

WASH Funders Infrastructure Checklists:

Boreholes & Handpumps

Kerstin Danert, Ron Sloots, Tabitha Ndiaye, Spencer Bogle
and Adam Questad

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STOP THE ROT

Ensuring borehole and pump
quality for rural water supplies

Ask for *Water*
MAKESA

TGS *water* Ltd.
Borehole drilling and water supply

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Rural Water Supply Network

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SUMMARY

Although not the only issue to be considered, the design and construction of high-quality infrastructure is a prerequisite for sustainable rural water supply services. Support to the management, maintenance and repair of services, as well as post-construction monitoring are important. However, poor-quality infrastructure undermines everything that follows.

The policies, checks and balances by funding organisations, alongside the support that they provide to their Grantees, have a tremendous bearing on the quality of boreholes and handpumps, with a knock-on effect on the functionality and longevity of water supply services. Well-intentioned, but inappropriate Funder policies can actually have unintended, negative consequences on infrastructure quality.

This document urges funding agencies to be explicit in expecting infrastructure and services to be of high quality – and to foster a culture of quality. The set of four checklists presented should help organisations that are funding Water, Sanitation and Hygiene (WASH) projects and programmes to ask the right questions in relation to borehole and handpump design and construction quality. The checklists can support a self-assessment or an assessment of specific Grantees. The checklists could also be used when assessing applications, and/or to take stock part-way through an ongoing programme and enable organisations funding WASH to strengthen mechanisms and ultimately ensure that their Grantees follow good practices, with technical construction standards consistently upheld.

The four checklists are:

1. Direct implementation – boreholes
2. Direct implementation – handpumps
3. Direct implementation – post-construction monitoring and inspection
4. Indirect implementation – strengthening the enabling environment for service delivery that relies on borehole drilling and/or handpumps

INTRODUCTION

Although not the only issue to be considered, the design and construction of high-quality infrastructure is a prerequisite for sustainable rural water supply services. While support to the management, maintenance and repair of services, as well as post-construction monitoring, are crucial aspects, poor-quality infrastructure jeopardises further implementation, creating problems such as:

- **Unproductive or failing boreholes**, whereby water wells and boreholes fail to deliver sufficient water within just a few months or years rather than lasting 25 years or more. Underlying quality causes are generally poor siting, low yields and incorrect design.
- **Poor quality pump components** result in frequent breakdowns, high maintenance costs and premature pump failure, with users returning to unprotected and distant water sources.
- **Rapidly corroding handpumps** cause high levels of iron in the water, with unacceptable taste and colour often leading to rejection of the source. Premature failure occurs, while operational expenditures to replace components and keep services working are high. Drinking water quality is affected, with possible contamination by lead and other heavy metals of concern.

Discussions with select organisations funding Water, Sanitation and Hygiene (WASH) projects and programmes have revealed ongoing concerns about the technical quality of handpumps and rapid corrosion within their funding portfolios. Further, not all funding agencies have policies in place which foster proper borehole siting, construction and rehabilitation. The policies, checks and balances, alongside the support that Funders provide to their Grantees, are crucial to the quality of boreholes and handpumps. In turn, this has a knock-on effect on the functionality and longevity of water supply services. Well-intentioned Funder policies, for example, to keep per-capita investment costs low, can have unintended, negative consequences on infrastructure quality. Further, a lack of post-construction monitoring or inspection can mean that quality problems may exist, but remain undocumented and continue to be repeated over years.

This set of checklists urges funding agencies to be explicit in expecting infrastructure and services to be of high quality – and to foster a culture of quality.ⁱ It starts by recognising a number of things that can go wrong:

- Firstly, Funders may assume that Grantees have procedures in place and the capacity to consistently ensure design and construction quality. Unfortunately, this is not always the case. Grantees may have gaps in their skills, knowledge, staffing or financial resources which inhibit them from developing and adhering to professional procedures. This is exacerbated in cases where national standards and guidelines are also lacking.
- Secondly, Grantees may not always follow the right contracting procedures or use proper specifications, with some not even aware of their weaknesses.
- Thirdly, even if WASH Funder policies inadvertently undermine quality, Grantees may not raise complaints due to the inherent power imbalances of Funder-Grantee relationships.
- Last, but not least, a Grantee may have the capacity to install quality infrastructure, but take short cuts or not follow their own protocols in order to meet Funders' requests for a low budget and/or fast schedule.

