



Islamic Republic of Afghanistan



Ministry of Rural Rehabilitation and
Development (MRRD),
RuWatSIP Department



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Final Report

February 2016

Capacity Building and Institutional Cooperation in the
field of Hydrogeology for Faryab Province,
Afghanistan

Financed by



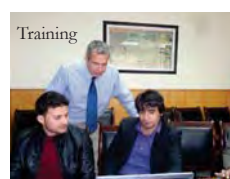
Surveys



Reports



Maps



Training

Hydrogeology - GIS/ MIS - Water Supply - Capacity building: Desk study - Surveys - Sampling - Analysis - Data collection / cleaning + Database design - Map design - Water supply - Technology Testing- Reporting (Web Atlas- Maps) - Training - Information Management - Coordination

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What will my future be?

will this project make a difference?

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ACRONYMS AND ABBREVIATIONS

AFG	Afghanistan
ANSA	Afghanistan National Standards Authority
ARTF	Afghanistan Reconstruction Trust Fund
AUWSSC	Afghan Urban Water Supply & Sewerage Corporation
CAD	Computer Aided Design
CAWSS	Central Agency for Water Supply and Sewerage
CDC	Community Development Committee
CLTC	Community Led Total Sanitation
DACAAR	Danish Committee for Aid to Afghan Refugees
DDA	District Development Assemblies
DPSI	Direct Project Implementation Section
e.g.	For example
GIS	Geographical Information System
GIZ	German International Development Cooperation
GPS	Global Positioning System
ha	Hectare
HGS	Hydrogeological Study
ICCB	Institutional Cooperation and Capacity Building
IP	Induced Polarisation
ISAF	International Security Assistance Force
Km2	Square kilometres
MAIL	Ministry of Agriculture Irrigation and Livestock
MFA	Ministry of Foreign Affairs - Norway
MIS	Management Information System
MoMP	Ministry of Mine, Industry and Petroleum
MEW	Ministry of Energy and Water
MoPH	Ministry of Public Health
MRRD	Ministry of Rural Rehabilitation and Development
MUDH	Ministry of Urban Development and Housing
NABDP	National Areas Based Development Program
NCA	Norwegian Church Aid
NEPA	National Environmental Protection Agency
NGO	Non Governmental Organisation
NOK	Norwegian Kroner
NORAD	Norwegian Agency for Development Cooperation
NRAP	National Rural Access Program
NSP	National Solidarity Program
O&M	Operation and Maintenance
PCU	Project Coordination Unit
PRRD	Provincial Rural Rehabilitation and Development
PRT	Provincial Reconstruction Team
RFP	Request for Proposal
RuWatSip	Rural Water Supply, Sanitation and Irrigation Department in the MRRD
TMU	Technical Monitoring Unit
TNA	Training Needs Assessment
TOR	Terms of Reference
UN	United Nations
UNICEF	United Nations International Children Emergency Fund
U.S.	United States
WASH	Water and Sanitation and Health
WSG	Water and Sanitation Sectoral Group
WSIP	Urban Water Supply Improvement Program

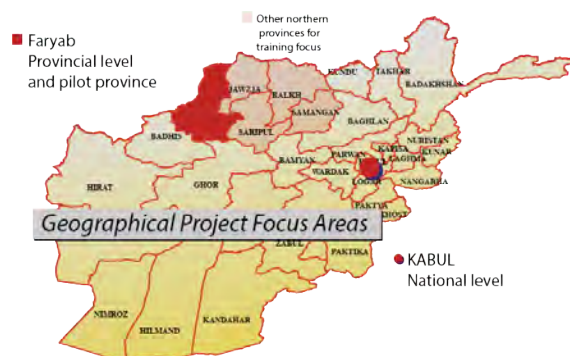
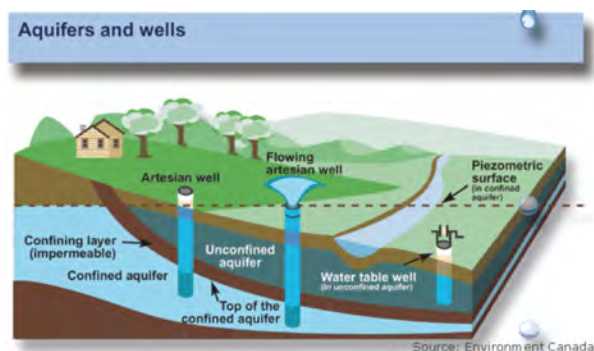
1. Executive Summary

MRRD has requested Norway for assistance in building up capacity to map and find groundwater for rural water supply in Afghanistan. About 70% of the 28 million people live in rural areas and only 40% have access to safe drinking water. In many areas, the water is scarce and in many areas the groundwater so salty that it is not fit for human consumption. With close to 13- 14 million rural people waiting for basic water supply the pressure is on MRRD to find ways of expanding water supplies to close the service gap.

With water becoming increasingly difficult to find, MRRD requested Norway for assistance with Capacity building and institutional cooperation in the field of hydrogeology for Faryab province.

The Norway signed an agreement with MRRD for a three year project with a budget frame of 35 million Norwegian kroner. NORAD was handling the project on behalf of the Norwegian Government. MRRD had requested that a Norwegian partner should provide assistance with the implementation of the project. The Norwegian partner (a consultant firm) should work together with a local partner in Afghanistan and MRRD and NORAD had identified DACAAR to be the partner for the Norwegian consultant firm to work with. After competitive bidding, NORPLAN was selected as the partner to implement the project. The contract between MRRD and NORPLAN was signed in November 2011 and the project started in January 2012.

The consultant was to be stationed at MRRD and the project was decided into three phases:



- Inception period (2 months)
- Planning period (6 months)
- Implementation period (28 months)

During the inception period the idea was to survey training needs, identify available data and information necessary for hydrogeological surveys for Faryab. During the planning phase the capacity building program with training courses should be planned and training material prepared. The methods for hydrogeological surveys would be prepared and the data base and GIS framework for handling collected data should be prepared. During the implementation phase, the field surveys should be done, data treated, hydrogeological reports prepared, water supply planning and design for three towns and finally to implement a training program which could make MRRD strong enough to continue groundwater mapping the rest of Afghanistan using Faryab as a model

province. All the field work was to be undertaken using Faryab as the pilot province.

1.0.1. First year slow progress

During the first year the progress was slow. A problem arose whereby the contract between MRRD and NORAD had to be endorsed by Ministry of Finance to allow for tax exemption for services and equipment to be procured under the project. A result of this was that cars were stranded in a custom warehouse for more than 12 months and the consultant had to wait for payments for more than six months. So the project was close to 9 to 12 months delayed. Faryab province was first visited in November 2012 which made field work start late.

