to install new water points.

		Observation
How was the site for the water point chosen?	Identification of the potential zone for borehole construction: the community indicate the area desired	
What are the determining elements of this phase?	The area chosen for the water point should be officially recognized by the village authorities	A new water point should focus on areas not already covered by an existing water supply
How will you evaluate the consistency or quality of the work? **What actions should be taken?**	Involve key decision makers from the village when choosing the site for the new water point and inform the entire village of the area selected for implementation through a GA. Going to the selected areas (and not just indicating it) is advised to avoid poor interpretation of the location	

Methodology / how to run the session:

Key learning and discussion points:

- ✓ Discuss equity issues in relation to choosing in a specific case of a beneficiary quarter a site for the water point that is most central to the majority of the inhabitants of this quarter. Drawing a map on the ground can help visualize the water point site options in relation to where the inhabitants live.

- ✓ Remind people their right to be informed about decisions affecting all the water users. This is especially important since the community will be required to pay for water.

This session will use questions, answer, and the sharing of experiences to help participants identify the potential risks in the social aspects of implementation in their own community. Participants will be invited to share experiences which illustrate their various opinions for each of the below:

Q1. In a given place, what area should be prioritized for installing a water point and why?

Q2. How should this choice be made, and by who?

Q3. Who should be informed of the location of the site selected for the new water point and why?

Q4. When should other members of the community be informed of the location selected?

Q5. How should the indication of the location be made? : Verbal description? Going on site? Argue for the different options

At the end of the session, participants will be asked to summarize the main good social practices for assuring community involvement in implementation.

Session duration

About two hours.

How the session is organized

Conducted in plenary.

Materials needed

None.

Module 2: Practical implementation

The objectives to be addressed in this module are:

- ✓ Prevent influential individuals or groups changing the water point location to their personal benefit when the time comes for implementation (indicating an area other than the one initially selected through consensus in the village);
- ✓ Prevent risky or inappropriate locations (proximity to latrines, cemetery and surroundings, polluted areas, etc.);
- ✓ Ensure technical set standards (distance, etc.) are followed/complied with.

How was the infrastructure site chosen?	Determining the exact place to construct the water point.
What are the determining elements of this phase?	Installing the water point in a risk-free area. Clear identification of the selected area to prevent influential persons changing the water point location.
How will you evaluate the consistency or quality of the work? **What actions should be taken?**	<u>Before installing</u>: - Presence of the WUA before the start of/during installation; - WUA indicates the place selected to the team in charge of installation. <u>At commencement of installation check that</u>: - The site is at an adequate distance (prescribed distance) from any source of pollution (minimum 30m); - The site is not situated in a low-lying area vulnerable to flooding; - The place is not situated in a sacred area with no allowed access or with restricted access. - The area selected is at least 300 m from another water point except for a valid reason. <u>After installation</u>:

	- Marking and protection of site - Public information on how the site was selected for the water point.

Methodology / how to run the session:

Key learning and discussion points

- ✓ Risk related to a bad sitting (e.g. cemetery and surroundings)of the water point
- ✓ Complying with minimal distances between water point and source of pollution
- ✓ Drainage to permit uninterrupted access to the water point all year round even during the rainy season
- ✓ Who in the community should monitor implementation?
- ✓ Who should be informed of the sites selected?

Ask participants to explain how implementation should be carried out in the field. Then ask them the following questions (NB a) participants should be invited to share experiences which could illustrate various opinions b) the facilitator should provide the answers that were not mentioned by participants):

Q1. Who should indicate the team in charge of installation what area was selected for infrastructure and why?

Q2. If the place chosen by the implementation team is a sacred area, what should be done?

Q3. What other places do you think should be avoided and why?

(Certain specific places should be mentioned (cemetery, flood plains or low-lying areas, polluted areas); if these are not mentioned, mention them and ask participants why they should be avoided).
For sources of pollution, indicate the minimum distance and the possibility of eliminating some sources of pollution (if latrines, garbage dumps, ponds, banco pool)?

Q4. Do community members need to be present during implementation and why?

Q5. How do you ensure that the area(s) selected for installation will be found again when the machines arrive? What should community representatives do who assisted in installation?

Q6. Should one inform the entire community of the sites selected?

During the various parts of the session, let participants debate and argue to make sure that all opinions are expressed.

At the end of the session, ask participants to summarize the best practices for practical implementation.

Session duration

The session will last about two hours.

How the session is organized

The session will be carried out directly as a plenary.

Materials needed

None.

Preparation

Know how water can be contaminated by different sources of pollution (latrines, garbage dumps, etc.).

Module 3: Drilling

The following aspects will be covered in this module:

- ✓ Avoid errors or influential individuals/groups changing any aspects during implementation of the infrastructure;
- ✓ How to ensure that essential parts of drilling (drilling equipment: tubing, gravel) are appropriately carried out;
- ✓ Check to see that the quality of water at the end of drilling is visually pleasing.

How was the infrastructure implemented?	Infrastructure implemented by drilling machines.
What are the determining elements of this phase?	Do not drill in any other site than the one that was identified with the community at the planning stage. Quality of materials used during drilling. Quality of water after drilling the infrastructure.
How will you evaluate the consistency or quality of the work? **What actions should be taken?**	<u>Before starting to drill & build the infrastructure</u> - Ensure that the official representatives of the community are present for the beginning of the implementation; <u>During drilling</u> - See that the casing tubes used to line the borehole are not broken; - See that the lower casing strainer tubes are used (not hand sawn slotted tubes) at the level of the water influx; - Check that the size and type of gravel is consistent with the design specification <u>During development</u> See if water is clear and note the time taken for clean water to come out when water is struck at the time of drilling

Methodology / how the session is conducted:

Key learning and discussion points

- ✓ Technical characteristics of a borehole (use visual medium);
- ✓ Quality of materials used for a borehole
- ✓ Borehole cleaning (development) process after the drilling and casing

Ask participants to explain (according to their experience) how drilling is conducted. Then ask the following questions:

- **1.** Which community members should notify the company in charge of drilling of the site selected for the borehole and why? (Participants are invited to share their experience, which serve to illustrate various viewpoints).
- **2.** Draw a picture or diagram to illustrate the drilling process (water infiltration, capture screens & water inflows, water filtering through the gravel packing, etc.).
- **3.** Ask participants to debate what qualities or characteristics of PVC tubing and gravel pack make a good quality borehole.

  These characteristics are:

  - For the strainers: allow water to flow in without clogging too much, allowing fine elements to pass during the development (the slots should not be too small), retain larger elements behind the screens during the borehole use (the slots should not be too large).
  - For the gravel filter pack: retain the coarse elements of the aquifer (water table) and let other elements filter through during the development (drill cleaning).

  Note: Ensure you have prepared in advance to show the participants adequate samples of screens and samples of good and poor quality gravel (PVC sawn, non-siliceous and non-rounded gravel).

- **4.** Ask participants to describe the characteristics of good quality water.
- **5.** Explain the process and equipment used for constructing a borehole (cleaning the drill) that takes at least four hours or more, if necessary, until water is clear.

- **6.** At the end of the session, ask participants to
    a) Summarize the types of materials to use, how to clean a borehole, and what water should be like at the end of the development.
    b) Discuss what to do if:
        - The borehole is drilled in a place other than what was decided by the committee;
        - Poor quality materials are used or poor practices are used;
        - The water does not become clear.

Session duration

The session will last about two hours.

How the session is carried out

The session will be carried out directly as a plenary

Materials needed

- Diagram of a borehole;
- Good quality sample of a gravel filter pack;
- Poor quality sample of gravel;
- Good quality sample of a PVC strainer;
- Sample of a hand sawn slotted PVC tube (poor strainer).

Preparation

- Know good quality gravel;
- Understand the stages of drilling and developing a borehole.

Module 4: Installing the pump

The goal of this module is to:

- ✓ Allow community members to evaluate pump installation: Is the depth at which the pump is installed conforms to the required depth based on the pumping test?

How is the infrastructure implemented?	The installation of the pump is done by a business or a pump supplier.
What are the determining elements of this phase?	A good quality pump is properly installed and is placed at the required depth.
How will you evaluate the consistency or quality of the work? **What actions should be taken?**	It is impossible for communities to assess the quality of the pump, but they can evaluate the depth at which the pump is installed and compare that with the information given to them by the project. Ensure that the pump has no leaks: water must leak before five strokes of the pump.

Methodology / how to run the session:

Key learning and discussion points

- ✓ Know the right depth of installing the pump cylinder (some meters below the water level in the driest season and after pumping at the maximum yield of this borehole during the whole season)
- ✓ How to check that the pump has no leaks: You should not need to pump more than five times before water comes out of the pump nozzle.

Discussions will be based on their knowledge of well dewatering, where the level of water varies depending on the time of year and the level of usage. Understanding that these realities are also applicable for boreholes is important. For the pump to be able to deliver water at any time, the pipe needs to be long enough to be submerged in water at all times of the day and in all seasons.

Ask the following question:

- **Q1.** How do you know what length of pipe to use to make sure to always have enough water when the pump is used?

  Listen to the explanations and give the correct explanation if the participants' responses are not satisfactory. Pump testing allows one to test the borehole and estimate for an average flow rate what will be the water level at the end of the dry season. Based on this, a few meters are added to this level to determine the total pipe length.

  Discuss how or who should give this information (length of pipe to use for the pump).

  At the end of the session, discuss with participants what they should do if:
  - They determine that the pump is not installed at the right depth;
  - The pump has leaks.

Session duration

The session will last about 30 minutes

How the session is organized

The session will be carried out directly as a plenary.

Materials needed

- Well diagrams with different water levels (different lengths of cord necessary for the borehole).
- Borehole diagrams with different water levels and sufficient lengths for pipes to always be submerged in water year round.

Preparation

None

Module 5: Implementing the superstructure

The goal of this module is to help community representatives understand the function of the superstructure, and how to evaluate the quality of the construction of the superstructure:

- ✓ The purpose of the different parts of the superstructure;
- ✓ The overall quality expected for the different parts of the superstructure
- ✓ The quality of the aggregate material;
- ✓ The way the blocks are made;
- ✓ The manner in which the concreting and plastering are done.

How is the infrastructure implemented?	The infrastructure is constructed by a contractor
What are the determining elements of this phase?	Implement a quality superstructure (quality of concrete and blocks) that permit a complete seal between the surface and the water source and avoid any stagnant water pooling around the platform and drill
How will you evaluate the consistency or quality of the work? **What actions should be taken?**	<u>The quality of the materials used is crucial</u> - Check that the sand and gravel used does not contain debris or soil; - Check that the cement used is fresh, comes from a new bag that is tightly closed, dry and has no lumps; - See if the water used is clear (not cloudy). <u>The superstructure must help protect the water quality and limit animals access of to the point of use</u> - See if the coping and the concrete floor around the borehole are correctly built, so as not to allow water infiltration into and around the immediate drilling area; <u>Proper preparation of blocks is necessary</u> - See if the area chosen to make the bricks is shaded; - Count the number of bricks made from one bag of cement (one bag of cement should make 40 bricks of 15cm each); - See if bricks are correctly watered morning and night, for at least 14 days and dried in the shade.

	Proper preparation of concrete and proper plastering is essential - Verify that the concrete is watered morning and evening after the setting period for at least one week; Check that the plastered areas are watered morning and evening after the setting period for at least one week.

Methodology / how the session is conducted:

Key learning and discussion points

- ✓ Good quality concrete requires good quality materials and adherence to the specific rules of mixing and curing.
- ✓ The role of the platform in protecting the groundwater source and the physical characteristics of a good platform.

This session will revolve around the following principles:

- the various parts of the superstructure have a function, and their construction should be of a quality that meets that function ;
- A good quality infrastructure cannot be constructed with poor quality materials;
- Good quality materials alone are not sufficient, they must be used correctly.

Ask participants to identify the various parts of the superstructure (coping concrete floor, walls, drainage channel, soak away pit) and specify the use of each part. Engage the participants discuss what would happen if any of the parts did not work well.

Ask participants to list the key components for the making of bricks and concrete. Make additions and/or corrections where needed.

Ask participants to summarize the requirements for obtaining quality results. Complete their understanding by further explanation when you note that participants' responses show insufficient level of understanding. Explain what will be the effect of using poor quality materials.

Provide and show participants good and poor quality samples of each of the materials (sand, gravel, cement).