This short document provides guidance for organisations funding WASH on what should be considered in trying to ensure the quality of the infrastructure on the programmes and projects which they fund. The scope is boreholes or drilled wells installed with handpumps. It includes borehole siting, design and installation, as well as handpump supply chains and post-construction monitoring.

The guidance is mindful of three relevant aspects:

1. Funders may support improved access to water services through direct implementation, or through the enabling environment or both.
2. Many funding organisations use WASH systems building blocks as a tool for conceptualising and/or guiding their work. However, technical quality of the infrastructure quality is not explicit within these building blocks, and is an aspect which is arguably often taken for granted.
3. Those responsible for managing grants that include WASH may not necessarily be WASH specialists, nor may they have a detailed understanding of groundwater, drilling or handpump technologies.

Guidance is provided in the form of four sets of checklists which can be used for self-assessment and/or assessment of the WASH Funder and specific Grantees.

Each checklist is intended to help Funders reflect on their policies and procedures, and/or the procedures followed by individual Grantees. The checklists should enable gaps to be identified and highlight capacity weaknesses.

In short, the checklists will help WASH Funders to ask the right questions in relation to borehole and handpump design and construction quality, either to support a self-assessment, or an assessment of specific Grantees. The checklists could also be used when assessing applications, and/or to take stock part-way through an ongoing programme.

Together with the links to further information (in the form of short films and written guidance published by RWSN, UNICEF and Practical Action), these checklists should enable WASH Funders to strengthen mechanisms and ultimately ensure that their Grantees follow good practices, with technical construction standards consistently upheld.

CHECKLIST 1: DIRECT IMPLEMENTATION – BOREHOLES

Professional and cost-effective borehole drilling needs to ensure that there is good quality siting, drilling, technical construction and materials installation, with measures in place to ensure accountability and prevent corruption.

Subject/Questions			Considerations
1.1 Finance			
(See also RWSN Costing and Pricing publication and costing tool)			
a	How are the costs for siting, drilling and supervision estimated?	<input type="checkbox"/> WASH Funder sets a rate/per capita rate <input type="checkbox"/> Competitive bidding (between potential grantees) <input type="checkbox"/> Grantee prepares engineers' estimates <input type="checkbox"/> Grantee prepares estimates based on in-house work for direct costs <input type="checkbox"/> Other _____	<p>If costs are not calculated properly, the grantee may have to manipulate budgets and expenses, or adapt implementation in order to meet targets.</p> <p>If budgets are too low, construction quality generally suffers.</p> <p>If budgets are too high, there is an increased risk of financial leakage/corruption.</p>
b	Are non-productive boreholes or low yielding boreholes paid for, particularly in high-risk areas?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	Although non-payment for dry boreholes may appear to be a way of preventing corruption, it places a considerable risk on the drilling contractor, who has to find other ways to recuperate losses, such as inflating the cost for successful boreholes or cutting corners in terms of technical quality.
c	If used, is the term "dry borehole" clearly defined as taking yield into consideration?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	While water may be found in a borehole, the yield needs to be sufficient for the designed purpose and demand in order to be considered productive. Thus, it is essential that the term "dry" is not used loosely, but is rather clearly defined.

WASH Funders Infrastructure Checklists: **Boreholes & Handpumps**

Subject/Questions		Considerations
1.1 Finance		
(See also RWSN Costing and Pricing publication and costing tool)		
d	Do grantees clearly separate implementation costs (siting, drilling, handpump and supervision) and overhead costs in their budgets? <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	Separating overhead costs from implementation costs incentivises grantees to be transparent about costs of siting, drilling, installation and supervision.
e	Do grantees use Bills of Quantities in their tender and contract documents? <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	A Bill of Quantities provides transparency with respect to all of the components of the drilling process and their prices.
f	Do project budgets include provision for post-construction monitoring and inspection? <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	Post-construction monitoring and inspection can incentivise quality. Even the highest quality parts will require replacement, and if left unmonitored, will result in prolonged downtime of the handpump. Post-construction monitoring and inspection should be budgeted for.
<i>See additional questions related to finance under siting and drilling.</i>		

Subject/Questions		Considerations
1.2 Staffing and personnel		
a	Do grantees undertaking borehole drilling have a qualified hydrogeologist as a staff member to provide support in preparing project proposals, procurement plans and for siting and borehole drilling? <input type="checkbox"/> All do <input type="checkbox"/> Some do <input type="checkbox"/> All don't <input type="checkbox"/> Don't know	A professional hydrogeologist or geologist/engineer with training in hydrogeology is able to consider issues including previous success rates, depth of boreholes, data requirements, suitable geophysical siting methods, water quality, seasonality and materials in programme development and implementation. She/he can also make comparisons between siting and drilling reports.