Another challenge at the beginning was that RuWatSIP did not have adequate in-house expertise to guide different consultant how to plan MIS GIS systems for RuWatSIP. In parallel to the NORAD support project, UNICEF was also supporting a private consultant to develop a database for monitoring functionality and of rural water supplies and drinking water qualities. After some initial confusion it was agreed that NORAD would fund a GIS expert as an adviser to RuWatSIP to coordinate work for both UNICEF and NORAD supported activities in addition to internal information needs. Thus in December 2012 a GIS expert was in place working 50% on NORAD support activities and the rest of the time on UNICEF MIS-GIS activities. Thus from early 2013, the project started to move forward in many areas. DACAAR came on board to work closely with Norplan and field work could start for hydrogeological surveys. Because of difficulties in the first year it was agreed by the annual meeting in 2014, the project should be extended by one year working within the agreed budget frame.

1.0.2. Second year good progress

In 2012/13, work with the hydrogeological survey for Faryab made progress. A desk study was prepared and data collected for Faryab from DACAAR, different ministries and the geological survey department. Much information was gathered, and field surveys started. Archives in Moscow was also visited to collect best possible hydrogeological maps and information. This collection of field data progressed well with DACAAR in Faryab and with Norplan senior hydrogeologist developing methods for survey and work program for field work.

1.0.3. Successful training program.

The first training course was organized in April 2013 covering hydrogeology. That was the beginning of a quite extensive and effective training program. Over the next 2,5 years, about 45 training



courses were completed with more than 830 course participants. The training courses followed.

The planned training activities as outlined in the inception report was very closely followed. Courses were relatively short and the number kept low for best possible result. During the interactive training the trainers learnt much about the training need and new courses were organized to meet exposed training gaps. Close to 380 different persons attended the training coming from over 40 different organizations.

Though the training program all sector stakeholders working on the technical level were well informed and coordinated in groundwater mapping needs.

1.0.4. **Groundwater mapping of Faryab successful**

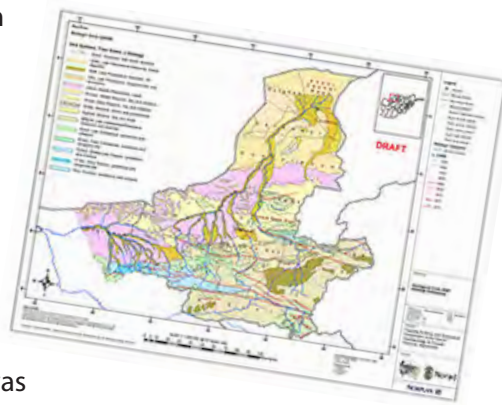
The international expert, who is also a textbook author, on groundwater mapping, organized the surveys for Faryab well for DACAAR to collect field data. The data was cleaned, analyses and hydrogeological maps produced. In addition, geophysical investigations were carried out with both MRRD and DACAAR teams surveying aquifers near Maymane. After analyzing data, MRRD mobilized a drilling rig to Faryab and exploratory drilling started covering two production boreholes and 2 observation wells. Test pumping was performed in April to June 2015. All the data collected has been presented in the Water Atlas for Faryab (a 180 page document, see web) which serves as a hydrogeological survey for Faryab but the document also serves as a textbook example of how to conduct provincial hydrogeological surveys and data analysis.



1.0.5. **GIS activities completed with well designed maps for Faryab**

After the GIS adviser had been recruited work started developing database and formats for managing the hydrogeological data. The hydrogeologist and the GIS expert worked closely to develop templates for presenting hydrogeological data from Faryab. In late 2013 and early 2014 template maps were produced and ready for presentation for local users. 7 different formats were prepared following good international standards,

ArcGIS software to produce standard paper maps or the desktop computer maps is very expensive. So it was great when ArcGIS launched a free software for online maps (like Google maps) This is free as long as the information is public domain and not for commercial use. This new development was picked up by the project and used for Faryab hydrogeological maps. The software is so easy to use that only after 2-4 days training the users can use this software. On-line hydrogeological maps for Faryab are complete and published on the project web. This is an excellent tool to show location of water points and properties of water quality and the GIS activities have been concluded well.

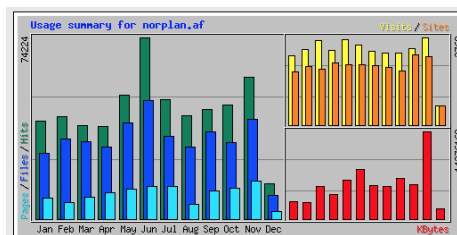


1.0.6. **Water supply planning not successful nor appropriate as proposed.**

The project was meant to plan water supply for 3 towns in Faryab. This work has failed and the reason has more to do with inappropriate terms of reference rather than problems with project implementation. The reason is that when water supply is developed in rural areas the communities are mobilized to participate. This is considered an essential part for later operation and maintenance and sustainability of developed services which the communities are to manage. So when the idea here was to plan for rural water supply without having funds for construction, it would be highly unexceptionable to inform the communities that only planning would happen without any implementation. This would not work and in the annual meeting between NORAD and MRRD it was agreed to drop this component.

1.0.7. Coordination has been acceptable

The coordination has been quite effective though all the technical training course participants being updated on project interventions covering hydrogeology and GIS-MIS. In Addition the IT tool used for this project worked well using a project web to disseminate all information about the hydrogeological surveys, methods developed, and all training activities undertaken. The web page linked up to very many stakeholders with about 70-80 daily visits or about 2500 visits per month . In days with special events and conferences up to 245 visits has been noted in a single day. This is quite good knowing the size of sector technical staff. In addition, to technical coordination, National conferences have been organized for ground water mapping, a national GIS conference and a Strategic Seminar for water supply coverage extension. During the national conferences and seminars close to 300 senior decision makers attended where all became aware about the project. For these seminars the senior staff agreed that follow up action plans were heeded as highlighted by the project.



1.0.8. Management

The project has moved forward reasonably well. The management has required much time input to resolve unnecessary constraints and problems. This particularly necessitate increased time for team leader , deputy team leader and administration support staff.

