



Professional Management of Water Well Drilling Projects & Programmes: Online Course 2019 Process Report



Module 1	• Introduction and Groundwater Information and Siting
Module 2	• Costing and Pricing, and the Procurement and Contract Management
Module 3	• Borehole Drilling and Supervision
Module 4	• Institutional Frameworks for Borehole Drilling Professionalism
Module 5	• Dialogue and Actions to Raise Drilling Professionalism

“Before undertaking my first training on borehole drilling management I thought it was just like managing a regular structural project but I realised it is totally different. Every borehole is unique and it is something to note and share with everyone. I would want to be really involved in training and educating these stakeholders in the ministries.” Participant (Assignment Module 5).

“It is a triad of learning; the participants learn from the facilitators; the participants learn from each other; and the facilitators learn from the participants” (Dotun Adekile, Course Facilitator).

In my experience the course was... “Worth the extra time I had to create to participate in it. It has increased my confidence in discussing practices in borehole drilling” Participant (Evaluation Survey).

*Dr Kerstin Danert, Skat Foundation
April 2020*

This document reports on the online course on professional management of water well drilling projects and programmes that took place in 2019. The course was made possible thanks to funding contributions by Skat Foundation, Lotteriefonds St.Gallen, United Nations High Commission for Refugees (UNHCR), WaterAid UK, Oxfam UK; in kind support by the Water Integrity Network (WIN) and the British Geological Survey (BGS) and hosting and facilitation by UNDP Cap-Net on their virtual campus. This course built on the 2018 version, which was developed as part of a Project Collaboration Agreement (PCA) between UNICEF and Skat Foundation (2017 to 2019).

This is one of two documents. A sister document has been prepared and is available the public domain: **Danert, K (2020) Groundwater and Drilling: Insights from over 50 Countries, Skat Foundation, St. Gallen, Switzerland**, Available at <http://www.rural-water-supply.net/en/>

Contents

List of Boxes, Figures and Tables.....	4
Summary.....	4
Introduction.....	7
1. Course Overview.....	8
2. Participation and Engagement	11
3. Course Evaluation	14
4. Recommendations for future courses.....	19
5. Closing Words	21
References.....	22
Annexes.....	23
Annex 1 Participant Details.....	24
Annex 2 Course Facilitation Team	25

List of Boxes

Box 1	Course Learning Objectives.....	8
Box 2	Comments by the Course Facilitators	11
Box 3	Select responses to question, "In my experience the course was..."	17

List of Figures

Figure I	Map of countries of course participants	5
Figure 1	UNICEF Guidance Note published as part of 2015 - 2017 UNICEF – Skat Foundation Project Collaboration Agreement (PCA)	7
Figure 2	Course Modules	9
Figure 3	Map of Countries of Course Participants.....	11
Figure 4	Breakdown of Types of Organisations Participating in the Course.....	12
Figure 5	Histogram of Scores of those who passed the Course	12
Figure 6	Participation in Discussion Forums and Passing Assignments & Quizzes for all Modules....	13
Figure 7	Time Spent Dedicated to the Course per Week (N=79 & 81).....	15
Figure 8	Response to evaluation question "How would you rate the course?"	17

List of Tables

Table 1	Course Gantt Chart (2019).....	10
Table 2	Number of participants passing quizzes	14
Table 3	Response to question, "How do you rate your knowledge on each module topic before and after the course?"	16
Table A1	List of countries and regions in which participants are working.....	24

Summary

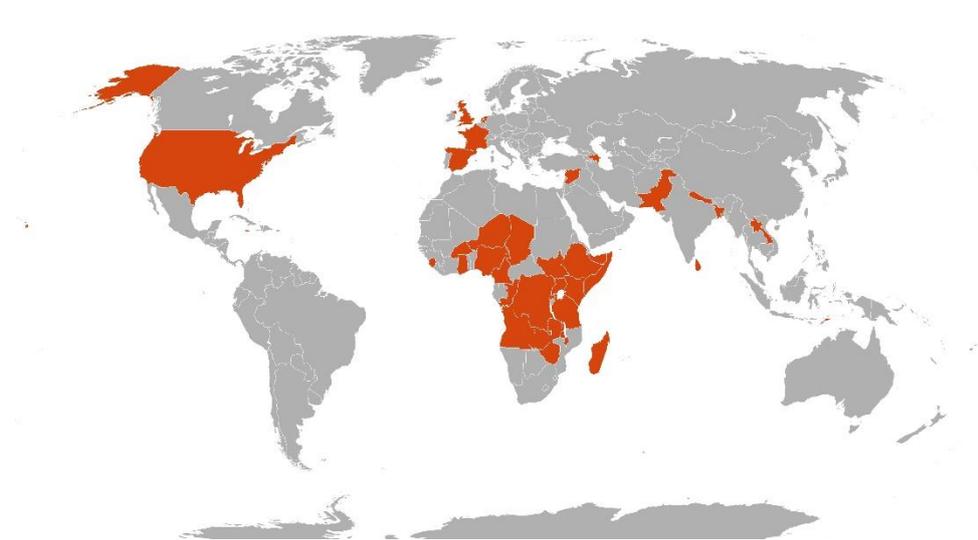
The second online course on the **professional management of water well drilling projects and programmes** enabled 97 participants working for NGOs, the United Nations, governments, private enterprises and academic/training institutions in more than 34 countries to improve their skills and knowledge, and learn from one another. Of the participants, 18 (19%) were female. The course comprised the following five modules:

1. Groundwater information and siting
2. Costing and pricing, procurement and contract management
3. Borehole drilling and supervision
4. Institutional frameworks
5. Dialogue and action to raise drilling professionalism

The course was hosted by UNDP Cap-Net on their Virtual Campus, an online learning platform, and managed by Skat Foundation, with content facilitation by a team of nine groundwater professionals. Participants were provided with an overview presentation for each module, alongside reading materials, videos, presentations and links to select websites. As the second course, improvements that became apparent during the running and evaluation of the first edition of the course in 2018 had been incorporated.

Of the 97 people (18 ♀) who took the course, 72 (74%) successfully completed the course and were awarded with certificates, with another six (6%) actively participating but with insufficient marks to pass. The pass rate is higher than in the 2018 edition of the course where it was 51%. The remaining 20% of participants were considered as visitors, and benefited from having access to the online library materials and forum discussions. The participants were working in over 36 countries, with at least two participants having regional roles across multiple countries.