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Subject/Questions			Considerations
1.3 Siting (See also RWSN film Drilling: the importance of good borehole siting , RWSN siting publication and UNICEF Professional Drilling Toolkit Module 3)			
a	Who undertakes borehole siting on the projects that you fund?	<input type="checkbox"/> Government <input type="checkbox"/> Consultant <input type="checkbox"/> Staff <input type="checkbox"/> Drilling Contractor <input type="checkbox"/> Don't know	<p>There should be a clear (written) process for siting.</p> <p>The process should include a desk study as well as visits to the communities to site the boreholes.</p> <p>Ideally, siting and drilling should be separated, but this can be a challenge if there is a lack of good hydrogeologists in the country/state.</p>
b	Is siting undertaken by an experienced hydrogeologist or suitably qualified engineer or geologist?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	It is worth finding out if either an experienced hydrogeologist is involved or, alternatively, a suitably qualified engineer or geologist. Some countries may have a licensing requirement in place.
c	Are there specifications for how siting should be undertaken?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	The siting process should be clearly specified in writing, with roles and responsibilities, as well as reporting requirements, clearly defined. Without this, a superficial siting process can be followed, with potential conflict when roles are not clear.
d	Does siting include the collection and analysis of existing data and information prior to field work, or the use of equipment at the proposed drilling locations?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	A considerable amount can be learnt about the drilling locations from data and information that has been collected by others. This may be available in groundwater databases (online or hosted by government agencies), through published or grey literature, and from drillers' reports.
e	Are siting services paid for if sufficient water is not found?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't no	It is important to pay properly for siting services, even in areas where the risk of drilling a dry, or low yielding, borehole is high. Otherwise, there are few incentives to work in such areas.
f	Do grantees have clear policies and procedures for dealing with land ownership and access issues?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't no	It is essential that projects consider who owns the land at the potential location of the borehole. It is essential to clarify whether the landowner has agreed to terms of use that comply with expectations and/or requirements of the community/institution that will use the borehole, as well as the funder and grantee.

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Subject/Questions		Considerations
1.4 Community and committee preparation		
a	Does the community (as a whole) receive information regarding the siting and construction process, and what is expected of them prior to the driller arriving on site?	<div> <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know </div> <p>There are negative consequences for sustainability of the services of not preparing communities.</p> <p>Issues such as accessing permission to the site should not be left to the driller but handled by the grantee in advance of arrival on site.</p>
b	Is a water user committee (or equivalent) put in place and trained in operating the handpump and dealing with minor repairs and maintenance?	<div> <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know </div> <p>There are negative consequences for sustainability of the services of not preparing communities.</p>
c	Are water user committees (or equivalent) provided with information on what they should do in the event of a breakdown or issues with water quality?	<div> <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know </div> <p>Community preparation for their roles in maintenance, as well as where they should turn to in case there are problems, need to be explained before the infrastructure is provided, with these messages reinforced later.</p>
d	Are water user committees (or equivalent) trained in maintaining a sanitary environment around the water collection point?	<div> <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know </div> <p>Ensuring a sanitary environment around the water point is essential for water safety, for taking care of the supply and maintaining the service.</p>

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Subject/Questions		Considerations
1.5 Procurement of drilling services (if undertaken by the grantee) (See also RWSN film – Four steps to better drilling contracts RWSN publication procurement/contract management and UNICEF Professional Drilling Toolkit Module 1 and 2)		
a	Do grantees prepare a procurement plan? <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	A good procurement plan is essential for effective procurement and contract management.
b	Are engineer's estimates used to prepare the bidding process? <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	Engineer's estimates, if done properly, can enable grantees to realistically evaluate the financial aspects of bids, including whether they are too low, or too high.
c	Do the tender documents specify the locations and specific sites of the boreholes to be drilled? <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	By specifying the exact drilling locations, the drilling contractor has better information to prepare bids.
d	Do grantees undertake a process to assess and pre-qualify competent contractors? <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	Pre-qualification can ensure that the drilling contractors that tender all have the required equipment and materials, and this can simplify analysis of their bids.