1.0.9. Sustainability

The sustainability of the project can be questionable due to lack of funding. However, this being a capacity building project, the project has done well here with over 800 course participants, attending many of the 45 practical courses organized. All training material, developed methods, key reports, training videos etc. has been left behind with many organizations freely distributed and also available on the web. The many trainers from universities, polytechnic, NGOs and government training organizations are able to repeat training courses if interested. Some of the courses has already been rerun at the university, and some ministries have started using the GIS mapping systems introduced by the project.

Finance is a major constraint for replicating groundwater mapping to continue. MRRD had hoped for new project be able to continue activities under the project. Currently there seems to be a funding gap which may adversely affect continuity of the project even though both MRRD and MEW are keen to continue groundwater mapping.

The project team are quite proud to have been able to complete the project in a most professional manner with results and outputs reported nationally and internationally.

Outputs and impacts.

As been indicated above, this project has had very good outputs and have been innovative. For the hydrogeology components, methods have been developed and tested for Faryab, a very compre-

hensive Water atlas (or provincial hydrogeological report) has been produced which can be use a textbook example for other provinces. The methods developed has been translated to Dari and so has instruction on how to use the different type for geophysical equipment which MRRD use. Exploratory drilling was also conducted in Faryab showing good water potential for Faryab City. Under the project MRRD received a well equipped well logging vehicle. This was built and assembled in Kabul and commissioned. Since DACAAR also bought a similar equipment there is now a good chance that the different institutions will collectively support each other to improve geophysical work using this equipment.

All data was treated in databases and presented no paper maps but also on the new free-ware utility from ArcGIS software. All the maps and systems are functional as planned.

Planning of water supplies in 3 towns could not be implemented because of lack of construction funds which make interactions with communities difficult. However, two types of water technologies have been tested together with NCA and the use of the equipment looks promising.

The training and capacity building delivered perhaps better than planned in the inception report, This is training skills which are needed and will be useful . What is important is that so many different organization has participated in the training and this has made many local trainers able to repeat much of the training courses if requested to do so.





































All information produced under the project is available on the web for free downloading. This support sustainability, continuity of activities and reuse of materials and methods developed.

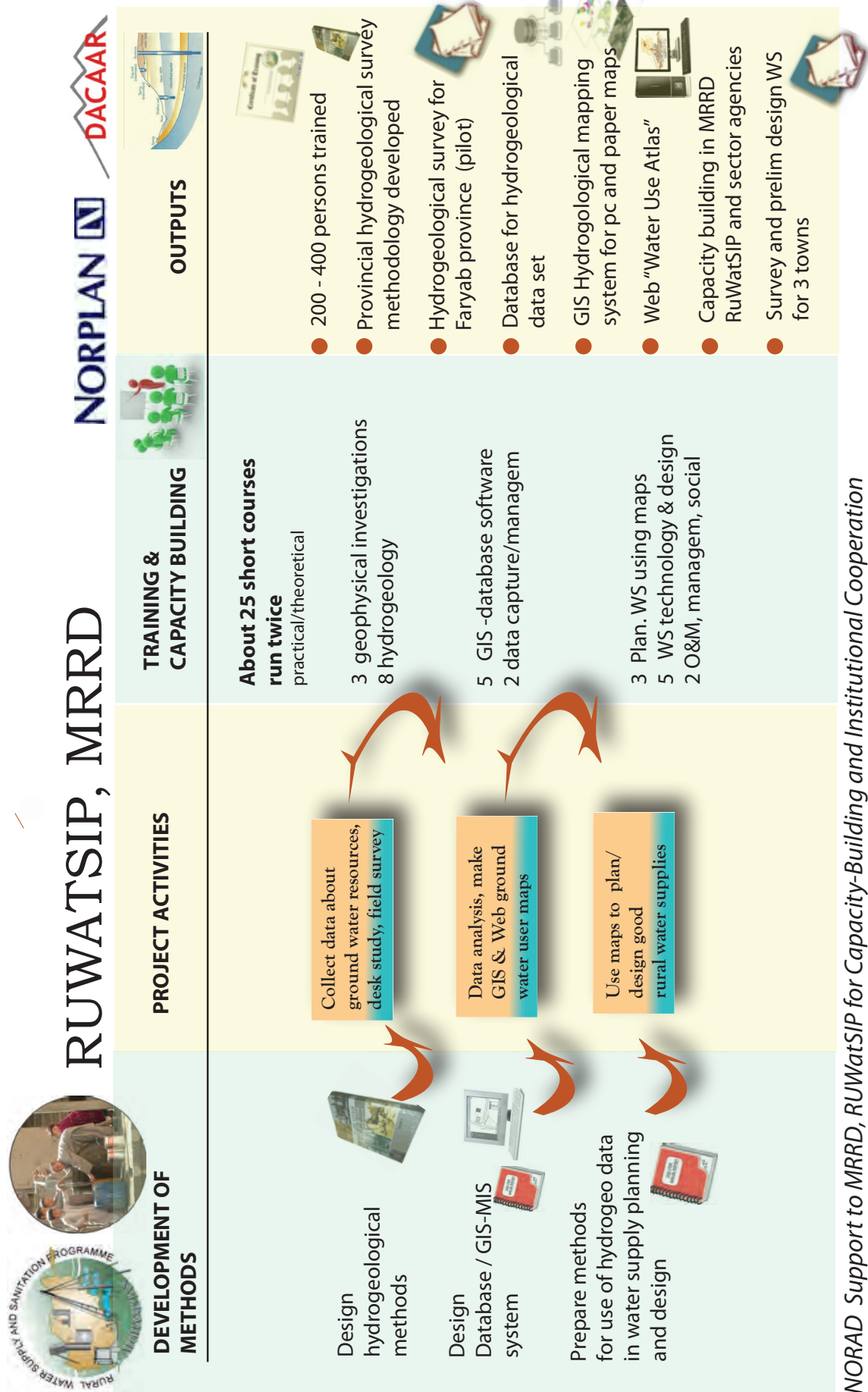
The project has quite well applied IT using web pages containing documents, photos, videos and maps for all to see and use.

Finally, the project has trained primarily technical staff in the groundwater sector, but during the last year, government ministries, ministers directors in key ministries and offices now know about the groundwater challenges in Afghanistan and how the work in Faryab can help mapping the rest of the country. The approach has also enhanced coordination between ministries which now leave the decisions for the government how to take the work forward after the conclusion of this project.

It is though anticipated that additional funding is required, and outside support to facilitate for continued coordination between the ministries would probably also be needed.