For good practices, ask participants to indicate what they should not do when making bricks or cement, and ask why: for the implementation site, for the proportions of materials used (number of

bricks/ bag of cement, etc.), for mixing the materials, and for watering the concrete during the curing process.

Ask participants how to verify that the blocks were done well: listen to the answers and give the right answer if it was not provided (no crumbling when pressed with fingers, does not fall apart when dropped from a height of one meter). Do a practical test with participants.

At the end of this session, ensure that participants can summarize the usefulness of the superstructure, the quality of materials to be used and good practices for making bricks and concrete.

Discuss with participants what should be done if:

- Poor materials are being used and/or if the wrong mix of concrete is used;
- The bricks are cured in the sun;
- The bricks or the different cement or mortar (plaster) are not adequately watered (morning and evening, for the correct amount of time)

Duration of the session

The session will last about two hours.

Organization of the session

The session will be carried out directly as a plenary; no subgroups.

Materials needed

- Good quality samples of sand and gravel
- Poor quality samples of sand and gravel
- Several concrete blocks to test examples of both good and poor quality (test for erosion, strength and impact resistance).

Preparation

Understand the consequences of the use of poor materials and poor practices when making concrete blocks and concrete.

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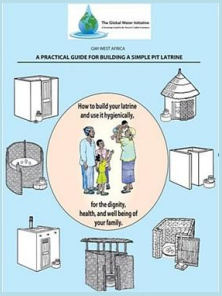
The GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation:

A practical guide for building a simple pit latrine.

ref.: 2011-01-E



Assuring Quality: an approach to building long-lasting infrastructure in West Africa.

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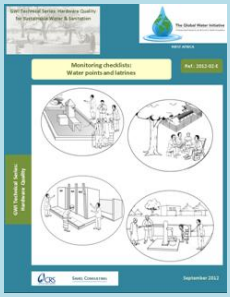

Community monitoring of borehole construction: a training guideline.

ref.: 2012-03-E

Contracting for water point construction: Provisional and final acceptance forms.

ref.: 2012-04-E

The essential steps before handing-over a borehole (with hand pump) to the community.

ref.: 2012-05-E

Community monitoring during the construction of a gravity-fed, solar powered water supply: a training guideline.

ref.: 2012-06-E

Making the right choice: comparing your rural water technology options.

ref.: 2012-07-E

These documents are also available in French.

The main authors are Lambert Zounogo P. Nikiema (CRS), Sue Cavanna (Sahel Consulting) and Jean-Philippe Debus (CRS).

The Global Water Initiative
A Partnership Funded by the Howard G. Buffet Foundation

GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation

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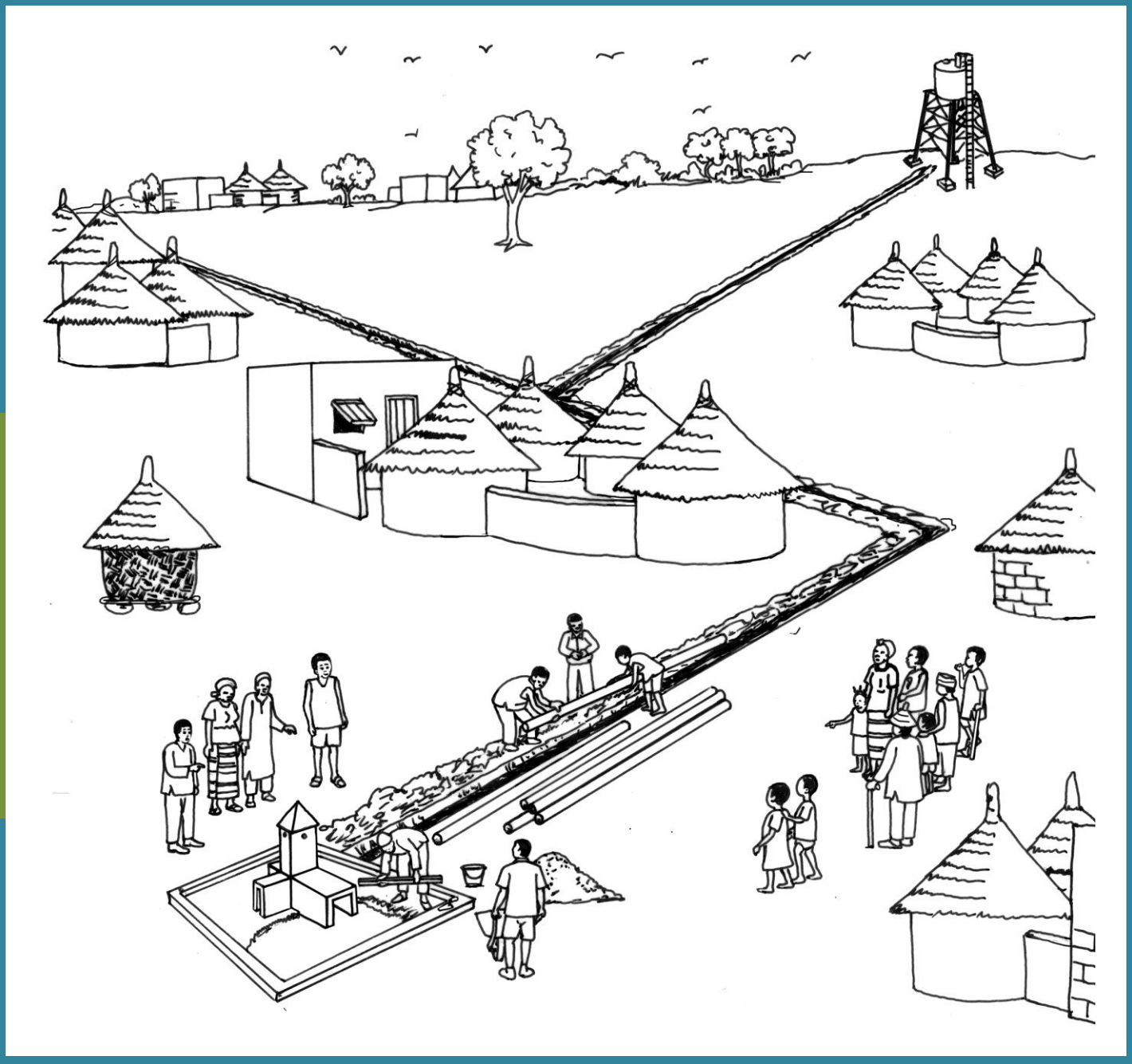
WEST AFRICA

Community monitoring during the construction of a gravity-fed, solar powered water supply: a training guideline

Ref.: 2012-06-E



GWI Technical Series: Hardware Quality

CRS CATHOLIC RELIEF SERVICES

SAHEL CONSULTING

September 2012

Table of contents

About this series

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** is a Global Water Initiative tool that was developed in West Africa by Catholic Relief Services (CRS) and Sahel Consulting as a response to common difficulties in rural water & sanitation projects.

Each document in the series addresses a particular aspect of technology choice, design, build and maintenance. All these aspects are important in delivering a reliable and lasting community water/sanitation resource within an increasingly decentralised context.

We aim to influence those with the power and responsibility to get water and sanitation to the rural poor.

We also want to influence the communities themselves to become proactive and break away from their past role as passive beneficiaries.

The tools have been designed and field tested for use with communities, development workers, commune leaders and government technical services. They focus specifically on gaining an informed understanding that will lead these key decision makers to choosing the correct technology, supervising construction to assure quality, putting in place correct operation and maintenance systems, and assuring that revenue generated is adequate to keep that service going.

These tools are not a method in themselves, they presume that anyone using them is already engaged in a robust participatory process.

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** includes:

A practical guide for building a simple pit latrine	ref.: 2011-01-E
Assuring Quality: an approach to building long-lasting infrastructure in West Africa	ref.: 2012-01-E
Monitoring checklists : water points and latrines	ref.: 2012-02-E
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Please use any of the documents freely. They can be downloaded from http://www.crsprogramquality.org/publications/tag/water-manualsuser-guides

We would be most interested to receive feedback from you on the usefulness of this material.

The series is published in French and English. If you translate the material into another language please send a copy to lambert.nikiema@crs.org, jeanphilippe.debus@crs.org, suecavanna@sahelconsulting.org.uk.

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About the Global Water Initiative

The Global Water Initiative (GWI), supported by the Howard G. Buffett Foundation addresses the challenge of providing long term access to clean water and sanitation, as well as protecting and managing ecosystem services and watersheds, for the poorest and most vulnerable people dependent on those services. Water provision under GWI takes place in the context of securing the resource base

and developing new or improved approaches to water management, and forms part of a larger framework for addressing poverty, power and inequalities that particularly affect the poorest populations. This means combining a practical focus on water and sanitation delivery with investments targeted at strengthening institutions, raising awareness and developing effective policies.

The Regional GWI consortium for West Africa includes the following partners:

- International Union for the Conservation of Nature (IUCN)
- Catholic Relief Services (CRS)
- CARE International
- SOS Sahel (UK)
- International Institute for Environment and Development (IIED).

GWI West Africa covers five countries: Burkina Faso, Ghana, Mali, Niger and Senegal. Some activities also take place around the proposed Fomi dam in Guinea. For more information on the GWI, please visit: www.globalwaterinitiative.com.

Introduction

When designing and building a community water and sanitation supply, we often encounter quality-related problems even when the work is supervised by a professional. The beneficiary communities often find themselves assigned the role of ignorant & powerless observers. Community involvement in supervision of the works not only enables them to keep an eye permanently on the way works are carried out, but also contributes towards beneficiaries and future managers regarding the sustainability of that system in the long-term. Instead of just passively receiving a finished product these beneficiaries will become genuine stakeholders in the construction work. The capacity of these communities need to be built to enable them to understand the key basic engineering principles of the works and thus to play the role of assuring a quality infrastructure is built.

Training objective

This training guide aims at providing the communities with the most essential practical information on: the various stages in borehole and gravity distribution with submersible pump powered by solar energy design and construction, the main stages of the works, the critical engineering/construction points in each stage, the quality of materials to be used, and finally the expected quality of the work. It aims at preparing them to intervene in alerting the funding/facilitation body & the decentralized commune authority anytime they note gaps in compliance with the standards that were agreed at the start of the work.

Specific training objectives

The training will permit participants to:

1. Get acquainted with the various stages in the design and construction of borehole and gravity distribution with submersible pump powered by solar energy;
2. Understand how each stage of the work should be carried-out;
3. Understand the key factors that assure a quality result at each stage;
4. Know how to assess the quality of the works at each stage ;
5. Have a clearer idea on what to do in case of observing poor practice in the construction work.

Expected results

At the end of this training, participants should:

1. Know the various stages of design and construction of a borehole and mini gravity distribution with submersible pump powered by solar energy;
2. Understand how the work should be carried out at each stage ;
3. Know the factors that assure a quality product at each stage ;
4. Know how to assess the quality of works at each stage ;
5. Have a clear idea on what to do in case of poor practice in the construction work.

Training methodology

The training will be organized in several modules, each module representing one stage in the construction of a borehole and mini gravity distribution with submersible pump powered by solar energy. Modules will be presented in the chronological order in which the various stages of construction occur.

For each module the specific objectives listed below are fully discussed/understood before moving on to the next module.

The teaching of each module should include practical demonstration for illustration purpose.

In order to achieve a wider involvement of the target population and adopt the most participatory approach, participants will be constantly requested to share their knowledge on the content of the module in pre-teaching brainstorming sessions.

Training content

There are 5 main parts in the construction of a borehole and mini gravity distribution with submersible pump powered by solar energy:

A. Constructing a new borehole or identification of an old one with high discharge (at least 5m3/h) ;
B. Layout of the various equipment and infrastructures ;
C. Installation of the power generator and the submersible pump ;
D. Installation of the water tower ;
E. Installation of the mains ;

F. Construction of water distribution points.

A. / Constructing a new borehole or identification of an old one with high discharge (at least 5m3/h)

Building a new (high discharge) borehole

There are three main stages of borehole construction, and the content modules will be closely related to them:

- Geographical layout (A1);
- Practical physical layout (A2)
- Drilling (A3).