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Subject/Questions		Considerations
1.6 Contract management & payment (if undertaken by the grantee)		
(See also RWSN film – Four steps to better drilling contracts and procurement/contract management publication)		
a	Are drillers paid according to a bill of quantities, i.e. paid for the metres that they drill and the materials that they install?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>If not, what are the reasons for this?</p> <p>Not paying according to bills of quantities means that drilling contracts are actually paid an estimated price rather than a realistic cost.</p>
b	Are drilling contractors paid for dry holes, or low-yielding boreholes, even if someone else selected the location or site?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>Although non-payment for dry boreholes may appear to be a way of preventing corruption, it actually places considerable risk on the drilling contractor, who has to find other ways to recuperate losses, such as inflating the costs for successful boreholes or cutting corners in terms of technical quality.</p>

Subject/Questions		Considerations
1.7 Borehole design & construction		
(See also RWSN film – Why are some boreholes better than others? , Skat Drilling Publication and MacDonald et al – Developing Groundwater)		
a	Do grantees use standard specifications for borehole drilling, well development and pumping tests?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>This is often a weak area, and is exacerbated by situations where there are no national guidelines, or where these guidelines are not followed. Important aspects may be left out, or expectations of the drilling contractor may be unrealistic.</p>
b	Is the borehole design specified in the drilling contract?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>Good siting draws on existing data from other boreholes in the vicinity as well as from the site itself and provides the basis for a preliminary borehole design. Design specifications will need to be adjusted on site, in light of the formation encountered and the location of water-bearing strata. Inappropriate designs are likely to reduce borehole lifespan.</p>
c	Is the borehole design modified during drilling in light of field realities & hydrogeology?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>By specifying the exact drilling locations, the drilling has better information to prepare bids.</p>

WASH Funders Infrastructure Checklists: **Boreholes & Handpumps**

Subject/Questions		Considerations
1.8 Rehabilitation of boreholes and major repair of handpumps		
a	Do grantees have a process for diagnosing the reason for the broken-down borehole and suitable rehabilitation?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>Diagnosis is extremely important in order to (i) prevent the same problems from occurring again, (ii) properly cost rehabilitation and (iii) properly record status before and after rehabilitation.</p> <p>A standard per-borehole figure for supervision (especially if it remains constant year on year) indicates a lack of rigour, and may even reflect corruption.</p>
b	Are records of rehabilitation and repair available?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>With online tools and platforms (such as mWater), it is relatively easy for grantees to record the specifics of their rehabilitation and repair work. These data are also very helpful for planning and costing.</p>

Subject/Questions		Considerations
1.9 Supervision of drilling and rehabilitation		
(See also RWSN Film – A borehole that lasts for a lifetime , RWSN supervision publication and UNICEF Professional Drilling Toolkit Module 3)		
a	Is there independent on-site supervision of the borehole construction & completion?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>Independent supervision is an important aspect of quality control. Supervision may be full-time, or part time. For part time supervision, key milestones need to be supervised.</p>
b	Are the on-site supervisors of drilling works experienced hydrogeologists or suitably qualified engineers or geologists?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>Professional drilling supervision requires technical knowledge (of geology and hydrogeology, as well as borehole design, development and pumping tests) and practical skills. Some countries have licencing mechanisms in place.</p>
c	Are supervisors properly remunerated, and do they have the transport logistics necessary to be independently on site?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
		<p>Poor remuneration provides an incentive for collusion with the drilling contractor.</p> <p>Inadequate transport logistics can make it difficult for them to actually remain on site, or create dependence on the driller.</p>

WASH Funders Infrastructure Checklists: **Boreholes & Handpumps**

Subject/Questions		Considerations
1.10 Data (See also UNICEF Professional Drilling Toolkit Module 4 for drilling log and pumping tests formats and WHO.		
a	For successful boreholes, do grantees obtain drilling logs from the contractor?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
b	For unsuccessful boreholes, i.e. those that are classified as dry or do not pass pumping tests, do grantees obtain drilling logs from the contractor?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
c	For successful boreholes, do grantees obtain pumping test results from the contractor?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
d	For unsuccessful boreholes, do grantees obtain pumping test results from the contractor?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
e	For successful boreholes, do grantees obtain water quality test results from the contractor prior to borehole commissioning?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
f	Are water quality test data shared with the community?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know
g	Are reports from the drilling operations (drilling logs, pumping test results and water quality test data) submitted to the respective local or national authority?	<input type="checkbox"/> All three always submitted <input type="checkbox"/> Some are submitted <input type="checkbox"/> Sometimes submitted <input type="checkbox"/> Never <input type="checkbox"/> Don't know