Figure i Map of countries of course participants



In total, 81 participants (84%) took the online evaluation survey. 96% found the course to be extremely or very relevant. The course exceeded, and completely met the expectation of 20% and 69% of the participants. Of the evaluation respondents, 86% rated the course as excellent or very good. Respondents to the survey rated that their knowledge on the topics had increased across all course modules. Select quote from evaluation are set out below. *"In my experience, the course was...*

- *“Worth the extra time I had to create to participate in it. It has increased my confidence in discussing practices in borehole drilling”.*
- *“An Eye-opener for me...every step towards delivering a cost-effective borehole was well thought through with... educational videos which explain the roles ever[y] stakeholder in the industry should take... I'm glad to have been one of the few that participate[d] in this course. I believe this opportunity given to me would have lot of great impact in my organisation. My appreciation goes to all the organizers of this great platform and the sponsors”.*
- *“Extremely valuable and I wished I had it in 2015-2017 when I was managing borehole drilling directly”.*
- *“This course exceeded my expectations. It is especially relevant as we look to prepare for uncertainty in water availability and access. I printed out most of the course materials”.*

Three types of activities (i.e. quizzes/questionnaire, discussion forums and written assignments) enabled participants to engage in depth with the subject matter, reflect on their own experiences and consider the effectiveness of policies and practices within their own organisations and more widely in the country (or state) in which they work. Participation in these activities was excellent, with 36 participants scoring over 80%.

The facilitation by Cap-Net guided the participants through the course through regular communication (by email). A team of experienced professionals from Burkina Faso, Netherlands, Nigeria, Madagascar, Senegal, Switzerland and the United Kingdom responded to the participants on the discussion forums and marked the assignments for each module, providing individual feedback.

The separation of management, technical support and content facilitation enabled the team members to each focus on their roles. As in 2018, the content of the modules and flow of topics worked very well. Participants responded to the discussion forums for all modules, raising pertinent issues, sharing experiences, as well as relevant reports or guidelines and asking questions. There was a logical flow between the modules, with participants often raising new issues that the course covered in subsequent modules (particularly in relation to the institutional framework).

As in the 2018 edition, a wealth of information was shared through both the discussion forums and assignments. This has been drawn together in a sister report entitled Groundwater and Drilling: Insights from over 80 Countries (Danert, 2020).

The insights shared highlight the need for continued efforts globally and locally to raise professional drilling, and drilling management capacity. It is hoped that this will further incentivise Rural Water Supply Network (RWSN) partners and other organisations to institutionalise efforts to improve borehole drilling professionalism worldwide. As in the 2018 edition, this course highlights the tremendous need for capacity strengthening with respect to borehole drilling professionalism in order to ensure that no one is left behind in accessing safe drinking water supplies.

We hope that this course can be run again. When it was openly advertised in 2018, there were 648 applications. The two years in which this course has been run has enabled 174 people to take the course, but need, and demand remain very high.

Introduction

Developing sustainable water services that rely on boreholes requires considerable knowledge and skills. Even those who are not actually building the infrastructure but rather managing drilling programmes and projects need have the knowhow to properly manage contracts, and ensure that the boreholes are sited and completed in a professional manner. Ideally, drilling programmes should take place in the context of a supportive enabling environment. National (or state level) policies and regulations, as well as their implementation and capacity to oversee drilling projects varies considerably. Notably many industrialised countries face similar problems and constraints to those of those that are less industrialised. **This document reports on the 2019 online course on professional management of water well drilling projects and programmes.**

The need to systematically raise capacity in with respect to drilling management and oversight, as well as drilling itself has remained a recurrent theme since the Rural Water Supply Network (RWSN) launched a flagship on borehole drilling in 2004. The UNICEF Guidance Note on Professional Water Well Drilling (Figure 1) brought together considerable documentation that has been generated for 15 years within RWSN and beyond. It is structured around six action areas and provided the core document for the online course.

Chapter 1 provides an overview of the course objectives, participants, facilitation and methods used. Chapter 2 presents the participation and engagement of those taking the course. Chapter 3 gives a summary of the course evaluation results. Chapter 4 sets out the action areas pf improving drilling professionalism that participants identified. Chapter 5 provides a synthesis of the information and insights provided by the participants in their assignments and through the forum discussion. Finally, chapter 6 reflects on the course and provides recommendations for future editions.

The course was hosted on the UNDP Cap-Net virtual campus and managed by Skat Foundation. This, second edition of the course was made possible thanks to collaboration, financial and in-kind support from Skat Foundation, Lotteriefonds St.Gallen, United Nations High Commission for Refugees (UNHCR), WaterAid UK, Oxfam UK, the Water Integrity Network (WIN), the British Geological Survey (BGS), UNICEF and the Africa Groundwater Network (AGW-Net). The first edition of the course in 2018 was developed within a Project Collaboration Agreement (PCA) between UNICEF and Skat Foundation (Danert and Theis, 2018).



Figure 1 UNICEF Guidance Note published as part of 2015 - 2017 UNICEF–Skat Foundation Project Collaboration Agreement (PCA)

1. Course Overview

Learning objectives and time requirements

This online course offers participants an introduction to the professional management of water well drilling projects and programmes (Box 1). It provides an overview of what is required to improve the professionalism of their own efforts, as well as those within the organisations and countries in which they work.

Box 1 Course Learning Objectives

By the end of the course participants will:

- Have an understanding of the key elements of a **professional** water well drilling sector.
- Understand key reasons for immediate and longer-term **borehole failure**.
- Recognise the value of groundwater **data** and know what constitutes good borehole siting.
- Appreciate the importance of drilling **supervision**.
- Learn about practices, initiatives and challenges to improve drilling professionalism from participants in **other countries**.
- Have improved knowledge to reflect on **procurement** and contract management
- Understand what constitutes a strong **institutional framework** (at national or state level) for borehole drilling, including driller licencing, borehole permits and associations.
- Have signposts for materials that support **further learning** on the topic.

Throughout the course, the participants are required to reflect on the pros and cons of practices and policies from the contexts in which they work. Using state-of-the-art materials, i.e. videos, documents, presentations and websites, the course builds up to a final assignment whereby participants are tasked to explore actions that could be taken within their own organisations, by local and national authorities to improve borehole drilling professionalism.

Participants were expected to dedicate a total of 40-60 hours for the course. More time is needed for those without a basic understanding of hydrogeology. This time dedication should enable review of the basic (compulsory) readings and participation in all activities (forums, assignments, multiple-choice quizzes). Participants who wish to read additional materials and watch related videos require more time.

Target participants and selection

The course is for professionals that have been involved in the budgeting, planning, procurement, management, implementation, supervision, monitoring of water supply projects or programmes involving borehole construction, and those involved in water resources monitoring, regulation or other governance aspects. The course is relevant for all regions of the world. The 2019 course targeted about 100 participants, with 97 taking part. In an attempt to enable participants, able to dedicate sufficient time and commit to the course, over 120 people were invited to join. However, the participation of those that did not complete a compulsory pre-course survey and who were not active in the first module was cancelled. This enabled 97 participants to take the course. Of the participants, 18 (19%) were female, which is lower than in 2018, which had 28% female participants.

Participants were selected by WaterAid, UNHCR, Oxfam and UNICEF, as well as UNDP Cap-Net. Given the waiting list of over 500 participants from the open call for the 2018 course, there was no open call this time round. UNDP Cap-Net contacted all those that expressed interest in the 2018 and based the selection on the responses.