Overview assessment of project implementation impact

NO	Name		NO	Name	
HYDROGEOLOGY:			4.7	Afghan candidates for postgraduate M.Sc. or Ph.D. course abroad	
1.1	Desk study Faryab		4.8	Develop training videos for many technical subjects for later use	
1.2	Development Survey methods		STAKEHOLDER COORDINATION:		
1.3	Field surveys Faryab (DACAAR)		5.1	Technical coordination through training courses and meetings in MRRD, MEW, MAIL, AGS, World Bank, USAID, UNICEF	
1.4	Geophysical investigation field work Faryab		5.2	National coordination through National groundwater conference	
1.5	Exploratory drilling and test pumping, Maymane		5.3	National coordination through National GIS conference	
1.6	Prepared hydrogeological report/ Water Atlas for Faryab		5.4	Information sharing through project web page (norplan.af)	
1.7	Analysed 250 water and 30 soil samples for Faryab		5.5	Gender focus , 12% female trainees	
GIS- DATA MANAGEMENT:			OUTPUTS:		
2.1	Develop standardised data files		6.1	Hydrogeological survey methods developed and published	
2.2	Screening and cleaning existing data- Validate data		6.2	Water Atlas complete for Faryab	
2.3	Design ArcGIS Map templates		6.3	New well logger designed, build fitted,- commissioned, trained on	
2.4	Design ArcGIS maps for Faryab		6.4	Planning water supply for 3 towns	
2.5	Design and publish online ArcGIS maps using free online software		6.5	Over 100 training documents prepared and made available on web	
WATER AND SANITATION			6.6	Trained more than 830 course participants in 45 courses	
3.1	Survey and planning water supplies		6.7	Designed and published databases, ArcGIS hydrogeological maps, online hydrogeological maps for Faryab	
3.2	Develop framework for quality control for water testing labs		6.8	Demonstrated IT- web based transparent sector information/ coordination tools in practice	
3.3	Tested solar stills for desalination		www.norplan.af		
3.4	Tested membrane filtration for small scale emergency water treatment				
CAPACITY BUILDING - TRAINING					
4.1	Training needs assessment				
4.2	Plan. design 30 short training courses, implemented 45				
4.3	Develop and publish methods for hydrogeological surveys				
4.4	Training of 830 course participants				
4.5	Develop training material for 30 training courses for re-runs				
4.6	Engage local co-trainers (prof. lectures, local experts for course re-run)				



NORAD Support to MRRD, RUWatSIP for Capacity-Building and Institutional Cooperation in the Field of Hydrogeology for Faryab Province, Project

Snapshots from events

Sieving analysis training



Drilling methods training



Annual Meeting MRRD - NORAD, March



Afghan delegation visits Oslo,



Pumping test preparations near MRRD



Solar stills tested at NCA in Kabul



MRRD drilling rig mobilized to Faryab,



Classroom training: Hydrochemistry,



More photos: See web norplan.af

2. Synthesis of the inception, planning and implementation phase

The project was designed with three phases, Inception, planning and implementation phases. Each phase had defined its own activities and outputs for moving the project into the next phase. The TOR also described that for after each phase, a revised working program should be presented with updated budgets.

2.0.1. Inception phase.

According to the TOR, during the implementation phase, the consultants team was mobilized, office facilities established, sector information gathered and a project implementation plan prepared and discussed during the Inception workshop. The workshop was gathered involving client and key sector stakeholders.

2.0.2. Planning phase

The planning phase was scheduled to last for 6 months. During this phase, all existing data and relevant sector information should be analyzed and organized so that the implementation activities could be planned. Furthermore during the planning phase the training program and courses should be designed and planned for implementation during the next phase. In the case of water supply design for rural towns, three candidates for possible towns should be identified. During this phase, hydrogeological survey methods should be developed and field tested, existing data systems at MRRD review and data bases planned and designed for use during the implementation phase.

Outputs from planning phase:

- Draft planning report
- Revised budget
- Bridging workshop with workshop report.

2.0.3. Implementation phase.

The implementation phase was scheduled for 28 months implementation. During this period, the following were to be undertaken:

- Hydrogeological field surveys
- Preliminary design of water supply for up to three towns
- Implementation of the ICCB training program
- Preparation of the draft hydrogeological report
- Undertake Hydrogeological workshop
- Analyze results, improve and update MIS
- Preparation of MIS report and MIS manuals
- Prepare draft completion report
- Winding up workshop
- Prepare completion report for the project.

It was mentioned that one of the important issues to be covered during this phase was the drilling



From the Mid Term review workshop with more than 40 participants discussing the progress of the training program till date.

in Faryab and the planning of town water supplies.

3. Description of the project objectives, tasks and outputs

3.0.1. The assignment

The project objectives were clearly focusing on capacity building in MRRD to assist the ministry technical staff to develop adequate water points for the rural areas in Faryab Province. The capacity of local NGOs and the private sector should be retained to enhance development of the water sector and to accelerate the monitoring and evaluation of water supply. The project should furthermore focus on effective coordination mechanism at the national and provincial levels for the sector.

More specifically the capacity of MRRD, RuWatSIP staff and PRRD (MRRD provincial staff) staff should be enhanced for conducting investigations and surveys of ground water through hydrogeological surveys. For that purpose Faryab should serve as the pilot province. The project should furthermore look for sustainable solutions for water supply by assessing the groundwater investigations. The methods and knowledge developed for the hydrogeological investigations for Faryab should be used for expanding groundwater surveying to other provinces. During the project the capacity of MRRD technical staff should be assisted in water quality testing, drilling technologies and working with the existing management information systems (MIS).

The TOR also proposed to search for conceptual/ preliminary design for water supply solutions in areas with saline waters. For Faryab it was proposed to undertake preliminary/ conceptual design for water supplies for three towns preferably in saline areas.

3.0.2. The tasks.

The project should cover development of appropriate hydrogeological surveying methods, conducting desk study for groundwater situation in Faryab, collection of existing data from different sources, supplementing gaps in data by field surveys and water sampling, conducting data cleaning and data quality control. With the data collected from Faryab province, the data had to be entered into a database for treatment and analysis. After being checked as trustworthy, the data should be entered into ArcGIS software in order to produce hydrogeological maps. A map template design should be prepared and maps showing different and appropriate information should be developed, tested and standardized for general use in Afghanistan. Therefore the hydrogeological reports and the hydrogeological maps should be an integral part of the report framework for such projects.

With the hydrogeological information available for the Faryab Survey, this information was to be used for planning water supply for three rural towns or villages.

With the above methods and activities to be sustainable, capacity building was to be undertaken to secure knowledge and expertise for continue activities after the end of the project.