CHECKLIST 2: DIRECT IMPLEMENTATION – HANDPUMPS

Ensuring that handpump components and materials are consistently of high quality is a prerequisite for the longevity of the water supply service.

Subject/Questions		Considerations
2.1 Handpump quality (See also background report: Stop the Rot Trilogy – 3)		
a	Do grantees clearly specify handpump components and materials when procuring?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Vague or unclear specifications provide an opportunity for inferior quality products to be inadvertently procured. This can result in poor handpump performance, or even premature failure.
b	Do grantees buy parts in bulk ?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Purchasing parts in bulk can be a way to improve availability of quality parts on hand when replacements are needed, and it can reduce the overall price for the parts.
c	If procuring internationally, do grantees ensure that pre-shipment inspections of handpumps are undertaken at a defined frequency?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Pre-shipment inspections are a mechanism for ensuring quality before the products are exported. Once they reach the destination country, it can be more difficult to reject components, and they may even end up on the market inadvertently.
d	If procuring in-country, or locally, do grantees follow well-defined quality assurance mechanism such as buying from certified or reputable vendors?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Given the challenges in ensuring material quality, such as verifying the grade of stainless steel, it is essential that grantees ensure that they are procuring from vendors or suppliers that consistently procure quality pumps and parts.
e	If poor quality handpumps are purchased, do grantees have ways of ensuring replacement from suppliers?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Purchase contracts may include a guarantee period, for example.

WASH Funders Infrastructure Checklists: **Boreholes & Handpumps**

Subject/Questions			Considerations
2.2 Preventing rapid handpump corrosion (See also background report: Stop the Rot Trilogy – 2)			
a	Do grantees work in countries where rapid handpump corrosion is a risk?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	Use of handpump components that rapidly corrode reduces the lifespan of the part (and potentially the entire system) and the quality of the water. If there is a risk of rapid handpump corrosion, grantees need to consider which materials should be used as an alternative.
b	Are there any policies, directives or guidelines in the countries where grantees operate that relate to mitigating rapid handpump corrosion, such as through the use of specific materials?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	It is essential to know what policies, directives or guidelines have been issued. In case these have been issued, they should be followed.
c	Is the pH of the groundwater tested prior to installation?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	pH testing is an important indicator of the corrosivity of galvanised iron.
d	Are corrosion-resistant pumps installed when the pH of the water is <6.5?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know	<p>If corrosion-resistant pumps are not being installed, reasons need to be clarified.</p> <p>The lifespan of galvanised iron pipes and rods installed in corrosive groundwater declines from 8-10 years to as little as 3 months to two years. Alternatives currently available on the market (in 2024) include stainless steel riser pipes (grades 304 and 316) and uPVC riser pipes with stainless steel couplings.</p> <p>Importantly, given that groundwater conditions can change over time, and that there are also other parameters that lead to corrosion, some Funders and implementing organisations have stopped using Galvanised Iron (GI) riser pipes and rods and switched to non-corrosive materials.</p>

CHECKLIST 3: DIRECT IMPLEMENTATION – POST-CONSTRUCTION MONITORING AND INSPECTION

Create incentives for high quality construction through regular post-construction monitoring and inspection.

Subject/Questions		Considerations
3.1 Monitoring and inspection, including water safety aspects (For water safety aspects/sanitary inspection, see World Health Organization (WHO) Sanitary Inspection Packages – Chapter 4)		
a	Do water users have mechanisms to make complaints should there be a major technical problem with the facility within the first one to two years?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Well-operated user complaint mechanisms provide an additional way of identifying that there is a technical problem which may have been caused by improper design, construction or installation.
b	Do grantees have a protocol for post-construction monitoring and inspection?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know Setting out clearly what is expected in post-construction monitoring and inspection, as well as how information is recorded and reported, is needed for a rigorous process.
c	Do grantees have a protocol for undertaking sanitary inspections of boreholes installed with handpumps?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know Setting out clearly what is expected for a sanitary inspection, including how information is recorded and reported, is needed for a rigorous process. See checklist published by the WHO noted above.
d	Does the WASH Funder ensure that there is third party inspection of the facilities constructed by their grantees within 6 months of construction?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Professional third-party monitoring, with follow-up action to address quality concerns, can incentivise grantees to consistently ensure quality, and highlight problems that they may not be aware of.
e	Do grantees undertake sanitary inspections of boreholes installed with handpumps?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Sanitary inspection can incentivise grantees to consistently ensure quality, and also highlight problems that they may not have even realised exist.