Unfortunately, not all of the agencies were able to provide short lists within the deadlines set by the management team for participant selection. This caused some delays in launching the pre-course survey, and increased the management time. The removal of participants who did not undertake the pre-course survey and engage in the first module was effective, but selecting those from the waiting list proved to be challenging to undertake in a timely manner. Given that the late acceptances were enrolled on the course in week 5, it proved very difficult for them to catch up and complete the course. In future courses, it is proposed that for future courses, there is no waiting list, but rather that 120 people are invited to join from the start, with the expectation that about 20 will not demonstrate sufficient commitment within the first few weeks, and can be taken off the course.

Modules and timing

The course, comprising five Modules (Figure 2), is designed for both:

- those with a technical (i.e. engineering/science) and
- those with a non-technical (i.e. social science/economics/arts/politics) background.

Participants are expected to have a diploma or bachelor's degree qualifications and preferably at least three years of work experience in water supply service delivery (social or technical aspects), civil engineering, rural development or water/environmental management. As this is an introductory course, participants were not expected to have a detailed understanding of hydrogeology. Additional materials were provided for those not familiar with groundwater or drilling at all, but as noted above, this required additional study time). The five modules are shown in Figure 2.

Figure 2 Course Modules

Module 1	• Introduction and Groundwater Information and Siting
Module 2	• Costing and Pricing, and Procurement and Contract Management
Module 3	• Borehole Drilling and Supervision
Module 4	• Institutional Frameworks for Borehole Drilling Professionalism
Module 5	• Dialogue and Actions to Raise Drilling Professionalism

Table 1 Course Gantt Chart (2019)

Activity	Week commencing													
	May			June				July				Aug		
	13	20	27	3	10	17	24	1	8	15	22	29	5	12
Pre-course survey: 22/4														
Module 1				* (7)										
Module 2					* (14)									
Module 3						* (21)								
Module 4								* (5)						
Module 5											* (26)			
Extension for Completion														

KEY: *Assignment due in on the Friday of the week

Course manual and improvements

A revised course manual was prepared and shared with all of the facilitators for comment prior to the commencement of the course. Improvements to the course were made in light of the recommendations by the management, participants and facilitators of the 2018 edition i.e.:

- Orientation presentations (as voice recorded slide show and pdf) for modules 1 to 4.
- Providing one document with an overview of all references.
- Recorded welcome videos prepared by all facilitators.
- Including more references on anti-corruption methods and strategies.
- Specific improvements to some assignments and forum discussions to improve learning.
- Cancelling participation of those who did not demonstrate commitment at the course start.

Management and facilitation

There were two to three dedicated facilitators for each module (Annex 2), tasked with preparing an introductory video, responding to participants on the online discussion forum, marking assignments and providing feedback on how to improve future editions of the course. The time inputs by Dr Kirsty Upton (BGS), Justine Haag (WIN), Damien Indij (Cap-Net) and Mika Jouhki (Cap-Net) were funded by their respective organisation. The time for the other facilitators was paid for through financial contributions by partner organisations.

The course was launched on 22nd April (with a pre-course survey), and continued up to the 9th August 2019. There was a spill over of a very small number of assignments up to the 6th September. The course thus ran for 16 weeks in total, although the official timeline was 12 weeks. This is in line with previous experience. Although deadlines were communicated for each assignment through the online platform and the assignment template, late submissions were accepted. This approach is taken to enable those with competing schedules, health issues or difficulties in accessing the internet to complete the course. Participants were provided with opportunities to be awarded with their certificate without compromising on the deliverables expected, or their quality.

The course facilitators provided positive feedback on their experience (Box 2), as well as ideas for further improvements, which have been collated and can this feed into a subsequent edition.

Box 2 Comments by the Course Facilitators

"...some of the participants really embraced the opportunity for dialogue and provided very interesting insight" Kirsty Upton (2019).

"...some of the assignment submissions are so informative and brilliant to be worthy of publication in professional journals" Dotun Adekile (2019).

"...it is interesting when a participant from Spain mentions lack of groundwater database as a challenge in their country, a situation which one may think is peculiar to sub-Saharan Africa" Dotun Adekile (2019).

"The orientation given during Skype calls with Skat Foundation and Cap-Net and the facilitation team were a great help to get ready before the start of the modules" Justine Haag (2019).

"This course was a great opportunity for water professionals from Government, NGOs, private sector/consultancy firms and UN agencies to enhance their knowledge and skills and improve borehole drilling professionalism in their respective countries" (Serele, 2019).

Like the first course" ...it is still amazing to discover, by reading assignments, the diversity of [the] borehole drilling sector around the world, and the issues related to borehole drilling professionalism. The capacity building demand is still tremendous, and so is the need to do more trainings" (Diene, 2019).

Cost of the course

The expenditure on the course through Skat Foundation, paid for improving the materials from the 2018 version, course management and facilitation, reporting, and preparing a synthesis document of the insights shared from over 50 countries was CHF 85,000. Additional in-kind support was provided by Cap-Net, by hosting the course on their virtual platform and facilitating, and facilitation by staff from the British Geological Survey (BGS) and the Water Integrity Network (WIN). Taking out the cost of preparing the synthesis report, the 2019 course cost CHF 65,000, i.e. about CHF 650 per participant.

2. Participation and Engagement

Of the 97 people (18 ♀) who took the course, 72 (74%) successfully completed the course and were awarded with certificates, with another six (6%) actively participating but with insufficient marks to pass. The online course provides a learning platform for a larger number of participants from more countries than can be reached with a face-to-face classroom, or field-based training course that usually lasts for one or two weeks. The participants were based in over 36 countries (Figure 3), with at least two having regional roles across multiple countries. Most of the participants worked for NGOs or UN organisations (Figure 4). Staff from 36 different organisations participated.