Module A1: Identification of hydro-geological investigation area

Inform village leaders and the WUA in the area predefined by the hydrogeology team for the layout of the water point;

		Remarks
How will the construction work be carried out?	Identification of the potential exploration village area for the exploration/drilling of the borehole.	
What are the determining factors at this stage?	Layout zones should be within the limits of the village land and should be identified by the relevant village authorities	Choosing land outside the village must be avoided as much as possible.
How to assess work consistency and quality? **Which actions are to be undertaken?**	Involve main village decision makers in the validation of selected zones for hydro-geological investigations. To avoid errors, field visit on selected zones is recommended.	Avoid prohibited (taboo) areas.

Methodology / how to run the session:

Key learning and discussion points:

- ✓ Discuss the risks/consequences related to locating a borehole on land of another village which is not part of the beneficiary community

This session will be a question/answer and experience sharing session so that participants themselves can identify potential risks related to the identification of the geographical area selected for hydro-geological investigations. Discussions could be focused on the following questions in order to encourage participants to share their ideas and experience:

Q1. Who should show the hydro geologist the limits of the village land where hydro-geological survey can be carried out?

Q2. Who should be informed about the areas selected for hydro-geological surveys, and why?

Q3. How the description of the areas selected for hydro-geological surveys should be done? Verbal description? Field visit? Other? Call for arguments in support of the various options.

At the end of the session ask participants to give a summary of best practices to be adopted for the identification of areas for the hydro-geological survey.

Session duration

About 30 minutes.

How the session is organized

In plenary.

Materials needed

None.

Module A2: Practical implementation

The purpose of this module is to address the following aspects:

- ✓ Avoiding people changing what was planned (showing an area that is different from the one initially selected by common consensus by the village);
- ✓ Avoiding selecting areas which are inappropriate or which involve some risks (close to latrines, in or next to a graveyard, sources of pollution, etc.);
- ✓ Ensuring the respect of the technical norms & criteria (distance, etc.).

Where will the borehole be built?	Determination of the precise location of the borehole.
Which are the determining factors at this stage?	Laying out the borehole on risk-free sites. Clear identification of village land boundaries within which the layout of the water should be built.
How to assess the quality of the work? **Which actions are needed?**	<u>Prior to layout</u> : - Presence of WUA before and when layout is being conducted <u>During layout</u> : - Verify that prescribed minimal distances (30m) from source of pollution have been respected; - Check water point is not in a depression or an area liable to flood; - Check water point is not located on a sacred spot where access is limited or forbidden - Check selected point is indeed located within village land boundaries. <u>After layout</u> : - Marking and protection of sites selected by layout team ; Inform public at large on sites selected for drilling.

Methodology / how to run the session:

Key learning and discussion points

- ✓ Risks related to selection of wrong location of water point (e.g.: in or next to a graveyard);
- ✓ Respect of prescribed minimal distance between water point and source of pollution;
- ✓ Drainage issues to avoid water point pollution by surface water;
- ✓ Which community member(s) should monitor the work?
- ✓ Who should be informed about selected sites?

Ask participants to explain how layout work is generally conducted in the field and then ask the following questions getting them to share their experience that justifies their opinion (and allow participants to argue and discuss throughout this session):

Q1. Who should show the work site to the layout team? And why?

Q2. If the point selected by layout team is located on sacred land, what should be done?

Q3. Which other sites should be avoided? Why?

NB: Some specific points should be mentioned (cemetery, zone liable to flood, source of pollution), otherwise, mention them and ask participants for justification.

If necessary, the facilitator should complete answers to the various questions when participant answers are incomplete or incorrect.

In the case of sources of pollution, indicate the prescribed minimal distance to be respected and possibility to eliminate some sources of pollutions (e.g.: latrines, garbage dumps, clay quarries, swamps, etc…)

Q4. Which community members should be present when layout work is being conducted, and why?

Q5. How to ensure that the point(s) selected by layout team can be easily seen/identified when the engine comes to start drilling?

Q6. What are the tasks of the community representatives who attended the layout work?

Q7. Should the whole community be informed about selected sites?

At the end of the session, ask participants to summarize the best practices that must be adopted for the practical layout stage.

Session duration

The session will last about 2 hours.

How the session is organized

In plenary.

Materials needed

None.

Preparation

Ensure you have a thorough knowledge of how various sources of pollution (latrines, garbage dumps, etc.) contaminate aquifers.

Module A3: Drilling

This module will deal with:

- ✓ Avoiding errors in locating the borehole when drilling;
- ✓ How to ensure that the drilling and equipping of the borehole are well done (drilling equipment: casing, gravel);
- ✓ Checking the visual quality of water coming up at the end of the drilling.

How is the drilling work carried out?	Work is done with drilling machines.
Which are the key factors at this stage?	No drilling in any location other than the one identified during layout. Assuring materials of adequate quality are used for borehole equipment. Water quality at the end of drilling.
How to assess work is carried out to a consistent quality? **Actions to be undertaken?**	Prior to work launching Ensure that community official representatives are present at project launching; At borehole equipping - Check to ensure no broken casing is introduced into the borehole; - Check to ensure that screen casings have not been sawn to be used as inlet filters; - Check that gravel size and quality comply with standards At development Verify water clarity and note time taken to get clear water gushing out of the borehole.

Methodology / how the session is led:

Key learning and discussion points:

- ✓ Technical characteristics of a borehole (use visual medium);
- ✓ Quality of materials used for borehole construction;
- ✓ Process used to develop the borehole.

Ask participants to explain how drilling work is generally conducted. Then ask the following question:

1. Which community members should show the drilling company the point selected for drilling, and why? (Participants are invited to share experience that can justify their opinion)

2. Use a photo or diagram to explain the various parts that make a borehole (water inflow, water catchment with inlet filters in front of water inflow, water filtering through gravel packing, etc.)

3. Ask participants to discuss the quality of PVC casing and gravel packing & other features that will make it a high quality borehole.

Provide the participants with any additional information they may not have mentioned regarding quality materials and good borehole development, for example:

- Inlet filters should: let water flow easily in and let fine particles in during the development stage (perforations should not be too small), hold out soil materials outside the inlet filter at borehole exploitation stage (perforations should not be too large either).
- Filtering (gravel) packing should: hold bigger solid elements from the aquifer and let finer elements in, especially during development stage (cleaning of the borehole).

NB: make sure samples of good and poor quality inlet filters and gravel are available (sawn PVC casing, non-silica and non-water-worn gravel) for participants to see.

4. Ask participants to give the features of good quality water.

5. Explain the process and equipment required for the development of the borehole (cleaning of the borehole) for at least 4 hours or more (if necessary) until the water becomes clear.

6. At the end of the session, ask participants to:

a) Summarize the types of materials to be used, how to clean the borehole and what the borehole water should look like at the end of the borehole development.

b) Discuss what to do if:

- They note that the borehole is being drilled out on a different site from the selected one;
- The contractor is not using good quality materials or does not comply with best practices;
- They note that the water is not clean at the end of the borehole development.

Session duration

The session will last about 2 hours.

How the session is carried out

The session is in plenary

Materials needed

- Diagram of a borehole;
- Good quality sample of a gravel filter pack;
- Poor quality sample of gravel;
- Good quality sample of a PVC strainer;
- Sample of a hand sawn slotted PVC tube (poor strainer).

Preparation

- Knowledge of good quality gravel ;
- Good understanding of the stages of borehole development.

When using an old (high flow) borehole

In this case, there is need to ensure that there is no dispute around ownership of the borehole and it is located within the village land boundaries. The water must also be of good quality.

It is necessary to mention that the continuation of the process is linked to the water quality analysis results. This analysis is done by a laboratory. Beyond the visual aspect, the safety of the water is also related to some characteristics (physical, chemical and bacteriological). Most of the time it is cheaper to drill another borehole somewhere else than treating a poor quality water.

B / Layout of equipment and various infrastructures

This module deals with the layout of water collection points (standpipes), water tower and watchman's house:

- ✓ Avoid errors in water point (a site different from the one selected by consensus by the village);

- ✓ Avoid installing unplanned connections;
- ✓ Avoid installing the water tower on a forbidden site.

How is the work carried out?	Exact siting of the location of the various taps and of the water tower.
What are the key factors at this stage?	Layout of only the planned water points and of the water tower at the selected locations (without any later additions that were not part of the design).
How to assess the quality of the work? **Actions to be taken?**	Presence of WUA before and during the time that layout is being done.

Methodology / how to run the session:

Key learning and discussion points

- ✓ Risks of laying out water points at locations not initially selected/not part of the original design, risk of increasing water points beyond the initial number planned;
- ✓ Consequences of locating the water tower on a forbidden site;
- ✓ What are the community member(s) who should monitor the work?

Ask participants to explain how the practical layout work is usually conducted in the field. Then ask the following question:

Q1. Who should show the team in charge of laying out the points selected for water points (taps) installation, and why? (Participants are invited to share experience that can justify their opinion)?

Q2. Who should validate the location proposed for the water tower following the topographic surveys?

Q3. Who are the community members that must be present during the layout work? And why?

Throughout the various sections of this session, let participants argue and discuss at length.

At the end of the session, ask participants to give a summary of the best practices to be adopted for the practical layout stage.

Session duration

The session will last about 45 minutes

How the session is organized

The session should be held directly in plenary.

Materials needed

None

Preparation

None

C / Installation of the power generator and the submersible pump

The purpose of this module is to allow community representatives to know what the function of the generator and the pump are, the conditions under which they function best, and which main aspects must be monitored at the time that they are being installed:

- ✓ Utility and optimal operating conditions of the solar generator and the pump;
- ✓ Quality of the foundations (concrete and layout) of the pillars supporting the solar panels and the consequences of poor quality foundations;
- ✓ Absence of any potential source of shade on the solar panels.

How is the work conducted?	The work is carried out by a specialist sub-contractor with specialist knowledge in Solar-Electricity
What are the determining factors at this stage?	Installing the solar generator correctly (on a good structure) to avoid the stands of the panels sagging, or being displaced or blown-away by the wind (their orientation to catch maximal sunlight is also very important). Eliminate any potential source of shade on the solar panels.
How to assess the quality of the work being carried out? **Actions to be taken?**	<u>Foundation dimensions are decisive (depth, width and length)</u> - Check foundations dimensions are good. <u>Quality of materials is essential</u> - Check that the sand and gravel used do not contain dirt and/or clay; - Check if the cement used comes from dry, hermetically sealed bags, is in a fine powder, and does not contain lumps ; - Check if the water used is clear and not salty. <u>Remove anything likely to cast shade on the solar panels</u> - Check that there is nothing likely to cast shade is next to/near the solar panels. <u>Making good concrete is essential</u> After the concrete has set, ensure it is watered twice a day (morning and afternoon) for at least one to two weeks.

Methodology / how to run the session:

Key learning and discussion points

- ✓ Role of foundations in keeping the solar panels stable for optimal operation;
- ✓ Good quality concrete requires good materials and strict compliance with proper mixing and curing;
- ✓ No infrastructure or obstacle should be close enough to cast shade on the panels.

This session will deal with the following aspects:

- The dimensions of foundations and the quality of concrete are very important for a good structure that provides adequate support to the solar panels;
- The quality of materials is highly important in making good quality concrete;
- Using good quality materials is not enough; mixing and curing them properly is essential

1. Ask participants what makes a robust stand. Get participants to describe the consequences that will result from a poorly made foundation for the solar panel stand.

2. Ask participants to describe the possible negative impact of shade on the functioning of the pumping system.

3. Ask participants to give the components required to make concrete. Give additional information or corrections if necessary.

4. Ask participants to mention the qualities that must be found in these various materials and explain why these qualities are required.

Ensure you supplement the missing elements in their answers.

Display good and poor quality samples of the materials for participants to see.

5. Concerning best practices, ask participants to tell the "DO"s and "DON'T"s in making concrete. Ask them to justify their answers about the mixing ratios, mixing of the materials, and the watering.

6. To test their knowledge, ask participants how one can verify whether a piece of concrete or a stand is properly made. Listen to their answers and give them the right answer in case they cannot find it.

Make a practical test.

7. At the end of the session:

a) Ensure that participants make a summary of the main points on the use of good foundations for the solar-panel supporting stand, on the quality of materials to be used and on the best practices in making concrete.

b) Discuss with them about what they can do in case
   - They notice that the dimensions of the stand are inadequate ;

- They notice that the work team are not using good materials or are using wrong mixing ratios to do the concrete;
- The concrete is not properly watered (morning and afternoon over the required period) ;
- They notice that some obstacle next to the solar panels is casting shade on them.