WASH Funders Infrastructure Checklists: **Boreholes & Handpumps**

Subject/Questions		Considerations
f	Is post-construction inspection by local or national government undertaken?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Professional third-party monitoring, with follow-up action to address quality concerns, can incentivise grantees to consistently ensure quality, and highlight problems that they may not be aware of.
g	Do the grantees undertake post-construction monitoring of their facilities one to two years after construction?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know If a handpump breaks down, or performs poorly within the first one to two years, most likely there has been a problem with the design, construction or installation in the first place. Alternatively, the source may be operated by higher number of users than it was designed for.
h	Do grantees undertake water quality testing as part of their post-construction monitoring or sanitary inspection?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know Water quality testing provides essential data to support and complement the findings from physical inspection as part of the sanitary inspection.
i	If the grantees undertake post-construction monitoring or sanitary inspections of their facilities one to two years after construction (i.e. above), are the results shared with the WASH Funder?	<input type="checkbox"/> N/A <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know It is not only the monitoring itself that is important, but also the sharing of these results and subsequent action.
j	If post-construction monitoring and inspection, or sanitary inspections takes place, have the issues found been systematically addressed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know Issues include deficiencies in borehole construction (e.g. materials, depth, screening), platform construction (not adhering to specifications) and handpumps (e.g. rapid corrosion, early component failure, low performance) See WHO Sanitary Inspection Packages – Chapter 4 for the issues that could be raised with sanitary inspections.

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Subject/Questions		Considerations
3.2 Diagnosis		
(RWSN publication under development in 2025/6)		
a	In case of borehole or handpump failure within the first one or two years after construction, is a thorough diagnosis of the cause undertaken?	<div> <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/> Don't know </div> <p>Understanding the reason(s) for handpump and borehole breakdown or poor performance enables grantees to consider corrective actions.</p>

CHECKLIST 4: INDIRECT IMPLEMENTATION – STRENGTHENING THE ENABLING ENVIRONMENT FOR SERVICE DELIVERY THAT RELIES ON BOREHOLE DRILLING AND/OR HANDPUMPS

National policies, standards and guidelines affect how grantees are able to perform in-country. This set of checklists relates to a particular country, or in the case of a federal system, may relate specifically to a particular state.

Subject/Questions		Considerations
4.1 Drilling sector		
a	Is there any regulation of drillers, such as through licencing? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	Effective licencing of drilling contractors can inform grantees as they pre-qualify drillers, and even ease the process.
b	Is there a national or state level drillers association? <input type="checkbox"/> Yes – and it is active <input type="checkbox"/> Yes – but it is not active <input type="checkbox"/> No <input type="checkbox"/> Don't know	A drillers association can provide a very effective mechanism for WASH Funders to support capacity strengthening efforts of the drilling sector, particularly when drilling infrastructure quality problems are widespread.
c	Is there any regulation of water users, such as requirements for water abstraction permits? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	It is important that grantees are aware of any regulation and adhere to the requirements. WASH Funders may be able to support the strengthening of groundwater regulation if there are weaknesses.