Figure 3 Map of Countries of Course Participants

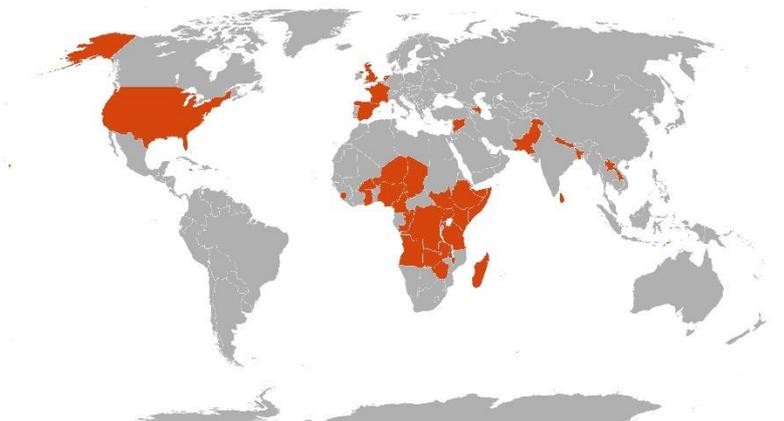
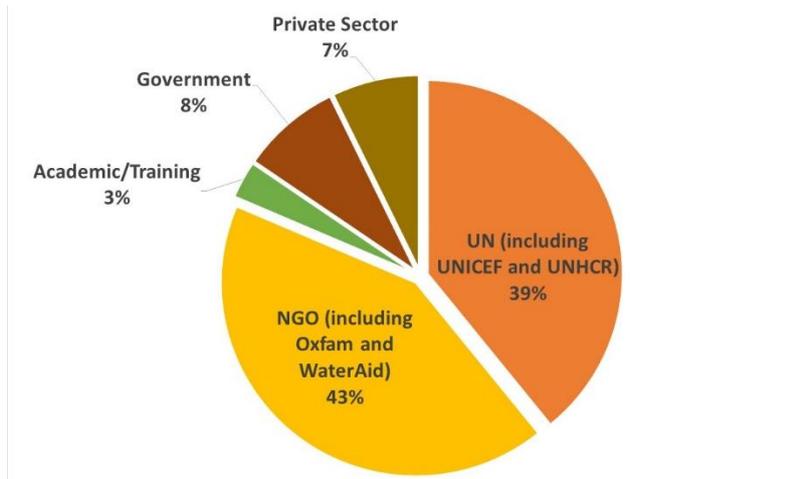
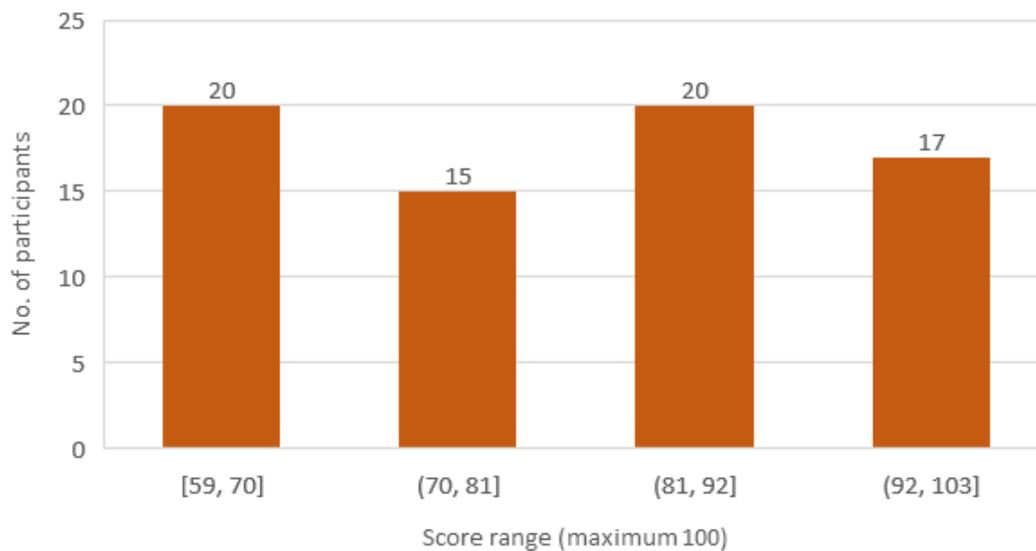


Figure 4 Breakdown of Types of Organisations Participating in the Course



Participants had to score at least 59 out of 100 points to complete the course, and thus be awarded with a certificate. This score could be achieved by providing three assignments, completing three quizzes and contributing to three discussion forums¹. Of the 97 participants, 72 (74%) successfully completed the course and were awarded certificates. This successful completion rate is higher than the 2018 edition of the course (where it was 52%) despite the requirements to pass being higher in 2019. Notably over half of those who completed scored over 80%, illustrating their commitment to the learning during the course (Figure 5).

Figure 5 Histogram of Scores of those who passed the Course



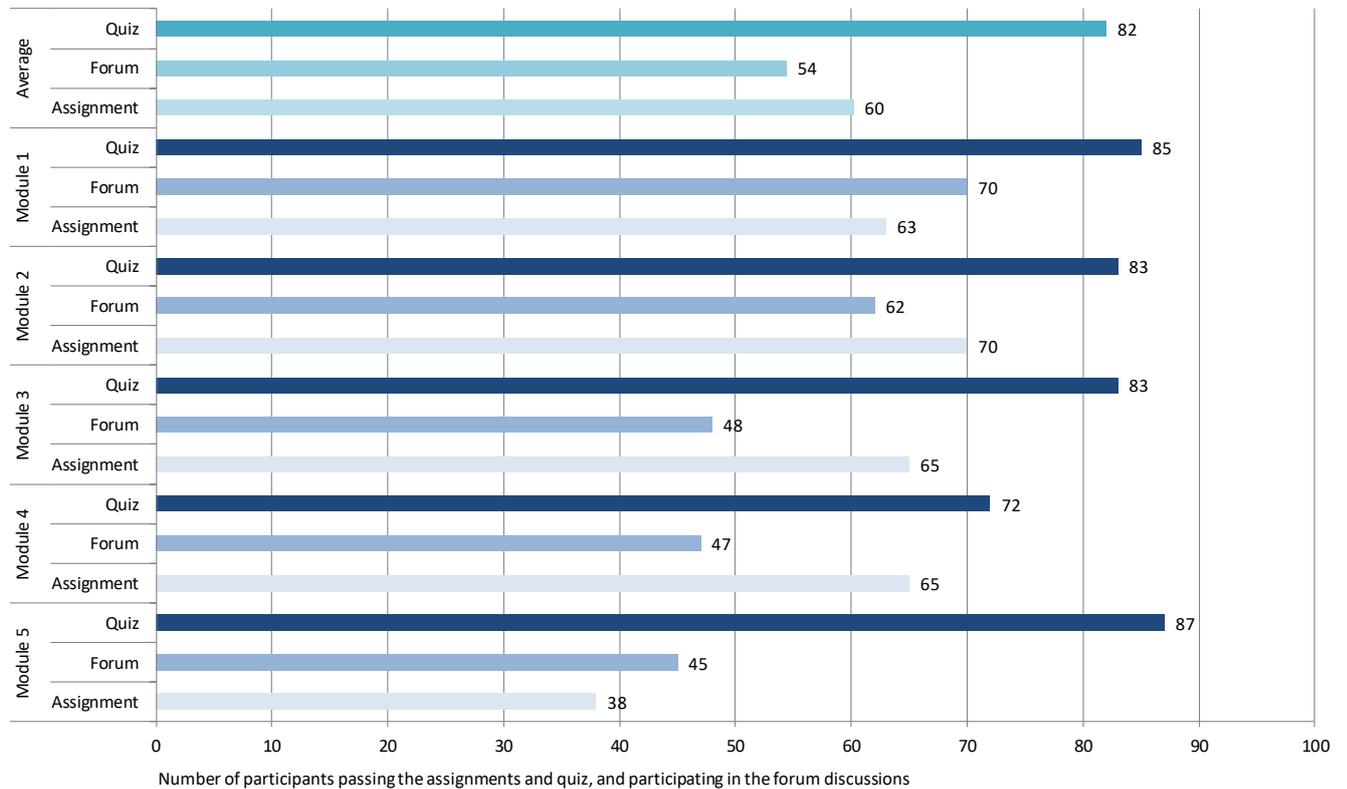
A number of participants reflected on their learning within the discussion forum, and per email. Select quotes are:

- *"I found this module [2] is very useful for water well drilling enterprises especially while costing and pricing (Ethiopia).*
- *"Through this module [2], I understand the difficulties the drillers will face" (Sri Lanka)*

¹ Participants received points for participating in the discussion forums, successfully completing the quizzes (by scoring 60%), and passing the assignments for each module.