Session duration

The session will last about 1h30 minutes

How the session is organized

The session should be held in plenary.

Materials needed

- Samples of good quality sand and gravel;
- Samples of poor quality sand and gravel;
- Samples of badly mixed concrete materials;
- Samples of well cured concrete;
- Samples of poorly cured concrete.

Preparation

Good knowledge of the consequences of poor quality materials and bad practices for making cinder blocks and concrete. Good understanding of how the structure of the stand works and the role of foundations in supporting the stand carrying the heavy weight of the solar panels. Knowledge on the minimal sizes for the foundations of the stands.

D / Installing the water tower

This module will teach community representatives the key aspects in the installation of the water tower and the need for them to monitor this installation and to understand the role of the water tower and the plans for its protection:

- ✓ Role of the water tower;
- ✓ Quality of foundations (concrete and layout).

Who carries out the work?	The work is carried out by a contractor
What are the determining factors at this stage?	Dig out the soil and lay foundations at the recommended depth with good quality concrete A metal water tower must be painted (with several layers) for protection against corrosion
How to assess the quality of the work? **Actions to be taken?**	<u>The correct dimensions of the foundations are vital (depth, width and length)</u> - Check adequacy of the dimensions of the foundations. <u>The quality of the materials used is vital</u> - Check that the sand and gravel used do not contain dirt or clay; - Check if the cement used comes from dry, hermetically sealed bags, is in a fine powder, and does not contain lumps; - Check if the water used is clear and not salty. <u>Making concrete adequately is essential</u> - After the concrete has set, ensure it is watered twice a day (morning and afternoon) for at least one to two weeks. <u>Metal water tower must be well protected against corrosion</u> Check if water towers are painted: number of layers, quality of layer application.

Methodology / how to run the session:

Key learning and discussion points

- ✓ The role of the foundations in maintaining the water tower steady;
- ✓ Good quality concrete requires good materials and compliance with specific regulations regarding mixing and curing the concrete ;
- ✓ How to protect the water tower against deterioration (case of metal water towers);
- ✓ The role played by the water tower in the whole system.

This session will focus on the following:

- The dimensions of the foundations (which depend on the total charge to support and the soil characteristics) and the quality of the concrete are very important for the quality of the structure of the water tower;
- The quality of materials is decisive to ensure good quality concrete;
- Having good quality materials is not enough, it is essential to use them properly (mixing and curing);
- The water tower plays many roles in the water supply system: giving pressure to the network, allowing the pump to rest and not work continuously or while the standpipes are operating, storing water to allow for maximum draw-off times.

1. Ask participants to tell what makes a water tower stand robust. Get participants to tell the consequences of making poor foundations for the water tower.

2. Ask participants to give the components required for making concrete. Supplement or correct their answers.

3. Ask participants to list the qualities they expect to see in these materials and justify their answers.

Supplement their answer with the missing elements.

Display samples of good and poor quality materials for participants to see.

4. Concerning best practices, ask participants to tell the « DO »s and « DON'T »s when making concrete and to justify their answers on the ratios of materials when mixing concrete, and curing it correctly.

5. Ask participants how one can verify whether a piece of concrete or a stand is properly made. Listen to their answers and give them the right answer in case they cannot find it.

Make a practical test.

6. At the end of the session:

c) Ensure that participants make a summary of the main points on the use of good foundations for a stand support, on the quality of materials and the best practices in making concrete.

d) Discuss with them about what they can do in case
   - They notice that the dimensions of the foundations are inadequate ;
   - They notice that the contractor's team are not using good materials or are using wrong ratios when mixing concrete;
   - The concrete is not properly cured (watered morning and afternoon over the required period) ;
   - They notice that the paint application on water towers is faulty (type of paint, number of layers, and quality of application).

Session duration

The session will last about 1h

How the session is organized

The session should be held in plenary.

Materials needed

- Samples of good quality sand and gravel;
- Samples of poor quality sand and gravel;
- Samples of badly mixed concrete materials;
- Samples of badly cured concrete;
- Samples of well cured concrete.

Preparation

Good knowledge of the consequences of poor quality materials and bad practices for concrete. Good understanding of how the structure of a stand works and the role that foundations play in the strength of the stand. Good knowledge of the role water towers play in storing water and providing height for gravity water supply systems.

E / Layout of mains

The purpose of this module is to enable community representatives to understand how the water mains must be laid out and the importance of each aspect of the mains layout work so that they can ensure good supervision:

- ✓ Depth at which mains should be laid;
- ✓ Installation of special parts like bends, valves, etc.;
- ✓ Installation of the mains on a bed of sand;
- ✓ Check that the system is tight, has no leaks.

Who does the work?	The work is carried out by a contractor with plumbing knowledge
Which are the determining factors at this stage?	Laying the pipes at the recommended depth (trenches of at least 0.80 m deep) in order to protect them from weathering and overloads and other risks (e.g.: plows and other farming implements) At turning points where pipes change direction, abutment must be placed to avoid pipes uncoupling under the pressure of water). Avoid using hand-made parts instead of correctly manufactured parts like bends (heating and hand-bending a UPVC pipe is not adequate) No leakage should be found in the laid pipes and the whole system of pipes should be tested before the trenches where pipes are laid are back-filled.
How to assess the quality of the work? **Actions to be taken?**	<u>Storage of pipes on the construction site</u> - Pipes (in PVC or HDPE) should be stored under the shade to avoid sunrays degrading them <u>The depth at which pipes are laid is important</u> - Check if the pipes are laid at the appropriate depth. <u>Pipes laid on a bed of sand</u> - Check if the pipes are laid on a loose (sand) bed that is at least 10 cm thick. <u>Abutment help avoid uncoupling and leaks</u>

	- Check if abutments are placed at turning points where pipes change direction. <u>No use of non-genuine parts (e.g.: heated pipes to make bends)</u> - Check that bends are not hand-crafted from heated pipes and used in the mains network. <u>No leakage should be found on laid pipes</u> A test to verify appropriate laying of pipe and absence of leakage should be conducted.

Methodology / how to run the session:

Key learning and discussion points:

- ✓ Compliance with the a minimal depth at which pipes should be buried ;
- ✓ PVC or HDPE pipes must be constantly stored under the shade prior to their laying ;
- ✓ Good quality materials must be used for the sand-bed. To be efficient, the sand bed should be of the prescribed thickness;
- ✓ Materials used for back-filling of trenches must be loose;
- ✓ After laying pipes, water tightness and leakage control tests must be made before back-filling in the trenches;
- ✓ At turning points, pipes should be held steady (with abutment);
- ✓ Special parts (e.g.: bends) should not be hand-crafted (pipes heated to force them into a given shape).

1. The modules will be taught using a participatory approach, banking on participants' knowledge and reasoning, etc.

2. Make various samples available: good special parts, hand-crafted special parts, etc. photographs and pictures can be used to show some aspects (e.g.: abutment, etc.).

3. Discuss with them about what they can do in case they note that:

- The trenches do not comply with the prescribed depth;
- Abutments are not placed at pipe turning points;
- Sand-bed is not used, or is of poor quality, or the materials used for backfilling in the trenches are loose;
- The PVC or HDPE pipes are stored under the sun before being laid;
- The company laying the mains has not carried out a leakage test.

Session duration

The session will last about 1h30 minutes

How the session is organized

The session should be held in plenary.

Materials needed

- Samples of pipes, genuine special parts and non-genuine special parts;
- Samples of PVC and of HDPE pipes made 'brittle' in the sunshine so are easy to crack/leak;
- Display heaps of poor quality materials that should not be used for filling in after laying pipes.

Preparation

Good knowledge of the effects of sunrays and overload on PVC and on HDPE pipes, good understanding of water flow and using gravity to get water from the storage tank to the water delivery points, why putting in more than the planned connections reduces water pressure so much that water will not come out of the taps at the distal end of the pipe network, understanding forces applying at pipe turning points, knowledge and understanding of how pressure test is conducted on laid pipes, etc.

F / Construction of water distribution points

The purpose of this module is to enable community representatives to assess the quality of the construction work of water points (standpipes):

- ✓ Quality of aggregates;
- ✓ Making concrete and rendering.

Who carries out the work?	The work is done by a contractor with plumbing/water engineering knowledge
Which are the determining factors at this stage?	Building robust water points.
How to assess the quality of the work? **Actions to be taken?**	<u>The quality of the materials used is decisive</u> - Check that the sand and gravel used do not contain dirt or clay; - Check if the cement used comes from dry, hermetically sealed bags, is in a fine powder, and does not contain lumps - Check if the water used is clear and not salty. <u>Making good concrete and render is vital</u> - Check for compliance with instructions on adequate proportions of materials used to make concrete and adequate mixing; - Check if the concrete is cured by watering in the morning and in the afternoon after setting for at least one to two weeks; Check if all rendered surfaces are watered after setting in the morning and in the evening for at least one to two weeks.

Methodology / how to run the session:

Key learning and discussion points:

✓ Good quality concrete requires good materials and compliance with specific criteria regarding mixing and curing.

This session will deal with the following messages:

- Poor quality materials cannot be used to produce good concrete;
- Using good quality materials is not enough; using them properly is essential (compliance with correct ratios and good mixing of materials).

1. Ask participants to give the components required for making concrete. Supplement or correct their answers if necessary.

2. Ask participants to mention the quality they expect to see in these various materials and justify their answers.

Please supplement answers with missing aspects.

Display samples of good quality and poor quality material for participants to see.

3. Concerning best practices, ask participants to tell the «DO»s and «DON'T»s when making concrete and to justify their answers on location of production, mix ratios (proportions of sand and gravel), materials mixing, and curing.

4. At the end of the session:

e) Make sure participants give a summary of the quality of materials and best practices in making concrete.

f) Discuss with them about what they can do in case:

- They note that the workers do not used good quality materials and/or do not use appropriate ratios in mixing the materials ;
- They note that the concrete or the mortar (rendering) are not adequately watered (in the morning and the evening during the required period).

Session duration

The session will last about 30 minutes.

How the session is organized

The session should be held in plenary.

Materials needed

- Samples of good quality sand and gravel;
- Samples of poor quality sand and gravel;
- Samples of badly mixed concrete materials;
- Samples of badly cured concrete;
- Samples of well cured concrete

Preparation

Good knowledge of the consequences of using poor quality material and wrong practices in making cinder blocks and concrete. Good knowledge of the correct ratios in making concrete.

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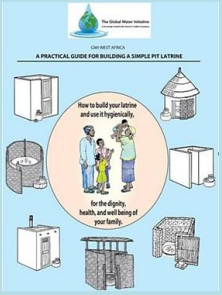
The GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation:

A practical guide for building a simple pit latrine.

ref.: 2011-01-E

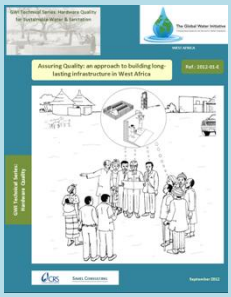


Contracting for water point construction: Provisional and final acceptance forms.

ref.: 2012-04-E

Assuring Quality: an approach to building long-lasting infrastructure in West Africa.

ref.: 2012-01-E

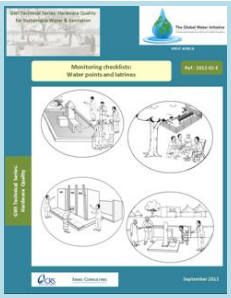


The essential steps before handing-over a borehole (with hand pump) to the community.

ref.: 2012-05-E

Monitoring checklists: water points and latrines.

ref.: 2012-02-E



Community monitoring during the construction of a gravity-fed, solar powered water supply: a training guideline.

ref.: 2012-06-E

Community monitoring of borehole construction: a training guideline.

ref.: 2012-03-E

Making the right choice: comparing your rural water technology options.

ref.: 2012-07-E

These documents are also available in French.

The main authors are Lambert Zounogo P. Nikiema (CRS), Sue Cavanna (Sahel Consulting) and Jean-Philippe Debus (CRS).

The Global Water Initiative
A Partnership Funded by the Howard G. Buffet Foundation

The essential steps before handing-over a borehole (with hand pump) to the community

Doc Réf. : 2012-05-E

Before construction of the borehole

Determine the operating and maintenance costs (on 15 or 20 years according to the provisional life cycle of the facilities) and the eventual pump replacement costs of the facilities.