In the TOR the Activities are listed as follows:

3.0.3. Undertaking the HGS

- Preliminary design of the water supply for up to three small towns
- Implementation of the ICCB training program.
- Preparation of a draft HGS Report.
- Undertake HGS winding up workshop
- Analyze results, improve and update the MIS.
- Preparation of MIS Report and MIS Manuals
- Prepare Draft Completion Report for the Project (including last 6 monthly progress report)
- Project winding up workshop
- Prepare Final Completion Report for the Project.

3.0.4. Outputs.

Reports to be delivered includes: Inception report, planning phase report, Capacity building report, MIS Report and Manual, Final HGS report, Winding up workshops

4. Hydrogeological Survey work

The project covers mapping, capacity building and institutional cooperation in the field of hydrogeology for the province of Faryab. It includes the following goals:

Develop methodologies for hydrogeological surveys.

- Develop methodologies for mapping groundwater resources in Afghanistan using Faryab as a Pilot Province.
- Design and develop methods for communicating information effectively to water sector staff (especially MRRD staff) to allow up scaling of mapping methodologies to all provinces in the country.

Test and demonstrate methodologies via a provincial survey in Faryab

- Using developed methods, collect data for Faryab, conduct additional surveys and prepare a hydrogeological survey using developed methods, collect data for Faryab; conduct additional surveys and prepare a hydro-geological 'Atlas' for Faryab Province, showing distribution of groundwater resources, water quality, and potential quantity in different areas.

Design and develop GIS/ data management for visualization of hydrogeological maps and data.

- Plan data management and GIS solutions so as to prepare hydrogeological maps providing information to hydrogeologists, water engineers and others in need of water sector information.

Apply hydrogeological data to the design of water supply in 3 villages

- The project should use information from the survey in Faryab to prepare a plan for water supply for three villages (of less than 5000 population)

Training and capacity-building, (50 courses, 800 persons)

- Develop capacity empowering MRRD, RuWatSIP, MEW to continue mapping groundwater resources across Afghanistan. Coordinate capacity building with MEW, MoM, AGS and other key sector stakeholders including DACAAR, GIZ, UNICEF etc.

Coordinate with other sector stakeholders for sustainable development

- Communicate lessons learnt and ideas to other key stakeholders in Afghanistan for the purpose of best possible project impact and benefits. It will then be up to Afghan stakeholders to decide how to utilise the project development, tools and results

Project management

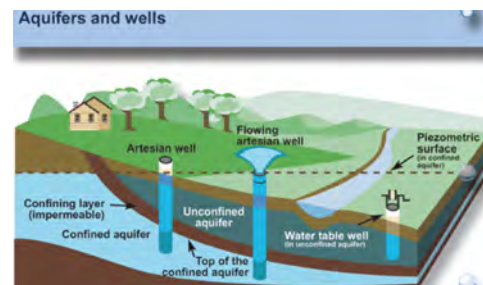
- Management of a capacity building project has many challenges including coordination, joint planning with key stakeholders, keep project focus and deliver outputs as defined in the terms of reference

In this chapter we will outline more that the project components entail. In addition, by looking in the appendixes (or on the web under norplan.af) the activities are presented in more depth.

4.1. Hydrogeology

Hydrogeology is knowledge water in the ground. MRRD and Afghanistan had needs of knowing where to find water and what quantities and qualities could be used for development of rural water supplies. Since most of the easy water sources already had been developed, finding adequate water for development of safe drinking water was becoming increasingly difficult. MRRD needed both the expertise on how to find water effectively and how to map available water resources for serving all people adequately.

During the inception phase, data and information was gathered of existing hydrogeological information available for Afghanistan in general and for Faryab in particular. All key organizations were contacted and a plan for further data collection set up. Key organizations with information included MRRD, MoM, Afghans Geological Survey, AGS, USGS, MEW and major NGOs such as DACAAR, SCA, NCA and other organizations which had been working in Faryab.



The next step for planning work in Faryab province was to prepare a desk study for hydrogeological surveys to be conducted for the province. The study focused on assessing what information was available and what additional information should be collected in order to develop a satisfactory hydrogeological plan. Hydrogeological maps were gathered from different organizations but also from geological archives in Moscow.

DACAAR which was the main partner for NORPLAN had already developed a database with hydrogeological data from about 2000 water-points in Faryab. These were scrutinized and about 1000 of their registrations could be used for the hydrogeological map. In addition, a further 250 water features had to be surveyed and data collected so as to have adequate coverage for the hydrogeological map.

The hydrogeological survey should also tell something about the source of the water, quantities and qualities of the water. For that purpose methodologies for hydrogeological survey had to be prepared.

The field survey methods thus developed covered:

- Precipitation Survey (Rain and snow sampling)
- River profile survey
- Soil sampling and analysis methodologies
- Soil salinity survey
- Water Sampling methodologies and analysis
- Survey schedules

(http://www.norplan.af/Page_hydrogeo_fieldsurvey_method_2.html)

The survey methods have been published in both English and Dari languages. The field surveys were

carried out by DACAAR.

As part of the quality control of the water samples, the different water testing laboratories in Kabul were tested by sending parallel samples to different labs. The results were poor and as a consequence, all 250 water samples collected from Faryab were sent abroad for analysis. The result was disappointing, so Norplan tried to take initiative to assist all laboratories to collectively work together for the establishment of a quality control system for Afghanistan under ANSA so that the lab results could be trustworthy. (See more comments on this under water supply chapter.)

- With all the data gathered, the senior hydro-geologist David Banks started drafting hydrogeological map for Faryab. It was also indicated that normally for a province of the size of Faryab, 2000 sampling points should be adequate for such a survey particularly since most people had settled near the water courses for obvious reasons. In parallel, hydrogeological maps were developed and the geology studied for the indemnification of larger aquifers which should of could be explored further. This would be areas where the geology could indicate formation which could have larger storage of water. But the hypothesis had to be explored. The location of such areas were discussed with the senior hydrogeological from MRRD, MEW, DACAAR and NCA. A plan was thus prepared for further geophysical investigations for those areas and subsequent planning for exploratory drilling and test-pumping for selected areas.

The areas identified for more detailed investigations were

- Maymane (near airport)
- Sherin Tagab
- Ankhoi

So after MRRD and DACAAR staff had been given training geophysical investigations, the teams started surveys in Maymane in September 2013. Security situation did not allow for the teams for continue work in Sherin Tagab.

Before the drilling team could move in for exploratory drilling the land owners had to be consulted to allow the drilling machine to enter their fields. When with as agreed, the first exploratory drilling



MRRD obtaining permission by landowners to drill on selected sites.