- Module 2: *A drilling business needs to have a business plan, sufficient cash flow and competent staff and to understand the market. Understanding and internalizing the national requirements and standards are also critical* (Malawi).
- General: the course provided the opportunity to discuss with people across the world on the discussion forum, bringing a huge range of experience (UK).

Figure 6 Participation in Discussion Forums and Passing Assignments & Quizzes for all Modules



Quizzes

The quizzes worked very well, with over 72 participants taking each one. Notably an average of 87% of the participants took each module quiz, compared to 51% in the 2018 edition. In the course evaluation, 87% of the respondents stated that the quiz at the end of each module was very good or excellent. One participant recommended that the course should *"include more challenging quizzes so that I am motivated to read more of the reading and learn more."*

Table 2 Number of participants passing quizzes

Module	No. of Participants Passing Quiz
1: Introduction, Groundwater Information and Siting	85
2: Costing and Pricing and the Procurement and Contract Management of Borehole Drilling	83
3: Borehole Drilling and Supervision	83
4: Institutional Frameworks for Borehole Drilling Professionalism	72
5: Dialogue and Actions to Raise Drilling Professionalism	87
Average of 97 participants (2019)	82 (84%)
Average of 84 participants (2018 edition of the course)	51%

Assignments

On average, 60 (52%) participants successfully completed their assignments² (Figure 6), a significant rise from the 2018 course where it was 41%.

Discussion forums

Within the discussion forums, participants were invited to respond to set questions, providing opportunities to share stories, challenges, lessons learned and opinions from their respective experiences and perspectives. In general, the facilitators provided specific responses, including encouragement to each posting. On average 54 (56%) of participants participated in the discussion forum (Figure 6), with an average of 175 postings and 66 voices³. In order to accommodate participants who had problems in participating on time, the course continued for longer than scheduled (see page 10). As a result, a number of participants were posting in earlier forums quite some time after the module had semi-formally ended, and dedicated co-facilitators were no longer available which led to some lags in responses during in the final weeks for the course. For a future course, delayed response to the forums needs to be planned in from the outset. As in the previous course, participants tended to respond to the specific questions, rather than discuss the issues faced with each other.

3. Course Evaluation

Overall results

In total, 81 participants (84%) took the online evaluation survey, which was sent first sent out on the 25th July⁴. 96%⁵ found the course to be extremely or very relevant. 81% of respondents found the communication between facilitators excellent or very good. Three participants indicated that they would have liked the course to include a live session.

The types of challenges reported by participants were as follows:

- difficulties in finding time to participate in the discussions
- challenges in connecting to the internet

² Assignments were not scored numerically, but rather as a pass or fail.

³ Postings ranged from 241 postings and 76 voices in module 1 to 121 postings and 51 voices in module 5.

⁴ The survey was sent out using the platform Survey Monkey.

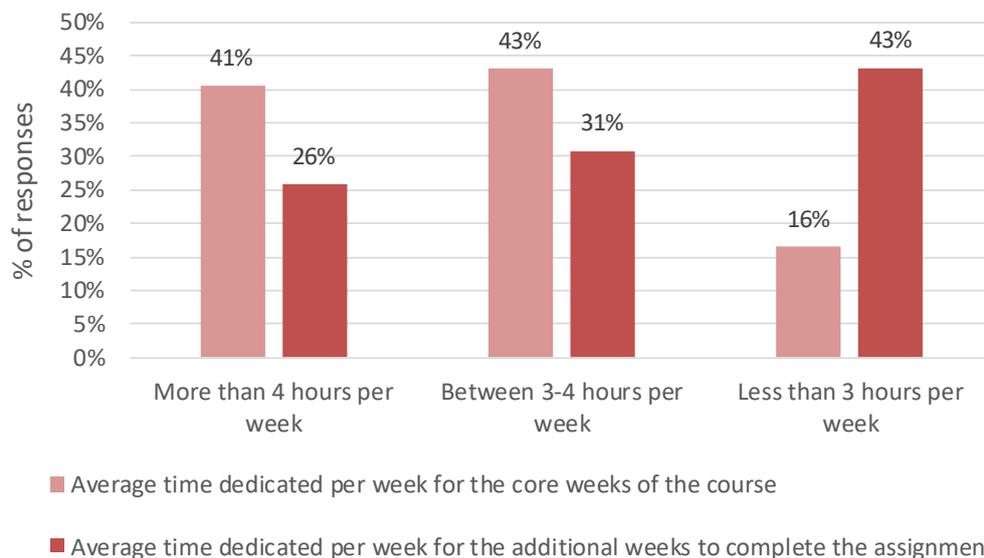
⁵ of 30 respondents to the question

- travel and competing priorities
- understanding English
- difficulties in finding data in country for the assignment
- not all emails from the lead course facilitator arrived.

Cap-Net are in the process of developing a new online Virtual Campus, which will be able to include new features. Ideas by participants for improving the platform will be directly taken up by Cap-Net from the course evaluation of this, and other courses.

Of the evaluation respondents, only 8% found that the official length of the course of eight weeks, plus three weeks to complete the assignments was insufficient (Figure 7). Notably, one participant commented that *"it was very useful to have the extension period to catch up on assignments"*, while another stated that *"to understand the topic and suggested journals needed more time"*. Of the respondents, 67% found the expected dedication time for the compulsory materials to be 4 hours per week to be adequate, while 28% found that it was insufficient.

Figure 7 Time Spent Dedicated to the Course per Week (N=79 & 81)



Of particular note is that for the 2018 course, 68% of the participants spent more than four hours per week for the core weeks, and so the 2019 course is an improvement. The new orientation presentations for each module coupled with the improved classification of reading materials may have contributed to this⁶.

Comments on the issue of time spent include:

- *"for a careful reader it could take longer"*
- *"Insufficient time for other with his English level"*
- *"depended on availability and accessibility of in country information per module – some information was readily available"*
- *"depend[ing] on the country situation like the internet, electricity to enable the person work at home"*

⁶ The 2018 course report (Danert and Theis, 2018) specifically recommended the use of orientation presentations in order to help participants select the materials most relevant for their needs from the extensive recommended reading/videos list.