Determine the operating and maintenance costs, and the replacement costs that the community will be responsible for.

Ensure with the community/commune that the water payment method and the tariff/rate adopted will be adequate for all the expenses that the community is responsible for (organize a meeting with the community on this subject).

During construction of the borehole

Verify that the water quality is consistent with national standards for drinking water and explain these to the community.

Train the pump mechanics on the current maintenance needs of the pump and give them an illustrated guide (in the local language) on the current maintenance requirements of the pump.

To allow for village level maintenance and spare-part replacement to be carried out, provide a basic set of good quality tools for the type of pump fitted to that borehole in that village.

Ensure that the superstructure, pump, and borehole provisional acceptance are properly completed.

After construction of the borehole

Be sure that an experienced and skilled pump mechanic is available and accessible within a reasonable distance to the community. If not either re-train the existing mechanic if he has potential or train a new one.

Train the pump care-taker and the water point management committee (or the water users association) on water point monitoring: sanitary evaluation, state of the physical infrastructure (including yield and leakage tests), and pump management monitoring.

Sensitize the managers and the users on good practices to reduce costs of O&M (preventive maintenance, early repair, careful use of the pump, sanitary survey, etc.).

Organize an official hand-over of the water point to the local government and support the local government to approve an agreement, delegating the water point management to the statutory water management structure established in the village.

Give the Local Government and the village water point committee a file containing all the documents pertaining to that particular water point: this file should include any technical sheet, water quality analysis results, the pump installation dossier, the water point provisional acceptance document, etc.

The water point can now be used

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WEST AFRICA

GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation

The Global Water Initiative

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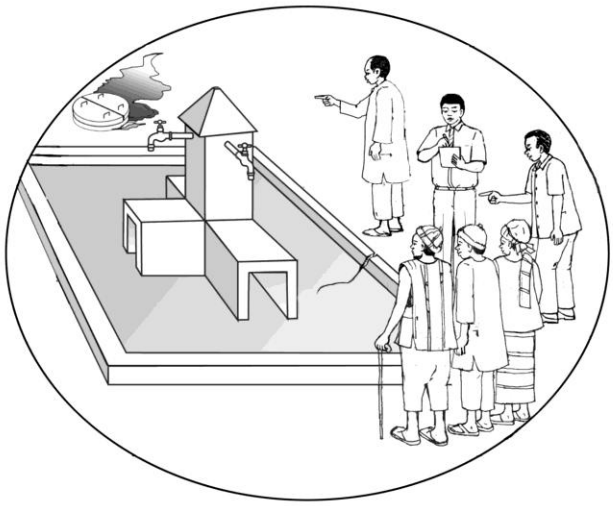
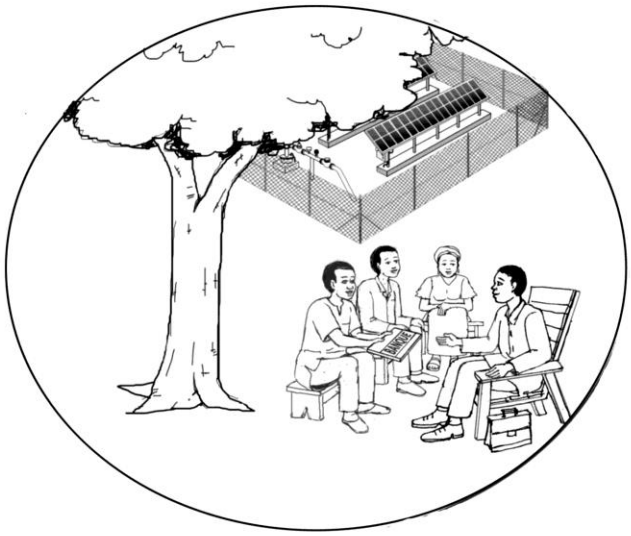
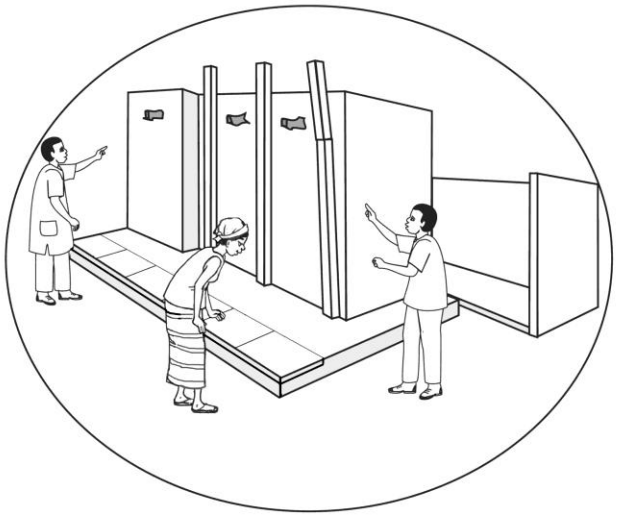
WEST AFRICA

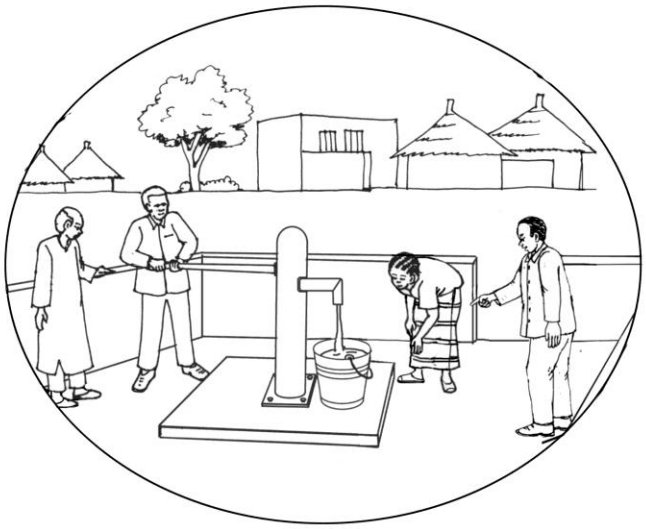
Monitoring checklists: Water points and latrines

Ref.: 2012-02-E









GWI Technical Series: Hardware Quality

CRS CATHOLIC RELIEF SERVICES

SAHEL CONSULTING

September 2012

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About this series

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** is a Global Water Initiative tool that was developed in West Africa by Catholic Relief Services (CRS) and Sahel Consulting as a response to common difficulties in rural water & sanitation projects.

Each document in the series addresses a particular aspect of technology choice, design, build and maintenance. All these aspects are important in delivering a reliable and lasting community water/sanitation resource within an increasingly decentralised context.

We aim to influence those with the power and responsibility to get water and sanitation to the rural poor.

We also want to influence the communities themselves to become proactive and break away from their past role as passive beneficiaries.

The tools have been designed and field tested for use with communities, development workers, commune leaders and government technical services. They focus specifically on gaining an informed understanding that will lead these key decision makers to choosing the correct technology, supervising construction to assure quality, putting in place correct operation and maintenance systems, and assuring that revenue generated is adequate to keep that service going.

These tools are not a method in themselves, they presume that anyone using them is already engaged in a robust participatory process.

The **GWI Technical Series: Hardware Quality for Sustainable Water & Sanitation** includes:

A practical guide for building a simple pit latrine	ref.: 2011-01-E
Assuring Quality: an approach to building long-lasting infrastructure in West Africa	ref.: 2012-01-E
Monitoring checklists : water points and latrines	ref.: 2012-02-E
Community monitoring of borehole construction: a training guideline	ref.: 2012-03-E
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Making the right choice: comparing your rural water technology options	ref.: 2012-07-E

Please use any of the documents freely. They can be downloaded from http://www.crsprogramquality.org/publications/tag/water-manualsuser-guides.

We would be most interested to receive feedback from you on the usefulness of this material.

The series is published in French and English. If you translate the material into another language please send a copy to lambert.nikiema@crs.org, jeanphilippe.debus@crs.org, suecavanna@sahelconsulting.org.uk.

Acknowledgements

This document was developed by Lambert Zounogo P. NIKIEMA (CRS), Sue CAVANNA (Sahel Consulting), and Jean-Philippe DEBUS (CRS), the Hardware Quality team of the Global Water Initiative (GWI) in West Africa.

GWI project staff from all five GWI countries contributed ideas during the early development stages, and most importantly tested the material in the field. We are indebted to them.

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About the Global Water Initiative

The Global Water Initiative (GWI), supported by the Howard G. Buffett Foundation addresses the challenge of providing long term access to clean water and sanitation, as well as protecting and managing ecosystem services and watersheds, for the poorest and most vulnerable people dependent on those services. Water provision under GWI takes place in the context of securing the resource base and developing new or improved approaches to water management, and forms part of a larger framework for addressing poverty, power and inequalities that particularly affect the poorest

populations. This means combining a practical focus on water and sanitation delivery with investments targeted at strengthening institutions, raising awareness and developing effective policies.

The Regional GWI consortium for West Africa includes the following partners:

- International Union for the Conservation of Nature (IUCN)
- Catholic Relief Services (CRS)
- CARE International
- SOS Sahel (UK)
- International Institute for Environment and Development (IIED).

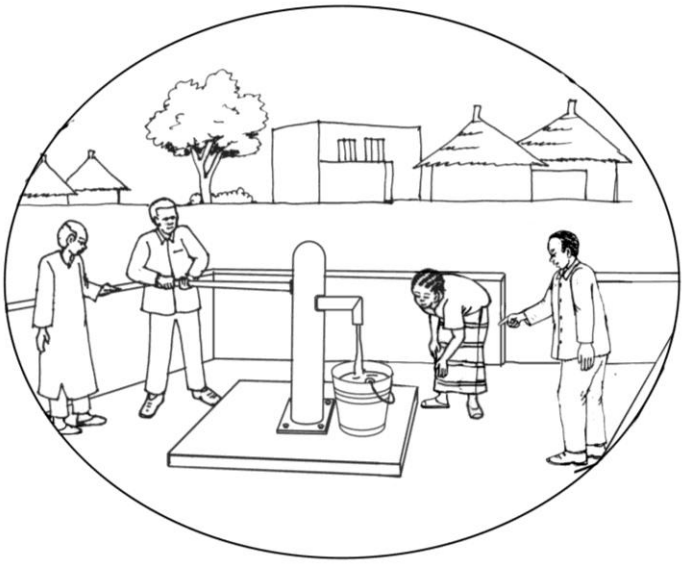
GWI West Africa covers five countries: Burkina Faso, Ghana, Mali, Niger and Senegal. Some activities also take place around the proposed Fomi dam in Guinea. For more information on the GWI, please visit: www.globalwaterinitiative.com.

The following check-lists have been developed to monitor water and sanitation infrastructure development in rural communities.

They can be used as a training guide for community management committees and water point supervisors.

1. BOREHOLE WITH HAND/FOOT PUMP: MONITORING CHECKLIST

Nature of the monitoring	Frequency
Water point sanitary assessment	Monthly
State and functioning of the pump	Monthly
Water quality	Monthly
User behaviour	Monthly
Capacity to monitor and maintain the water point.	Quarterly



1. Water point sanitary assessment

1.1 Location

		Yes	No	Action to take if "Yes"
1	Is there a latrine within 30 m of the water point?			Remove the latrine
2	Is there a manure pit or a rubbish dump within 30 m of the water point?			Remove the manure pit/rubbish dump
3	Is there an animal enclosure within 30 m of the water point?			Relocate the animal enclosure to more than 30 m away
4	Are there any chemicals (waste oil, petrol, solvent) within 50m of the water point?			Remove these chemicals
5	Is the fencing around the water point inadequate, allowing animals in?			Raise users' awareness and request them to build the protection fencing.

1.2 Condition of the Pump

		Yes	No	Action to take if "Yes"
6	Is the pump unsteady?			Replace the missing screw nuts / tighten the screw nuts
7	Is the pump broken?			Repair or replace the broken part
8	Is there any pooling of water on the concrete floor around the hand-pump?			Verify the condition of the joints and the hand-pump (pump body pierced due to rust?)

1.3 Condition of the concrete slab and of the overall drainage of water away from the water point

		Yes	No	Action to take if "Yes"
9	Is the concrete floor less than 1m wide around the hand-pump?			Repair the concrete floor or build a new one.
10	Are there any cracks in the concrete floor around the hand-pump?			Repair the cracks.
11	Are there breakages or cracks in the drainage channel?			Repair the breakage or cracks.