Drilling rig in place in Faryab in 2014

activities started in September 2014 in Maymane while test pumping was completed for the same wells in Maymane in June 2015.

Time did not allow for drilling to move to Ankhoi.

With the data collected from the field work in Maymane, the following was developed for use for replication in all other areas in Afghanistan:

- Hydrogeological survey methods
- Desk study as planning model for provincial surveys
- Sampling arrangements and logistics
- Data collection and data cleaning
- Sending data/ data processing for preparation of hydrogeological maps
- Preparation of provincial hydrogeological survey or Water Atlas for Faryab



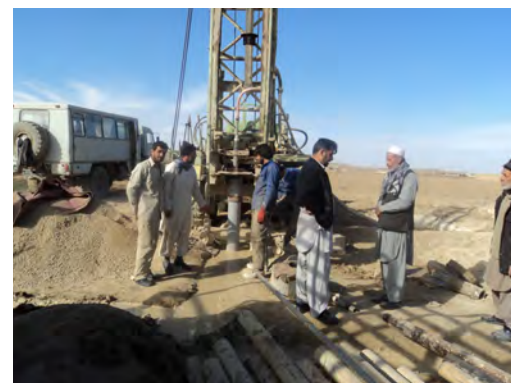
All the information for Faryab is presented in the Water Atlas. This book of 180 pages illustrates how the surveys can be done. This is probably a textbook version of the work. For replication for other provinces and areas in Afghanistan, the Web Atlas for Faryab combined with the field survey methods should provide good documentation for scaling up groundwater mapping throughout the country. In addition, the same Water Atlas should be a good text book to be used at training institutions including Universities and Polytechnics in Afghanistan.

The whole approach for hydrogeological mapping developed for Faryab has been covered in training courses run at MRRD but also the approach has now very successfully been presented to all stakeholders in Afghanistan under the NATIONAL GROUNDWATER CONFERENCE organized in Kabul in June 2015.



Geophysical investigations and exploratory drilling

DACAAR and MRRD working in teams for field work in order to cover much ground



4.2. GIS/MIS

In the terms of reference there are a few sentences which highlight the work assignment for the project:

Enable MRRD and PRRD staff:

- To plan and conduct studies of groundwater in consultation with MoM.
- To improve their technical knowledge and expertise in water supply designs, survey, MIS, GIS, water quality, water treatment and ethical project management.
- To address the problem of saline water in the Faryab Province.
- To make better plans for increasing the access to safe drinking water in Faryab.

When collecting hydrogeological information the volume of data to be handled is huge. A professional system is needed to clean manage, update and present data in a way that can be of use for planners and implementers for development of water supplies and other services.

4.2.1. Need to strengthen GIS- MIS unit at RuWatSIP

After some initial development work on GIS and MIS, it became apparent that the international GIS experts did not find people with relevant background and expertise to lead the discussions about GIS systems and development modalities. UNICEF were providing support for mapping information about rural water supplies, service provision, functionalities, and water quality and this work was technically very similar to the data management for the hydrogeological work. It was agreed that a full time adviser was needed at RuWatSIP.

NORAD was requested to support the full time GIS adviser who started working in mid December 2012. This delay in development in the GIS area delayed development of the GIS activities with close to 9 months. So in December 2012, or nearly one year after the start up of the project, capacity were established to lead the development of the GIS- MIS activities in RuWSatSIP.

After the establishment of the GIS-MIS unit, data equipment and software was procured and installed. Then the work started. The following activities were organized and implemented:

- Scrutinizing the WSG database and discussing standard format for hydrogeological database for serving hydrogeological maps but data which also could be shared with other users.
- Working with the hydrologists, starting work with cleaning and checking data using a defined quality control system.
- Starting design of templates for hydrogeological maps using international standard configurations.
- Templates were finalized for use for paper versions for hydrogeological maps for Faryab.
- The hydrogeological template design were presented in a workshop for users of such maps
- After agreeing of format for paper versions, PDF versions of hydrogeological maps were produced for Faryab.

Very much data also have to be collected about the data. This is called meta-data. Handling of this increasingly large amount of data is important for in-house use of data but also when data are to be shared. Sharing of data is a problem in Afghanistan and many other places but for more

effective development coordination, standardization and shared procedures and system need to be agreed to.

Establishment of the GIS activities under the project.

Data have been collated from many sources, but always starting with available and existing data. The data can be obtained from:

- Existing databases
- Drillers' borehole logs
- Geological maps
- Hydrogeological surveys and reports
- GIS maps
- Other data

Most of the existing data has been obtained from existing databases as WSG and DACAAR, with additional data from MRRD, MEW, and with maps from AGS and USGS and some others. Hopefully, in the future, data sharing and national databases can make things easier. Hydrogeological maps were also found in archives in Russia.

New data and surveys will have to be well planned and organized. In the case of Faryab, existing data was first collected and reviewed, then additional surveys for collection and analysis of field data, water and soil samples were planned and implemented.

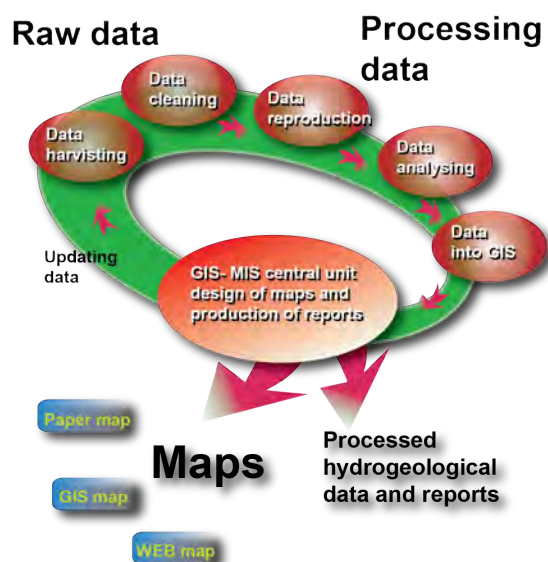
Much of the data is collected in excel sheets, while borehole logs are shown in the figure "Borehole log Report." These logs are very useful for hydrogeologists to evaluate subsurface conditions.

4.2.2. Data processing.

The data has to be processed, cleaned, and quality controlled before being analysed. The preliminary analysis is done using EXCEL and ACCESS spreadsheet and database software. Once checked, the data is transported to ArcGIS software for production of desktop maps or for printing of maps. The data management process is illustrated in the diagram to the right.