- *"it is challenging to get the commitment coupled with work travels and...power outages.. that see one waking up at midnight to access electricity"*
- *"Unfortunately, I had little time to engage with any additional materials because the compulsory reading took much longer than 4 hours to complete"*

Of the respondents, 94% found the quizzes at the end of each module to be excellent, very good or good, as illustrated by the comments:

- *"the quiz gives a lot of knowledge about the relevant material"*
- *"longer quizzes encourage more reading"*

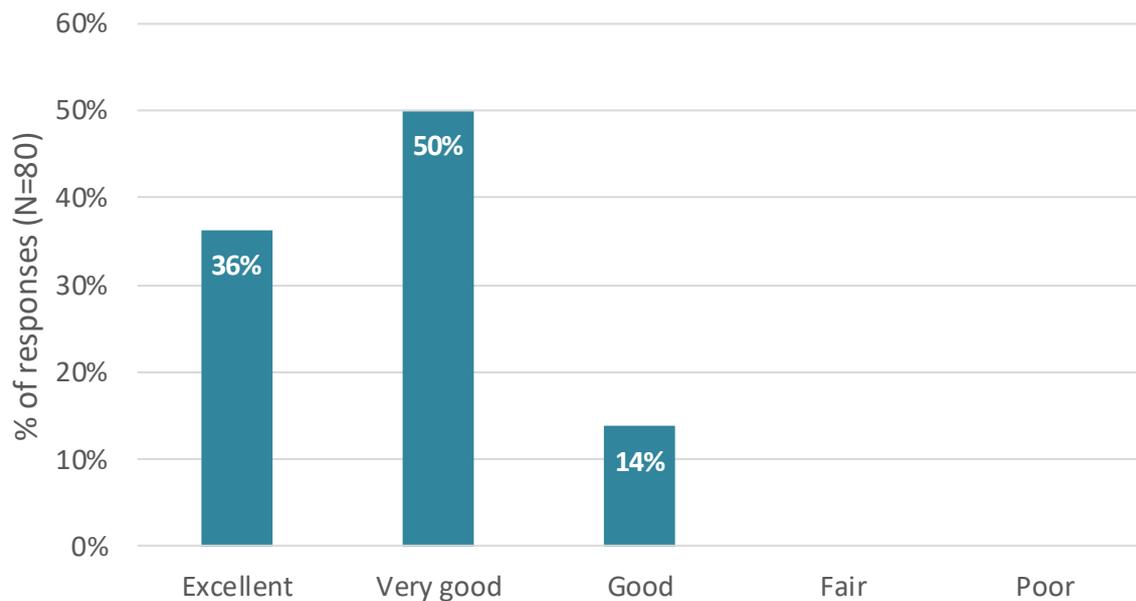
Likewise, views on the set of activities for each module were very positive with only 6% finding them excessive and 3% insufficient. In terms of relevance, 92% of the respondents found the course to be extremely, or very relevant. This reflects very well on the participant selection. One participant commented that they would have liked to have more on Self-supply and manual drilling.

Respondents were requested to rate the different training modules. Modules 1, 2 and 3 were given the highest proportion of rankings for excellent, with modules 4 and 5 ranked slightly lower. This is in line with the evaluation of the 2018 course. In future evaluations, it would be worth asking a qualitative question about why some modules ranked higher than others did. This could providing insights for improving modules 4 and 5.

The course exceeded, and completely met the expectation of 20% and 69% of the participants respectively. Of the evaluation respondents, 86% rated the course as excellent or very good (Figure 8). The evaluation survey respondents were asked to rate their knowledge on the topics for each module before, and after the course. The results, presented in Table 4, are very encouraging, with all modules showing a significant increase in the percentage of people ranking their knowledge as excellent or good after the course, compared to beforehand.

Table 3 Response to question, "How do you rate your knowledge on each module topic before and after the course?"

Module	Before the course (% respondents)				After the course (% respondents)				Change (% points)	
	Excellent	Good	Basic	Poor	Excellent	Good	Basic	Poor	Excellent	Good
1: Introduction, Groundwater Information & Siting	8%	34%	55%	4%	49%	48%	4%	0%	↑41	↑14
2: Costing & Pricing and Procurement & Contract Management of Borehole Drilling	4%	35%	49%	13%	46%	49%	5%	0%	↑42	↑14
3: Borehole Drilling and Supervision	3%	44%	41%	13%	56%	39%	5%	0%	↑54	↓5
4: Institutional Frameworks for Borehole Drilling Professionalism	4%	23%	5%	22%	24%	60%	15%	0%	↑21	↑37
5: Dialogue & Actions to Raise Drilling Professionalism	3%	18%	54%	26%	19%	68%	12%	1%	↑17	↑50

Figure 8 Response to evaluation question "How would you rate the course?"

In total, 73 participants responded to the evaluation survey question asking them about their experience of the course (Box 3).

Box 3 Select responses to question, "In my experience the course was..."

Engaging and refreshing. My capacity is enhanced on borehole drilling, construction and management for effective service delivery."

Excelent. It allowed to strengthen my capacities for drilling supervision.

Important as it enlightens my understanding and makes me comfortable on my daily activities.

The course is very useful especially [for] drilling practitioners although we are already working on it.

This course give us a systematic approach for drilling.

An eye opener of the way to conduct professional drilling in a project or programme. It covered all the topics one has follow for drilling of cost effective boreholes

Very helpful for drillers in developing countries. Scope and schedule was well understood.

Worth the extra time I had to create to participate in it. It has increased my confidence in discussing practices in borehole drilling.

An Eye-opener for me...every step towards delivering a cost-effective borehole was well thought through with an educational videos which explain the roles ever stakeholder in the industry should take... I'm glad to have been one of the few that participate in this course. I believe this opportunity given to me would have lot of great impact in my organisation. My appreciation goes to all the organizers of this great platform and the sponsors.

Extremely valuable and I wished I had it in 2015-2017 when I was managing borehole drilling directly as I not do it indirectly.

This course exceeded my expectations. It is especially relevant as we look to prepare for uncertainty in water availability and access. I printed out most of the course materials.

All responses were positive. Recommendations from the survey that should be considered in improving the course have been noted. Frequently occurring recommendations were to continue/extend/expand

the course and increase the number of participants so that it is available to others/more can be reached; avail the course in French and ensure that all materials are freely available online after the course. Some innovative suggestions were also put forward:

- the production of an abridged version of the course in booklet format
- sharing of field technical experience
- a national platform where “actions to raise drilling professionalism can be fully known across the nation”
- more video literature
- “I would love to see a follow-up course that has more to do with drilling... an advanced course to this one”.
- Refresher training after one-year duration.