		Yes	No	Action to take if "Yes"
12	Is there stagnant water on the concrete slab or in the drainage channel?			Clean up, scour the concrete floor / drainage channel Redo the concrete slab slope if necessary.
13	Is there stagnant water around the water point?			Fill in the holes around the water point superstructure and improve the drainage in the surroundings of the water point.
14	Is the concrete slab or the drainage channel dirty?			Clean up and scour the concrete floor or the drainage channel

1.4 Condition of the water-trough and the soak-away pit.

		Yes	No	Action to take if "Yes"
15	Is the water-trough overflowing?			Clean up the water-trough, unclog the drainage pipe.
16	Is the soak-away pit overflowing?			Empty the soak-away pit, remove the sediments and replace the rough stones. Raise users' awareness on a proper management of the water (avoid wasting the water).

	Yes	No	Observation
TOTAL / 16			**If the number of "Yes" is high the sanitary risk is high for this water point.**

Note: Recommended frequency of the water point sanitary Condition monitoring: Monthly.

2. State and functioning of the pump

		Yes	No	Action to take if "Yes"
1	Is any part of the pump missing?			Supply the missing part
2	Are there bolts / screw nuts which are not in place or well tightened?			Supply the missing bolts and or screw nuts and tighten those which are not well tightened.

		Yes	No	Action to take if "Yes"
3	**Is the pump leaking?** Leakage test: (to be conduct after stopping the pump for 30 minutes) If more than 5 pump strokes are necessary before the water comes out of the pump there is a leakage that requires attention.			Look for the cause → Call for the local pump technician. It is possible that the inlet valve is worn or that there is leakage around the pipes connections.
4	**Has the yield decreased?** Yield test: Begin the yield test immediately after the pump has been in continuous use. Give 40 pump strokes during approximately 1 minute while collecting the water in a bucket: the quantity of the water collected must be more than 10 litres.			→ Call for the local pump technician. The piston valve, the piston joint or the cylinder may be worn out.
5	Is the pump action heavy? More heavy than before?			→ Call for the local pump technician. Check that there is no mud in the pump cylinder or anything else that could block the pumping mechanism.
6	Is the pump making abnormal noises?			→ Call for the local pump technician. Find out why (sometimes a part can be worn out or damaged). Make the necessary repair.
7	Abnormal sideways "play" in the pump handle action?			→ Call for the local pump technician. Find the reason (sometimes a part can be worn or damaged). Make the necessary repair.
8	Are there other abnormalities?			Find out the reason. Make the necessary repair.
9	In the pump broken down (not functioning) ?			Look for the reason and repair the pump → Call for the local pump technician

Note: Recommended frequency to monitor the pump working state: Monthly.

3. Water quality

Note: The following tests are not scientific quality tests of water quality but help to identify potential problems.

		Yes	No	Action to take if "Yes"
1	Is the water turbid?			Inform the commune and technical services in charge of drinking water supply.
2	Does the water have an odour?			Inform the commune and technical services in charge of drinking water supply.
3	Does the water have an abnormal taste?			Inform the commune and technical services in charge of drinking water supply.

Note: Recommended frequency of Water quality monitoring: Monthly.

4. User behaviour

		Yes	No	Action to take if "Yes"
1	Is the pump badly handled?			Inform / sensitize users and water point managers on the link between the pump use and its durability.
2	Is there water wastage (e.g.: water overflowing from containers)?			Invite water point management committee to sensitize users on good management of water and the pump.
3	Are there other actions spoiling the superstructure? (e.g.: bicycles leaning against the walls of the superstructure)			Invite the water point committee to include this point in the water point use rules, and to toughen up on their inspection.
4	Are water containers generally dirty?			Necessity of a reminder on hygiene.
5	Are the containers generally uncovered (or cans not having a cork)?			Necessity of a reminder on hygiene.

Note: Recommended frequency of water point user behavior monitoring: Monthly.

5. Capacity to monitor and maintain the water point.

		Yes	No	Action to take if "No"
1	Is there a water point manager at the water point all time that the pump is in use?			Request the community to appoint water point managers.
2	Has he/she been well trained?			Organize training for the water point manager.
3	Is there at least one pump mechanic in the local area able to maintain the pump periodically?			Get the community to identify at least one person to be the pump mechanic and provide training for this person.
4	Is there a water point maintenance programme?			Invite water point managers to put in place a maintenance programme.
5	Is there a record of any maintenance on the pump?			Get the pump managers to use such a record
6	Does the pump manager know how to conduct a leakage test?			Teach him to do the leakage test.
7	Are the correct pump maintenance tools (keys, etc.) available?			Provide the necessary tools or suggest that the water point managers buy them.
8	Is there enough money available (be exact on the amount) and in a secure place ready for the repairs?			Work with the water point manager to put in place a water payment system and make sure that money collected will be looked after securely.

Note: Recommended frequency for monitoring the capacity of the community to monitor and maintain the water point: every 3 months.

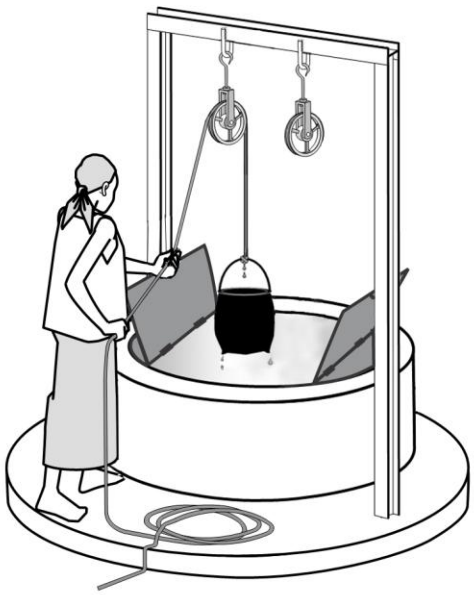
Additional points on management

If there is a maintenance schedule for the water point (pump), describe it:

How many times has the pump broken down since the last monitoring? What have been the nature of the failures and how much time has it taken to repair the pump (to have it functional again) for each case?
What is the system of obtaining the spare parts?
What is the actual amount of money available (in a bank) for the water point maintenance and repairs?
What was the original agreed annual amount that the community would contribute to assure enough money is set aside for maintenance and repairs?
Is the amount being collected enough to meet this target?

2. IMPROVED HAND-DUG WELL WITH PULLEY: MONITORING CHECKLIST

Nature of the monitoring	Frequency
Water point sanitary assessment	Monthly
Condition of the water-drawing equipment and concrete rings (both non-porous and porous filter rings)	Monthly
Well yield and water quality.	Monthly
User behaviour	Monthly
Capacity to monitor and maintain the water point.	Quarterly



1. Water point sanitary assessment

1.1 Location

		Yes	No	Action to take if "Yes"
1	Is there a latrine within 30 m of the water point?			Remove the latrine
2	Is there a manure pit or a rubbish dump within 30 m of the water point?			Remove the manure pit / rubbish dump
3	Are there any animals' enclosures within 30 m of the water point?			Relocate the enclosure beyond 30 m of the water point.
4	Are there any chemicals (waste oil, petrol, solvent) on or around the water point (within 50m)?			Remove these chemicals
5	Is the fencing around the hand-pump inadequate, allowing animals in?			Raise users' awareness and request them to build protective perimeter fencing

1.2 Drawing water

		Yes	No	Action to take if "Yes"
6	Could the bucket infect the water?			Establish rules for the use and storage of the buckets in order to prevent the contamination of the water in the well.
7	Could the rope used be a source of contamination of the water?			Find a system to prevent any contaminated rope (rope dragging on the ground) from entering the well.
8	Is the well without a cover?			Put in place a system to cover the well when it is not used.

1.3 Condition of the headwall, the concrete floor and the drainage.

		Yes	No	Action to take if "Yes"
9	Are there breakages or cracks on the headwall enabling the water to flow back from the concrete floor into the well?			Repair the breakage or the cracks.
10	Is the concrete floor less than 1m wide around the headwall?			Repair the concrete floor or build it to be at least 1 m wide all around.

		Yes	No	Action to take if "Yes"
11	Are there breakages or cracks on the concrete floor enabling water to infiltrate into the soil?			Repair the breakage or the cracks.
12	Are there breakages or cracks on the drainage channel?			Repair the breakage or the cracks.
13	Is there stagnant water on the concrete floor or in the drainage channel?			Clean up and scour the concrete floor or the drainage channel Re-do the concrete floor slope if necessary.
14	Is there stagnant water around the water point?			Fill in the holes around the water point superstructure; improve the drainage in the surroundings of the water point.
15	Is the concrete floor (platform) or the drainage channel dirty?			Clean up and scour the concrete floor or the drainage channel
16	Is the fencing around the well broken, allowing animals into the well enclosure?			Reconstruct the well enclosure.

1.4 Condition of the water-trough and of the soak-away pit.

		Yes	No	Action to take if "Yes"
17	Is the water-trough overflowing?			Clean up the water-trough and unclog the outlet pipe.
18	Is the soak-away pit overflowing?			Empty the soak-away pit, remove the sediments and replace the rough stones. Sensitize the users for better management of the water (avoid wasting the water).

	Yes	No	Observation
TOTAL / 18			**The higher the number of "Yes", the higher is the sanitary risk to the water point.**

Note: Recommended frequency of the water point sanitary Condition monitoring: Monthly.

2. State of the water-drawing equipment, and of the concrete rings (both non-porous and porous filter rings)

		Yes	No	Action to take if "Yes"
1	Is the drawing frame broken or not usable?			repair / replace it
2	Is there a lack of pulley or is the pulley not working (broken)?			Repair the pulley or manufacture a new one.
3	Are parts of the concrete ring lining broken away?			It is necessary to repair these parts.
4	Are there signs of damage (cracks) to the concrete ring lining?			Fill in the cracks.
5	Is the porous filter ring tilted?			It is necessary to rehabilitate these parts.

Note: Recommended frequency of the condition of the drawing equipment and concrete ring monitoring: monthly

3. Well yield and water quality.

Note: The following are not scientific quality tests of the water but help to identify potential problems.

		Yes	No	Action to take if "Yes"
1	Has the water rest level diminished (abnormally) compared to the time the well was newly constructed?			Clean out any sediment from the well and, if necessary, clean the porous filter ring (open the blocked holes). The intervention of a specialist is necessary. The deepening of the well must be undertaken if the water rest level has significantly dropped and if cleaning out the bottom of the well and the porous filter rings have not increased the water rest level.
2	Is the water turbid?			Clean out the well / develop the well to an adequate standard

		Yes	No	Action to take if "Yes"
3	Does the water have an odour or smell bad?			Undertake disinfection of the water within the well with chlorine or bleach, then empty the well completely after the contact period. Make sure that there is no dead animal inside the well. If there is, remove it and fully disinfect the well as above.

Note: Recommended frequency of well yield and water quality monitoring: monthly.

However, there can be occasional alerts on the water quality (odour, turbidity).

4. User behaviour

		Yes	No	Action to take if "Yes"
1	Is there water wastage (e.g.: water overflowing from containers) or water pooling around the well?			Invite water point management committee to sensitize users on good management of water.
2	Are there other actions that spoil the superstructure (e.g.: bicycles lying on the walls of the superstructure).			Invite the water point management committee to include this point in the water point use rules, and to toughen up on their inspection.
3	Are water containers generally dirty?			Necessity of a reminder on hygiene.
4	Are the containers generally uncovered (or cans without a cork)?			Necessity of a reminder on hygiene.

Note: Recommended frequency of the water-point users behavior monitoring: Monthly.

5. Capacity to monitor and maintain the water point.

		Yes	No	Action to take if "No"
1	Is there a water point manager?			Guide the community to put in place (a) water point manager(s).
2	Has the water point manager been well trained?			Organize training for the water point manager.

		Yes	No	Action to take if "No"
3	Is there a person in charge of the periodic maintenance of the well (minor repairs, well interior inspection, concrete ring cracks filling in)?			Ask the community to identify a person in charge of the maintenance of the well, and to provide training for this person.
4	Has the person in charge of the maintenance of the well been well trained?			Organize the training of the person in charge of the maintenance of the well.
5	Is a water point maintenance schedule applied?			Invite water point managers to adopt / apply a maintenance schedule and follow it rigorously.
6	Is there a chart to monitor/record any maintenance on this water point?			Ask the water point managers to use this kind of chart and to check the chart at every 3 months meeting.
7	Are the correct well maintenance tools (rope, helmet, trowel, bucket, security belt, etc.) available?			Provide the necessary tools or ask the water point managers to buy them.
8	Is there enough money available (be exact on the amount) and in a secure place ready for the repairs?			Work with the water point manager to put in place a water payment system and make sure that the money collected will be looked after seriously.