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Subject/Questions		Considerations
4.2 Handpump supply chains		
a	<p>Do national standards exist for the public domain handpumps that are used in the country?</p> <p> <input type="checkbox"/> Yes – and they are up to date <input type="checkbox"/> Yes – but they are not up to date <input type="checkbox"/> No <input type="checkbox"/> Don't know </p>	<p>National handpump standard specifications provide a basis for regulation and procurement. If they are not in place, international standard specifications, or specifications by the Bureau of Indian Standards provide a fall-back. Unfortunately, these are not up to date in terms of current practices, particularly in relation to the India Mark II and Mark III handpumps used in places with corrosion risk.</p>
b	<p>Does the national regulator or standards authority regulate handpump supply?</p> <p> <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know </p>	<p>Regulation has an important role to play in ensuring that handpumps and spare parts available on the market in the country conform with national standard specifications.</p>
c	<p>Do national procedures for quality assurance of handpumps exist?</p> <p> <input type="checkbox"/> Yes – and they are followed <input type="checkbox"/> Yes – but they are not always followed <input type="checkbox"/> No <input type="checkbox"/> Don't know </p>	<p>National procedures which ensure handpump quality include pre-shipment inspections under the authority of the national standards institution and licencing of suppliers. Such mechanisms, if effective, can ease the work of grantees in setting up their own procedures.</p> <p>WASH Funders could support the development of national quality assurance procedures.</p>

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Subject/Questions			Considerations
4.3 Data, institutions and human capacity strengthening (Overview of relevant training courses for professional drilling on RWSN website)			
a	Are you confident that there are sufficient skills, knowledge and experience of siting, supervision or drilling professionals in the country?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	WASH Funders can play an important role in strengthening the capacity of government, consultants and grantee staff in relation to siting, supervision, drilling, procurement and contract management.
b	Are there any initiatives taking place in the country to raise the skills, knowledge and experience of siting, supervision or drilling professionals?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	Capacity strengthening is not a one-off process but rather needs to be continuous as professionals or skilled artisans retire or leave the sector and new people join. WASH Funders can support skills development in this area.
c	Is there a national database or register of handpump and borehole assets in the country?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know	In case such a database or asset register exists, there may be scope for support to the hosting agency in order to clean and maintain the data and analyse it.

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Subject/Questions		Considerations
4.4 Groundwater resources management (select aspects only)		
a	<p>Is there a national groundwater database?</p> <p> <input type="checkbox"/> Yes, and it is up to date <input type="checkbox"/> Yes, but it is not up to date <input type="checkbox"/> No <input type="checkbox"/> Don't know </p>	<p>An up-to-date groundwater resources database provides key information for drilling programmes, with data particularly useful for planning purposes by implementing organisations as well as drilling contractors and those involved in borehole siting.</p> <p>WASH Funders can ensure that their grantees make sure that data from their programmes is submitted to the database (if it exists). They may also consider exploring how to support the institutions responsible for managing a groundwater database.</p>
b	<p>Is there an agency/department that collects drilling records?</p> <p> <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know </p>	<p>This relates to the above point. Records may be collected, but there may not be a groundwater database that consolidates the information.</p> <p>It is essential that grantees ensure that drilling records collected according to national standards (if these exist) and that they are submitted.</p> <p>WASH Funders may consider supporting government departments/agencies to establish data collection mechanisms.</p>
c	<p>Are there areas with challenging groundwater for development, e.g. high risk of dry hole, salinity, iron/manganese, low pH, or groundwater hotspots, e.g. falling groundwater levels or pollution?</p> <p> <input type="checkbox"/> Yes: _____ <input type="checkbox"/> No <input type="checkbox"/> Don't know </p>	<p>Being informed of challenging groundwater environments helps project planning. Such information should be considered in preparing project budgets. There may also be a link between communities that have been left behind and groundwater challenges, which may call for dedicated programming.</p> <p>By being informed, WASH Funders can discuss whether to operate in such areas, and if so, how grantees can do this.</p>

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Subject/Questions		Considerations
4.5 Sustainability checks		
a	<p>If Grantees are supporting the use of sustainability checks, do these include sections or questions which consider key issues that affect infrastructure quality?</p> <p> <input type="checkbox"/> Yes – the following aspects are considered: _____ _____ _____ _____ </p> <p> <input type="checkbox"/> No <input type="checkbox"/> Don't know </p>	<p>Sustainability checks can for example consider premature failure (i.e. within first one to two years from construction), abandonment by users due to water quality issues (stemming from corrosion), handpump performing poorly (and underlying reasons).</p> <p>They may also examine whether there are mechanisms for user complaints and how these are addressed.</p> <p>Sustainability checks may also consider whether borehole drilling is being effectively supervised, and whether there is post-construction monitoring.</p>

ⁱSrinivasan, A. and Kurey, B. (2014) Creating a Culture of Quality, Harvard Business Review Magazine, April 2024. Available at <https://hbr.org/2014/04/creating-a-culture-of-quality> (accessed 7th February 2024)