Specific reflections – WaterAid participants

Four months after completion of the course, WaterAid hosted a webinar for course participants from within the organisation. The key reflections from five participants are:

Participant 1 – based in London, with a global support role - Interest in groundwater from experience with the UPGro programme, i.e. multi-stakeholder research into sustainability of handpumps. This has shown that poor contracting and supervision are major contributors to handpump failure.

“I wanted to know what good practice is like and what to look out for... The course provided a wealth of information and resources. As I am based in the London office. I don’t apply lessons directly, but it is very useful to know what to look for and questions to ask with colleagues”.

Would strongly recommend running the course again.

Participant 2 – Senior programme officer and civil engineer, WaterAid Nepal. Currently supporting Resilient WASH programme and project with a UK Water Company who bring many technical resources to help improve utility system in urban WASH.

“Course went well and quite exciting. It was just the right moment to get involved. [Working on project with Nepal Water Supply Corporation ... with the mandate to supply safe drinking water in 23 cities. It was good to understand how a borehole programme should work through the guided step-by-step approach, dealing with contractual issues and institutional frameworks. We realised we need to do a lot ... Especially institutions: a dedicated unit, logs, reports, data. Specifications from policy to ground level need to be very clear whether you are working on large or small scale. ... Many lessons have been learned about why boreholes fail every 5-10 years. It was ... helpful to learn about specifications, frameworks, processes and institutions... A key person from the corporation was invited on the course. It was very encouraging for them to be part of the process on specifications and for government officials who were engaged. It helped to build relationships with them”.

Very strong recommendation to run the course again.

Participant 3 – Technical manager, WaterAid Zambia with a background in chemical engineering and development studies and now working in the water sector directly involved in borehole drilling.

“One major concern in Zambia is regulation and management of groundwater resource. Government introduced regulatory framework for conserving groundwater in 2017. The course highlighted many issues we were overlooking. One important thing is separation of hydrogeological investigations from drilling. At the moment we only pay for wet boreholes and siting is all done by contractors. This means the contractor

has to bear the cost of dry boreholes and cuts costs in other ways, which affects quality. We need to consider how we pay for failed boreholes. If someone else has done siting, then if it fails we need to pay contractor. ...The other main thing is contract management process and supervision. Sometimes we do this but when we work with other stakeholders like local authorities we need to make sure they understand”.

“Some of the people nominated for the course were government officials. We expect their support in supervision and contract managers.”

I will highly recommend the training especially if we target rural WASH coordinators in local authorities.

Participant 4 – Southern Africa with a background in sanitation.

“The course was super useful. Most of the knowledge is applicable to everything we do. Most components apply to good construction management in general. Good practice is transferrable to any construction work.

Enjoyed the course very much it is very well designed. Goes through all stages from assessment (siting). The importance of careful design from initial stages could be used for any type of work.

A lot of detail on supervision: proposals on how to set up supervision, timelines, right qualifications. This shows what team we need in place. Also important to go through all contract issues in detail”.

I would definitely recommend the course.

Participant 5 – Nigeria

“It increased my knowledge on drilling and siting. Also made me able to supervise and assist a supervision team. ... One key thing I found so important siting. We face difficult terrain [here]. Siting has been very difficult in some communities. During the training, I could share my experience and challenges and hear from other colleagues on the course. They shared experiences [from] other states. This helped achieve results. ... I have also been exposed to different ways to solve problems like getting water in very difficult terrain.”

Definitely recommend running the course again

Other reflections

“I am eternally grateful for the opportunity to be a part of this course. It has always been my dream to become a hydrogeologist and I see this course as part of my journey to that realization. I even printed all the reading material for the course in weekly booklets because I know I will use them in the future” (2019).

4. Recommendations for future courses

Recommendations for improvements to the course, based on a review of all discussion forums, quizzes and assignments submitted and marked, as well as feedback from the course facilitators, participants and funders are set out below. It should be noted that some of these have already been taken into consideration with the development of the Cap-Net’s new online platform, launched in mid-2020.

Process overview and materials

Include a timetable on the online course platform with all of the important dates for the participants.

Consider having a zip file per module with all the reading materials, clearly labelled, so that participants can download everything at once, or one location for all of the optional documentation.

Facilitation

Provide examples of good forum discussion feedback in updated manual. Note that advising facilitators to look at postings from participants in previous forum discussions can help them to have more context.

Consider always having three facilitators per module, and encouraging exchange between them regarding who may be best placed to respond to specific posts.

For a great number of the participants, English is not their first (or even national) language. When participants are struggling with English, it can take time for the facilitators to understand what they are trying to communicate and how to respond.

Forum discussions and interaction

As noted for the first edition of the course in 2018, the interaction between participants on the forum discussion platform remains limited. They all tend to respond to the questions. Is this something that should be worked on for future editions? It is worth exploring participants could be incentivised to respond to probing questions from the facilitators. It is important that participants always be responded to quickly to enable the Forum discussions to be as fluid as possible.

Forum discussion - module 5 could be adapted so that it (also) enables the participants to pose questions to the facilitators enabling them to consolidate their learning for the three previous modules.

While the forum can sometimes feel a bit dry, considering the large number of participants, and that they are in very different time zones there may not be a valid technical alternative for more interaction. However, in case a French version is run, with a smaller number of participants in close time zones, it may be worth considering one (or more) live presentations with interaction. It also may be worthwhile exploring the fostering of working groups to encourage collaboration between the participants.

Consider:

- Not having a forum discussion for each module, but rather for three modules only, with the final one much more of an interaction rather than a response to questions.
- asking the participants (on a voluntary basis) to prepare a one-minute introduction video
- facilitating post-course networking between participants by sharing participants list (for those who want to)
- asking participants to fill in a form, and share this information with the facilitators (covering who they work for, job title, which projects they work on, educational background)

Live sessions

The course has now been held for two years running, and the evaluations illustrate some demand for live sessions. It is also worth considering hosting webinars, or other live exchange that enables participants from the 2018 and 2019 courses to share experiences of what they have tried to do with the skills and knowledge gained through the courses.

Content

Consider adding additional readings on Integrated Water Resources Management (IWRM), particularly in relation to ensuring long-term, productive boreholes. There may be also scope to add more materials that can reinforce integrity/anti-corruption aspects. Provide more information on manual drilling.

Evaluation

In future evaluations, it would be worth asking a qualitative question about why some modules were ranked higher than others were. This may provide more insights for improvements.

Specific comments by WaterAid for running the course next time:

- The course was very well designed and very engaging. The discussion forum brought in external ideas. Do not see any improvements.
- Suggest making [the course] more mandatory for staff.
- Contact line managers and make participation more formal to allocate time to participate with quality.
- Some people had to opt out because of time pressure. So suggest time extended.
- The videos were good. Turn some of the bulky reading materials into video documentaries. Good for participants.
- Translate materials and make them available at all times.
- My colleague and I also went on a practical drilling course. The combination really enhanced understanding.