Note: Recommended frequency of the monitoring of the capacity of the community to monitor and maintain the water point: every three months.

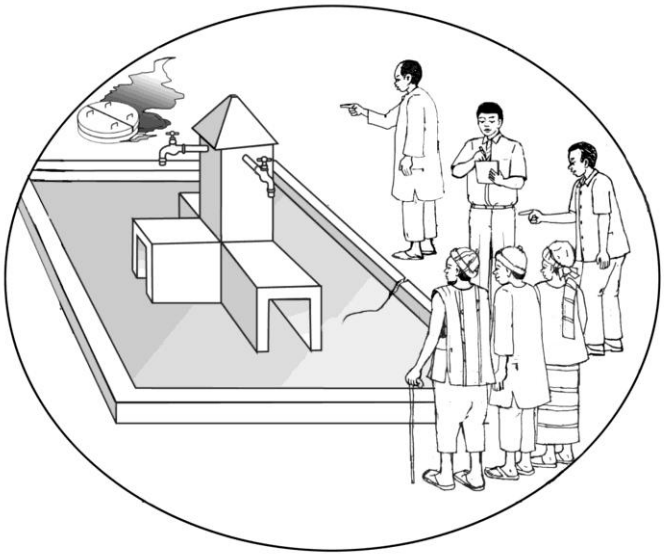
Additional points on management

If there is a maintenance schedule for the water point, describe it:

What is the actual amount of money available (in a bank) for the water point maintenance and repairs?
What was the original agreed annual amount that the community would contribute to assure enough money is set aside for maintenance and repairs?
Is the amount being collected enough to meet this target?

3. SOLAR POWERED MECHANIZED SYSTEM: MONITORING CHECKLIST.

Nature of the monitoring	Frequency
Water point (borehole) sanitary assessment	Monthly
State of the solar generator	Monthly
State of the water tank, the public stand-pipes, and other water drawing points	Monthly
State of the valves and valves chambers	Monthly
Water quality and quantity	Monthly
User behaviour	Monthly
Capacity to monitor and maintain the water point	quarterly



1. Water point (borehole) sanitary assessment

1.1 Location of the borehole

		Yes	No	Action to be taken if "Yes"
1	Is there a latrine within 30 m of the borehole?			Remove the latrine.
2	Is there a manure pit or a rubbish dump within 30 m of the borehole?			Remove the manure pit or rubbish dump.
3	Is there an animal enclosure within 30 m of the borehole?			Relocate the animal enclosure to beyond the 30mperimeter
4	Are there any chemicals (petrol, waste oil, solvent) on or around the water point (within 50m)?			Remove these chemicals
5	Is the borehole in an area liable to flooding?			Build a raised platform around the borehole headwalls to a height above the maximum flood levels.

1.2 State of the concrete headwall of the borehole and of the drainage around the borehole.

		Yes	No	Action to be taken if "Yes"
6	Can the concrete headwall of the borehole be flooded (is the borehole area liable to flooding)?			Heighten the borehole headwall and casing to avoid being flooded.
7	Are the screw nuts fixing the plate of the borehole headwall missing or not well tightened?			Replace any missing screw nuts / tighten the screw nuts
8	Is there any way in which water could get from the concrete floor into the borehole (due to cracks in the concrete, etc.)?			Mend the cracks.
9	There is no concrete floor or the concrete floor is less than 1m wide all around the borehole?			Repair the concrete floor/ construct it to meet the required minimum width of 1m around the borehole.
10	Are there cracks or breakages in the concrete floor around the borehole?			Repair the cracks or breakages.

		Yes	No	Action to be taken if "Yes"
11	Is there any stagnant water or a possibility for water to pool around the borehole?			Fill in the holes around the borehole, improve the drainage in the surroundings of the borehole.
12	Are there leaks on the piping on the borehole headwall?			Urgently organize for the plumber to repair these leaks.

1.3 State of the pipe network and the water tank.

		Yes	No	Action to be taken if "Yes"
13	Are there the pipes leaking? (noticeable by wet patches on the network path)			Urgently organize with the plumber to repair these leaks.
14	Are there leaks on the special parts (valves, etc.)?			Urgently organize with the plumber to repair these leaks.

	Yes	No	Observation
TOTAL / 14			**The higher the number of "Yes", the higher is the sanitary risk for the water point.**

Note: Recommended frequency for the monitoring of the water-point sanitary condition: Monthly.

2. Condition of the solar generator.

		Yes	No	Action to be taken if "Yes"
1	Is there grass growing under the solar panels?			Remove all plants from under the solar panel and around the enclosure of the solar panels.
2	Does water pool around the solar panels allowing grass to grow?			Make an embankment around the solar panels / enclosure
3	Are the solar panels dirty (dusty)?			Explain to the managers that this has a negative consequence on water production and ask them to plan daily cleaning of the solar panels.

		Yes	No	Action to be taken if "Yes"
4	Are the solar panels cleaned with a dry or dirty cloth / dirty water / or with caustic products?			Inform the managers that the cleaning of the solar panels must be done with a clean cloth, clean water without abrasive particles and without using caustic products.
5	Are the solar panels covered / shaded at any moment during the day (by trees, houses, etc.)?			Remove anything casting shade on the solar panels.
6	Is any solar panel broken or damaged?			Inform the competent technical structure (installer, commune, technical service, etc.) in order that measures (reorganization of the panels' electric connection) can be taken while waiting for the replacement of the broken or damaged panels.
7	Is the enclosure of the panels damaged? permitting access of animals/unauthorized persons to the panels enclosure			Ensure the enclosure is rapidly repaired.
8	Is the entry gate unlocked or nonexistent?			Install a padlock or door that can be locked.
9	Are the solar panels stand foundations sinking into the ground (causing the panels stand to shift → risk of panel breakage)?			**Urgently** inform the competent structure (installer, commune, technical service, etc.) in order that measures (panels dismantling) while waiting for the reconstruction of the foundations.
10	Are the electrical wires connection boxes not waterproof or opened?			Close the wires connection boxes that are opened / inform the competent structure (installer, commune, technical service, etc.) about the non waterproof boxes.
11	Are there wires hanging lose and are not held in place?			Inform the competent structure (installer, commune, technical service, etc.).
12	Are any wires cut?			**Urgently** Inform the competent structure (installer, commune, technical service, etc.)
13	Are there wires connections outside of connexion boxes?			Inform the competent structure (installer, commune, technical service, etc.) and ask for this to be corrected (change the wires to assure all the connections are inside the connexion boxes).

Note: Recommended for monitoring the frequency of the solar generator condition: monthly.

3. Condition of the water tank, the public stand-pipes and other water drawing points.

		Yes	No	Action to be taken if "Yes"
1	Are there leaks on the water tank?			Mend the water tank.
2	Are there leaks in the pipe system (drive pipes, delivery pipes, evacuation pipe, overflow system)?			Plan the repairs with the plumber.
3	Are there valves (under the water tank) that can't be turned easily or can't be turned at all?			Urgently plan the valves maintenance, and foreseen in the future a periodical maintenance program of the valves.
4	Is the stand pipe platform broken or cracked?			Repair the cracks or breakages.
5	Are there any taps broken?			Plan to change the taps.
6	Are there any leaking taps?			Plan the repair with the plumber.
7	Are there leakages on the aerial pipe (steel zinc-coated pipe)?			Plan with the plumber the repair of the leakages.
8	Is there stagnant water around the stand pipe or around any other water drawing point?			Fill in the holes around the water drawing points and improve the drainage in the surroundings.
9	Do any stand pipes or water-drawing points have blocked soak-away pits (and the water overflowing)?			Empty the soak-away pit, remove the sediments and replace the rough stones. Sensitize the users for better management of the water (avoid wasting the water).

NB: Recommended frequency of monitoring the water tank, the stand pipes, and other water drawing points: monthly.

4. Condition of the valves and valves chambers.

	Yes	No	Action to be taken if "Yes"
1 Are the valves covered by soil and buried?			Clear away the soil and make the valves visible, check that the valves can be turned on/off.
2 Are the valves concrete inspection chambers damaged?			Plan to reconstruct the valve chambers.
3 Are the covers slabs of the inspection chambers broken?			Plan to rebuild these cover slabs.
4 Are there any valves that can't be turned easily or can't be turned at all?			Urgently plan the intervention of valve maintenance and foreseen in the future a periodical maintenance program of the valves.

Note: Recommended frequency of monitoring valves and valves inspection chambers: monthly.

5. Water quality and quantity.

Note: The following are not scientific quality tests of the water but help to identify potential problems.

	Yes	No	Action to be taken if "Yes"
1 Is the water turbid? (not clear)			Inform the commune and the technical services in charge of drinking water supply.
2 Does the water have an unusual smell?			Inform the commune and the technical services in charge of drinking water supply.
3 Does the water have an abnormal taste?			Inform the commune and the technical services in charge of drinking water supply.
4 Has the average quantity of water delivered daily diminished since the last monitoring visit?			Inform the relevant structure (installing contractor, commune, technical service, etc.) about the problem.

Note: Recommended frequency for monitoring water quality and quantity: monthly.

6. Users behaviour

		Yes	No	Action to be taken if "Yes"
1	Are the taps badly handled?			Inform / sensitize users and water point managers on the link between the handling of taps and their durability.
2	Is there water wastage (e.g.: water overflowing from containers)?			Ask water point management committee to sensitize the users on good management of the water.
3	Is there damage to the infrastructures (the public stand pipes for example)?			Ask the water point committee to include this matter in the water-point use rules, and to make more thorough the inspection.
4	Are containers generally dirty?			Necessity of a reminder on hygiene.
5	Are the containers generally uncovered (or not having a mean to close them)?			Necessity of a reminder on hygiene.

Note: Recommended frequency of the water point users behavior monitoring: Monthly.

7. Capacity to monitor and maintain the water point.

		Yes	No	Action to be taken if "No"
1	Is there a guard for the solar generator?			Call for a meeting with the community to discuss about the risk of leaving the solar system unguarded and encourage them to take a decision.
2	Is there a guard house near to the solar generator for the guard?			Call for a meeting with the community to discuss about the risks and the decisions to take.
3	Is there a person in charge of daily cleaning/inspecting the solar panels?			Work with the community to identify /hire and train a person who will be in charge of this responsibility.
4	Is the person in charge of cleaning/inspecting the solar panels well trained?			Plan a training for him/her.

		Yes	No	Action to be taken if "No"
5	Is there a manager at each stand pipe?			Work with the community to put in place managers at each stand pipe and to provide the training for them.
6	Is there a person in charge of monitoring the state of the water network (water tank, valves, taps, pipes, etc.)?			Work with the community to put in place a monitoring system of the water network.
7	Is there a periodic recording of the water meter both at the pump and at each of the stand-pipes?			Work with the community to organize this data collection.
8	Is there a water system maintenance programme and is it in use?			Invite the water system managers to adopt and / or apply a maintenance programme.
9	Is there a chart to monitor any repairs on the equipment (solar generator, inverter, water tank, valves, etc.)?			Ask the managers to use this kind of chart at all times.
10	Is there money available for repairs (what is the exact amount) and is it kept in a secure place?			Work with the water point managers to put in place a water payment system and to keep the collected money safely.
11	Does the village know which technical skills are needed and who to contact (name of structure, telephone number, etc.) if there is a breakdown on the water system?			Work with the community to clarify this point and to make this information available for all.

Note: Recommended frequency of monitoring the capacity of the community to monitor and maintain the water point: every quarter.