The type of data collected will be reflected in the type of information on the hydrogeological maps. Information of importance include:

- Borehole / water point coordinates
- Altitude above sea level
- Depth to water level below ground
- Construction details, inclusive/ dates
- Yield and capacity of well
- Funding and responsible agency,
- Water quality (salinity)

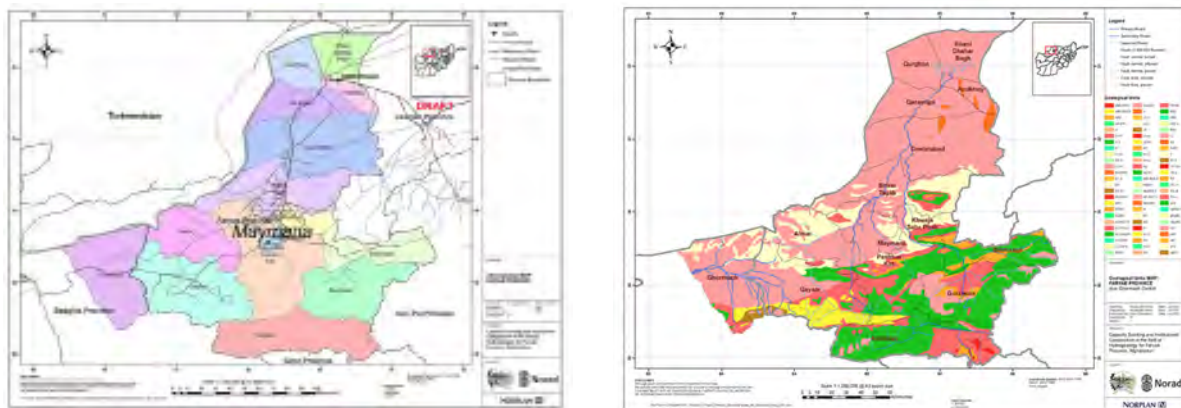


- Water productivity
- Geological details
- Administrative boundaries
- Other info

4.2.3. Design of hydrogeological Maps.

Six or seven different templates for hydrogeological maps have been prepared. This makes it easy to view maps on the desktop computer or to print out a paper copy of the different maps. See the following pages for examples of such maps.

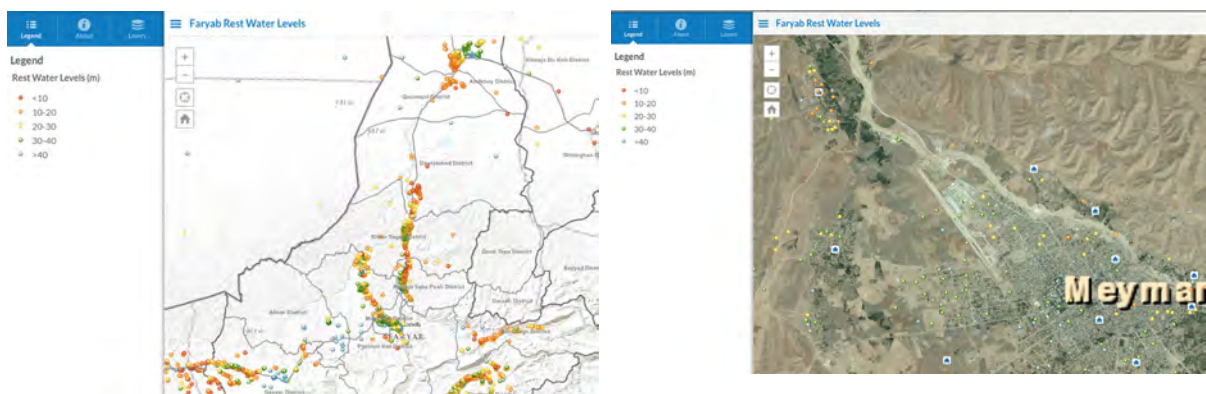
Examples of Hydrogeological maps (see web for details) below



4.2.4. On-line web maps.

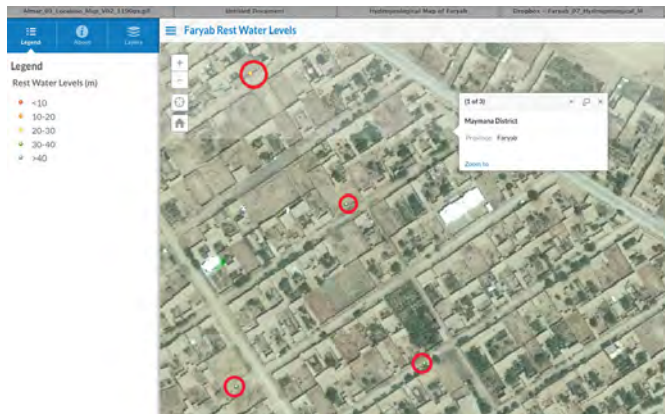
A new software facility – ArcGIS Online Utility - has been applied for preparing on-line maps. The use of this facility is free as long as the information is public domain (and not for commercial use). This is an exciting new facility which opens up for all to use GIS maps free of charge as long as the information can be freely shared. This is particularly good for organization which do not have funds for procuring expensive ArcGIS licenses. Making this software free to use in a new development which only started a few years ago and after the start up of this project. This software has now been introduced by NORPLAN for this project and for sharing the hydrogeological data for Faryab and

Examples of on-line Hydrogeological maps (see web for details) Just click and zoom in . See next zoom level next page where houses can water points can be seen!!



the system works. Furthermore, it is easy to train people to use the facility. Only 2- 4 days training is needed.

Many people have been trained to use this: with only a few days training, most people can manage to upload information without problems. In the web map environment, it is possible to zoom in and view the location of groundwater locations on very good satellite or aerial images. Every house and street in Afghanistan can be seen and so can the location of the water facilities.



This is excellent for the communication of groundwater information, for efficient planning and for verifying who seems to be served and who is not! An example of information which can be seen or downloaded is the individual borehole log sheets. Just click and view when online. http://www.norplan.af/Page_GIS_Web_maps.html

The GIS system has now been demonstrated, and three to four training courses have been organized for online ArcGIS systems. Many now know how to use the maps and how to make the maps.

The GIS system developed under the Faryab project was also presented at the NATIONAL GROUNDWATER CONFERENCE, but also presented on the NATIONAL GIS CONFERENCE organized at MRRD. The system was also presented at the World GISDAY as facilitated for by UNEP at Kabul University 18th of November 2015.