Participants

- I will highly recommend the training especially if we target rural WASH coordinators in local authorities (WaterAid Participant, Zambia).
- Consider having NGO or UN organisations as well as their partners taking the course at the same time, as this enables them to discuss issues.

5. Closing Words

This online course has been run for two years in a row and the feedback from the participants is very positive. Some minor changes to improve the course further have been noted separately, and can be used for a future edition. There is also now a strong team of experienced facilitators in place, including native French speakers.

The inputs by participants provide a wealth of information on the realities of professional drilling from many countries. This year, a separate report has been prepared, setting out the experiences and insights from managing water well drilling from 018 and 2019 courses. The sister report is entitled: *Groundwater and Drilling: Insights from over 50 countries* (Danert, 2020).

The need to try to repeat this course is captured in the following quote: *"The sustainable groundwater development conversation has been on for decades and will continue beyond our times, but we must make our own contribution - we must continue to advocate for good practice"* (Adekile, 2019). At the time of publishing this report, there was currently no funding to repeat it in the immediate future, but in case organisations are interested to run this course, or a version of it, please contact Skat Foundation or the report author.

References

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- Serele, C (2019) *Professional Management of Water Well Drilling Projects and Programmes – An Overview: Co-facilitation Report*, Internal Report prepared for Skat Foundation
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Annexes

Annex 1 Participant Details

Table A1 List of countries and regions in which participants are working

Note that some participants identifies with more than one country.

Country	Country
Angola	Nigeria
Azerbaijan	Pakistan
Bangladesh	Republic of Congo
Burkina Faso	Rwanda
Cameroon	Sierra Leone
Chad	Somalia
Democratic Republic of Congo	Somaliland
Ethiopia	South Sudan
France	Spain
Ghana	Sri Lanka
Jamaica	Syria
Kenya	Tanzania
Lao PDR	Timor Leste
Madagascar	Uganda
Malawi	UK
Nepal	United States
Netherlands	Zambia
Niger	Zimbabwe
Region	Southern Africa
Grand Total	97 participants from over 36 countries

Annex 2 Course Facilitation Team



Dr. Kerstin Danert, Skat Foundation, Switzerland (Course Manager)

Rural water supply specialist who has undertaken studies, raised awareness and provided capacity strengthening services for mechanised and manual water well drilling. She has developed publications and animated films, and run training courses that provide guidance on borehole siting, costing and pricing, supervision, procurement and contract management, and she has produced guidance for UNICEF on Professional Water Well Drilling.



Dr W. Jean Pierre Sandwidi, Independent Consultant and Lecturer, Burkina Faso

Dr Sandwidi, Hydrogeologist with competence in hydrology, climate change aspects related to water, irrigation management, IWRM and social sciences. Currently lecturer at University of Fada N'gourma in Burkina Faso, Dr Sandwidi is in charge of BRAVE 2 project of UPGro programme since 2013 and has been involved in various webinars and online trainings on groundwater as well as consultancies on irrigation and climate change aspects.



Ivann Milenkovic, Hydro Carto, Switzerland

Ivann is a French geologist and hydrogeologist with over 15 years of experience in groundwater resources exploration and management, environmental impact assessments and geological and hydrogeological mapping. He has been involved in design and implementation of many groundwater monitoring networks and water supply boreholes drilling in Africa and Europe.



Dotun Adekile, Independent Consultant, Nigeria

Dotun Adekile is a Nigerian geologist with over 35 years of experience in groundwater development in Africa. He was involved in the development of the RWSN Code of Practice for Cost Effective Boreholes and has authored and contributed to several publications and webinars in support of the Code. In the past three years he has been involved in training and capacity development of WASH personnel in the Cost Effective Borehole process in Nigeria, Sierra Leone, Zambia and Angola.



Tianaharivelo Rakoto, Independent Consultant, Madagascar

Ms Rakoto is a hydrogeologist and holder of an engineering diploma. She has more than 25 years of experience in the field of water supply projects in rural and urban areas. She has knowledge of drilling work in various types of geological conditions. She has participated in the development of a practical guide for carrying out borehole projects for water supply, and built capacities of the staff of partner NGO's, government and private sector for water supply projects.



Moustapha Diene, Cheikh Anta Diop University, Dakar, Senegal; Africa Groundwater Network (AGW-Net) and UPGro Ambassador

Moustapha Diene is hydrogeologist working currently at University Cheikh Anta Diop, Dakar – Senegal. Since January 2015, Dr. Moustapha Diene has taken over as Network Manager of the Africa Groundwater Network (AGW-Net); he has facilitated many training courses on intergrated groundwater management in Africa.



Dr. Charles Serele, Consultant

Dr. Serele is a hydrogeologist and he used to work for UNICEF and the United Nations Institute of Training and Research (UNITAR) as a WASH Expert. He provided management and technical support in sustainable groundwater development with focus on the professionalization of mechanical/manual drilling, increasing access to climate-resilient drinking water supply and development of innovative approaches to reduce vulnerability to drought through WASH risk-informed solutions. Additionally, Dr. Serele delivers capacity building activities to raise skills and knowledge in hydrogeological principals, water supply systems and drilling sustainable and cost-effective boreholes.



Justine Haag, Water Integrity Network (WIN)

Justine Haag is a Swiss WASH engineer and cooperation specialist in charge of the coordination of Water Integrity Network’s West Africa and Capacity Development programmes since early 2019. She has experience in planning and implementation of interventions with a wide range of stakeholders in various water sub-sectors (water supply treatment and distribution; wastewater conveyance, treatment and reclaiming; participatory groundwater agreements for IWRM).



Dr Kirsty Upton, British Geological Survey

Hydrogeologist with a focus on groundwater research in Africa. Kirsty is co-author of the Africa Groundwater Atlas and co-ordinator of the UPGro research programme, which focusses on physical and socio-economic issues of water security in sub-Saharan Africa. She has facilitated several knowledge exchange workshops and training courses focussed on different aspects of groundwater use and development in Africa.



Damian Indij, Cap-Net UNDP Argentina (Course Coordinator)

Cap-Net’s Virtual Campus Coordinator and Manager of the Latin America Water Education & Training Network (LA-WETnet). Damian has facilitated water-related courses in Latin America, Africa, Asia, and Europe, and participated as team member for the development of various training manuals.



Mika Jouhki, Cap-Net UNDP Argentina (Course Support Coordinator)

Mika Jouhki is a communication expert with many-faceted experiences of strategic and operational work and planning for improving organisations' external, internal and online communication and knowledge management. He has gathered a broad experience in the field of humanitarian aid and development during his 17 years in diverse communication tasks in the International Red Cross and Red Crescent Movement, both on national and international level.



Stephanie Theis, Skat Foundation, Switzerland (Course Assistant Manager)

Development professional with experience in managing projects for marginalized people, with a strong focus on gender mainstreaming, capacity building and knowledge management.

Stephanie has facilitated workshops, designed and implemented knowledge sharing events and is enthusiastic about innovative ideas and methods which foster the achievement of the SDGs.