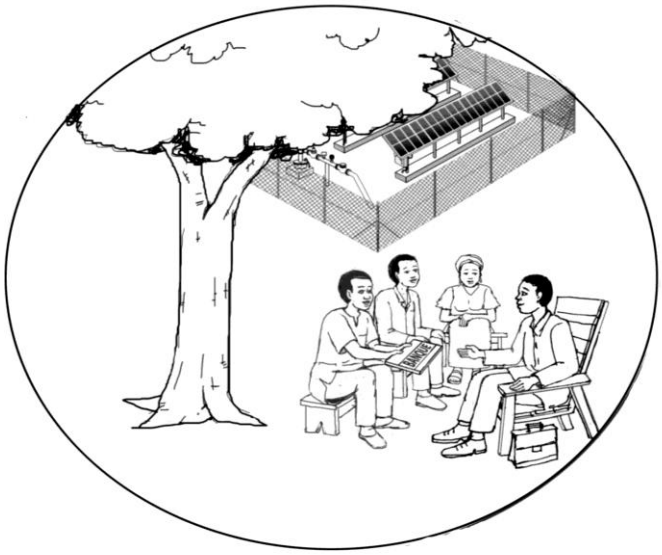
Additional points on management

If there is a maintenance schedule for the water supply system, describe it:

What is the system of obtaining the spare parts?
What is the actual amount of money available (in a bank) for the water supply system maintenance and repairs?
What was the original agreed annual amount that the community would contribute to make sure enough money is set aside for maintenance and repairs?
Is the amount being collected enough to meet this target?

4. WATER POINT MANAGEMENT: MONITORING CHECKLIST.

Nature of the monitoring	Frequency
Existence and functioning of the management body	Annually
Equity	Annually
Good governance	Annually
Capacity to manage	Annually
Efficiency of the management	Half-Yearly



1. Existence and functioning of the management body.

		Yes	No	Action to be taken if "No"
1	Are there persons in charge of the water-point management?			Organize the community to choose their water point managers.
2	Does the water point management committee have rules and regulations?			Work with the community and the water-point committee to develop rules and regulations.
3	Does the management committee meet periodically (and how often) to assess the water-point management and to take decisions?			Sensitize the committee to organize periodic meeting to assess the water point situation.

Note: Recommended frequency of the monitoring of the management body: Annually.

2. Equity.

		Yes	No	Action to be taken if "No"
1	Are there water-point access rules: who can access, how and when?			Work with the community and the management committee to elaborate water-point access rules.
2	Were the water point access rules developed in a participative manner with all the community structures?			Work with the community to re-examine if the access rules exclude any disadvantaged groups.
3	Are the water-point access rules applied?			Work with the community to identify the problems and find solutions.
4	No rule is contested by the users?			Work with the community to identify the problems and find solutions.
5	Is the management team composed of representatives of all the different user groups?			Work with the community to re-examine the composition of the water point management committee to allow each user group to be represented.
6	Are there sanctions against those who do not pay their water charge?			Work with the community to assure that all the water-point access rules are applied equally to all parts of the community.

Note: Recommended frequency of monitoring the equity of the water-point management: annually.

3. Good governance

		Yes	No	Action to be taken if "No"
1	Is there a periodic election of the water point management team?			Work with the community to make sure that election/re-election of the water point management committee are carried out in accordance with the rules as outlined in the water supply rules and regulations at community level.
2	Is there clear information available on the expenses incurred by the committee on behalf of the community water supply?			Require that the management committee must document the different expenses in an agreed format.
3	Does the management committee make regular financial report to the community?			Work with the community for a periodic financial statement meeting (this point must be included in the rules and regulations).
4	Are reporting documents (financial and narrative) available?			Work with the community to put this reporting system in place.
5	Are there clear/agreed processes for expense authorisation and execution?			Work with the community to identify and apply expense authorization processes and to include the authorization process in the water-point management rules and regulations.
6	Is the money collected in a secure place?			Work with the community to keep the money in a dedicated bank account which holds only the money of this community water supply.

Note: Recommended frequency of monitoring the governance within the water point committee: annually.

4. Capacity to manage

		Yes	No	Action to be taken if "No"
1	Does the water point committee know the approximate prices of the water point equipment spare parts?			Organize an information meeting on the cost of spare parts for the water-point.

		Yes	No	Action to be taken if "No"
2	Is there an annual budget with an allowance for depreciation of the spare parts and daily management expenses?			Work with the community to elaborate the annual budget of the water-point taking into account the spare part replacement and recurrent costs.
3	Has the committee clearly identified how they will mobilize funds for the water point maintenance and repairs?			Work with the community in a participative manner to identify the way they will pay for the water.
4	Is there a periodic maintenance programme for the water-point? (describe it)			Work with the community and the water point managers to identify a periodic maintenance schedule for the water point and who will do what and when.
5	Has the money collection plan been followed? Who does not pay his/her water bill?			Work with the water point committee to develop a monitoring system of individual household payment.
6	Does the water point committee know qualified repairers in their area?			Ask the water point committee to search for information on qualified repairers and make contact numbers available.
7	Are the financial and narrative reports existent and well kept?			Invite water point managers to find an adequate system to maintain regular records and keep them safely.

Note: Recommended frequency of the monitoring of the water point committee capacity to manage: annually.

5. Efficiency of the management

		Yes	No	Action to be taken if "Yes"
1	Does the water point breakdown frequently?			Get a specialist to re-examine the maintenance system and the system of supervision.
2	Are the breakdowns repaired after a long time?			Re-examine the system of identifying the need for repairs and getting the repairs done quickly
3	Is the water point in a poor condition (pump in a bad condition, cracks on the concrete floor, etc.)?			Work with the community to re-examine the water point maintenance system.

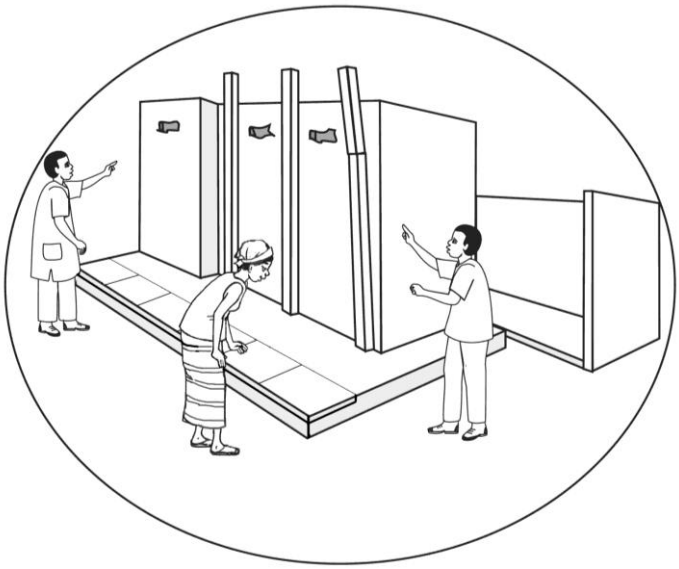
		Yes	No	Action to be taken if "Yes"
4	The money in the bank is less than what was planned and agreed and is not enough for the expected maintenance & repair costs			Work with the community to evaluate the situation and to take the adequate decisions to assure that the funds collected will be enough to cover the maintenance and repair costs.

Note: Recommended frequency of monitoring of the efficient of the water point management committee is: half-yearly.

Precision on the efficiency of the water point management

How many times the pump has broken down since the last monitoring? What have been the natures of the failures and how much time it has taken to repair the pump (to have it functional again) for each case?
What is the actual amount of money available (in a bank) for the water point maintenance and repairs?
What was the original agreed annual amount that the community would contribute to assure enough money is set aside for maintenance and repairs?
Is the amount being collected enough to meet this target?

5. LATRINE: MONITORING CHECKLIST.



1. Location

		Yes	No	Action to be taken if "Yes"
1	Is the latrine located in a low-lying zone?			Make an embankment around the latrine to prevent rain water from flooding the pit. If there is much risk of flooding, think of transferring the latrine.
2	Is there any risk of water stagnation around the latrine?			Make an embankment around the latrine
3	Is there any lateral infiltration of water into the pit?			Seek out where there is any lateral infiltration and make these areas impermeable, make embankment around the latrine, etc.)
4	Can you smell the latrine from the house?			If possible, change the location of the latrine and place it beyond the houses so that the dominant winds blow the smell away from the houses.

2. The slab

		Yes	No	Action to be taken if "Yes"
1	The latrine slab is not smooth / it has cracks.			Make the slab smooth or fill the cracks with mortar to allow for easy cleaning of the slab.
2	The latrine slab permits urine to pool.			Correct the slopes on the slab with mortar in order to facilitate the urine to flow towards the defecation hole.
3	The sides of the defecation hole are not smooth.			Smooth the sides of the defecation hole with mortar in order to facilitate the cleaning of faeces that may be found there.

3. Superstructure

		Yes	No	Action to be taken if "No"
1	Does the superstructure permit privacy?			Correct the superstructure construction so that it permits user privacy.

4. Use / maintenance

		Yes	No	Action to be taken if "Yes"
1	Are there a lot of flies?			For the non VIP (Ventilated Improved Pit) latrine, cover the defecation hole after having used the latrine. For a VIP latrine, create the conditions to have semi-darkness in the latrine so that the flies are attracted to the light via the vent pipe.
2	Is there much smell?			Pour ash on the faeces after defecation. For the VIP latrine, assure that the air is circulating correctly (entering into the pit by the slab hole and going out by the ventilation pipe).
3	Is the latrine used as a shower?			Ask the owner to build a separate shower in order to avoid filling his latrine quickly.
4	Is the interior of the cabin dirty (urine on the slab, faeces around or on the defecation hole sides, etc.)?			Ask the family to clean the latrine slab (daily) in order to avoid any contamination.
5	There is no hand washing facility for the latrine?			Sensitize the family on the sanitary risk due to transmission of faeces to food and invite them to put a hand washing facility in place.
6	There is no cover of the slab hole(non-VIP latrine)			Sensitize the family on the importance of the use of a cover over the slab hole as a barrier against the transmission of contamination through flies.

5. Particular considerations for VIP latrine superstructure

		Yes	No	Action to be taken if "Yes"
1	Is there any other opening on the superstructure (apart from door)?			Block these openings.
2	The latrine superstructure does not provide semi-darkness (the time for the eyes to accommodate to the dark is less than 10 seconds)			Create the condition for semi darkness inside the latrine: install a door if it is missing, diminishing the opening of the front door.
3	The door is not placed on the side of the dominant winds.			If possible move the door to the side of the dominant winds.
4	Is the height of the ventilation pipe less than 50 cm above the highest part of the superstructure?			Increase the height of the ventilation pipe so that it will be at least 50 cm higher than the highest part of the superstructure.
5	Does the ventilation pipe have any opening or cracks?			Change the ventilation pipe or block the openings or cracks.
6	Is the diameter of the pipe less than 150 mm?			If possible, change the ventilation pipe (to diameter of at least 150mm. The diameter of the ventilation hole must also be increase to around 150mm).
7	The ventilation pipe is placed to the North			For future new VIP latrine construction, place the ventilation conduct on the equator side of the superstructure (towards the equator in the Sahel the pipe will get a maximum of sun).
8	Is the ventilation pipe not well fixed / loose?			Fix the ventilation pipe (with concrete or mortar) so that it is steady
9	Is the ventilation pipe inclined (not vertical)?			Change the ventilation pipe fixture and position in order that it can be vertical and permit the sun light to reach the pit.

		Yes	No	Action to be taken if "Yes"
9	There is no fly screen on the top of the ventilation pipe.			Place a fly screen on top of the vent pipe to trap and eliminate the flies trying to exit from the pit via the vent pipe.
10	The fly screen has some holes.			Change the fly screen.
11	The fly screen is loose and does not fit tightly on to the ventilation pipe?			Tighten the fly screen so that it fits tightly on to the ventilation pipe.
12	Is there a cover for the latrine pit?			Remove the cover because the air must enter into the pit via the pit hole and flow out via the ventilation pipe.

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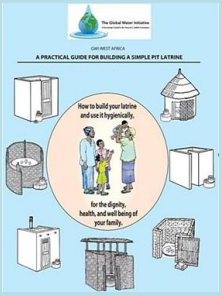

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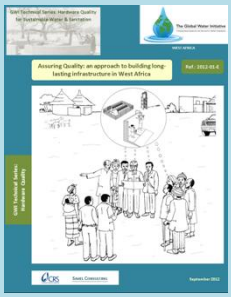

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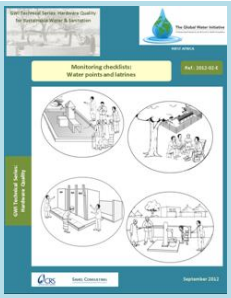

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These documents are also available in French.

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