4.3. Water supply and sanitation

4.3.1. General

The water supply and sanitation activities under this project had lesser focus than groundwater mapping and making information systems for describing how and where to find water.

The focus was to make sure that the tools and information systems developed would suit and fit the water engineers and hydrogeologists whether from government, NGOs or private sector to find

Water supply situation in Damquil, a village just outside Maymane, Faryab



water for effective development.

The hydrogeological tool for development under this project was for the purpose of finding and improved and sustainable methodology for development in Faryab province.

As discussed in the chapter covering planning for three towns, visits were made to Faryab and areas surveyed for combining hydrogeological exploration, capacity building and training of provincial staff so as to show the benefits of professional hydrogeological mapping. One such area was visited and identified, namely Damquil. As planning progressed, it turned out that both NCA and DACAAR has plans for water development in the same area. So methodologies developed was tested and used for this area. DACAAR conducted geophysical investigations and the same organization later developed water supply for that village. Here theory and practice was tested.

4.3.2. Technology for water supply.

The terms of reference challenges the project to identify appropriate solutions for water supply in Faryab with particular reference to areas with very salty/ saline water.

The project entertained this challenge with focus on sustainability and afford ability.

4.3.3. Desalination using reverse osmosis

Reverse osmosis is a well know method for desalination of water. This method has been tested also in Faryab. There are compact desalination units on the market which can make saline water drinkable. This process require specialized membranes but perhaps most important is require high pressure pumps. The high pressure pumps require much energy and thus the operational costs are prohibitive for rural poor. NCA had distributed such units in Faryab, but the local communities cannot afford the high energy costs nor the cost of replacing the membranes. For sustainability for rural poor some alternative ideas would be needed.

4.3.4. Solar stills

The idea for testing solar stills came from a visit made to Faryab in 2007 when a team from NORAD met a local entrepreneur who presented his desalination solution as shown to the right. The idea is just to let the sun evaporate salt water and then collect the condensate or distilled water free from salt. This is a well tested technology. It works well but the only problem is that the capacity of produce water per square meter of glass surface is limited.



However, Norplan developed a testing program for this technology in Kabul. Two different M.Sc students from Oslo University of Life Sciences, worked on

finding appropriate solutions for and developing in Afghanistan for use in the remote hot areas where high salinity of water was a problem. It was well understood that this would not be a solution for big communities, but for rural poor, with no access for potable water except very salty water. This solution could provide say 4 -5 litres per day and thus be value particularly for infants and children.

Together with NCA different models were tested. NCA is not in the process of field testing these solar stills in Faryab in over 100 households . See www.norplan.af/Page_Photos_Solar_stills_.html.,The two M.Sc students working on the solar stills project was Cecilie Kolstad and Håvard Kipperdal. Both the M.Sc thesis from their work can be found on the web. Their contribution was most appreciated.



4.3.5. **Membrane filtration**

Norplan introduced a different water treatment solution which was presented a world water conference in Nairobi Autumn 2014. A NGO from Australia had developed a concept called Sky-juice organized recycled high quality industrial membranes for ultra-filtration. The membrane used to operate under high pressure but the new application was based on ultra-filtration under low pressure. (1-2 meters head) The facility would remove all particles down to the size of .4 microns. This meant removing bacteria and well at about 50 % if all viruses. The importance of this was applications for emergency situations where surface waters had to be used as drinking water. Under such situations the water would after treatment be clean and safe to drink. The units shown on the photos would have a capacity of about 700 litres per hours and could be operated without electricity, Each treatment units costing about USD 2000 should be able to run for about



10 years without needing spare parts. This sounded very attractive for use in Afghanistan and for emergency use. Thus introduced and tested under this project.

The water quality was tested in the MRRD laboratory and the results showed that the effluent was free from bacteria and thus bacteriological safe to drink.

NCA has purchased some additional units which would be tested in rural communities using surface waters as main water source. MRRD has currently two units with one of the units being tested on a pilot basis in Gulbakh Village just outside Kabul.

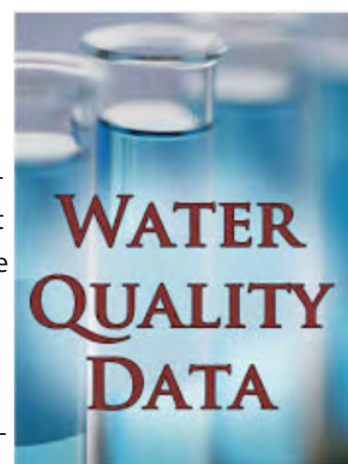
The photo on top show the very clean water treated using ultra membrane filtration unit.

In order to highlight the importance of water supply NORPLAN organized a seminar to present strategic issues affecting the planning and implementation of rural water supply. A mathematical model had been prepared which could highlight the relationships between population growth, sustainability and lifespan of rural water supplies, national investment levels for new facilities and facilities for rehabilitation/ replacement as well as operation and maintenance costs.

The seminar clearly demonstrated the need to close planning and tuning development to realistic sustainability and financial framework if closing the service gap were to be anything other than just a dream. (See web report from seminar)

4.3.6. Quality control at water testing laboratories

As discussed earlier, Norplan discovered a problem with lack of quality control when preparing for water testing in Kabul. For the project, it became necessary to send the samples abroad for analysis because the project was dependent on having trustworthy data for the hydrogeological survey for Faryab to be meaningful. However, Norplan felt that it was appropriate to provide some assistance in trying to facilitate for the establishment of a Quality Control system for water testing laboratories in Afghanistan under the control of ANSA (government appoint-



Meeting at ANSA trying to establish a laboratory testing quality control framework to render analytical results and reports trustworthy

ed authority of standardization and responsible for quality control)

CAN THE RESULTS FROM THE LABS TODAY BE TRUSTED? - NO.

CAN THIS BE FIXED? - YES.

WE HAVE STARTED SEEKING LONG TERM SOLUTIONS.

Evaluations of water testing labs in Kabul before the sample analysis Faryab revealed that we had a problem. So samples were given to some Kabul labs, two to three times, to check if the results were comparable with results obtained from international accredited water testing laboratories. For the project we required trustworthy results for our hydrogeological survey in Faryab so we sent 200 samples for analysis abroad (BGS lab in UK.)

We also observed that, in the Kabul labs, some analysis types were reliable and some were not. However, we could not pick and choose which analyses to trust and which to reject.

So we decided to take some initial steps to rectifying this situation, by encouraging Kabul labs to instigate more rigorous quality assurance schemes.

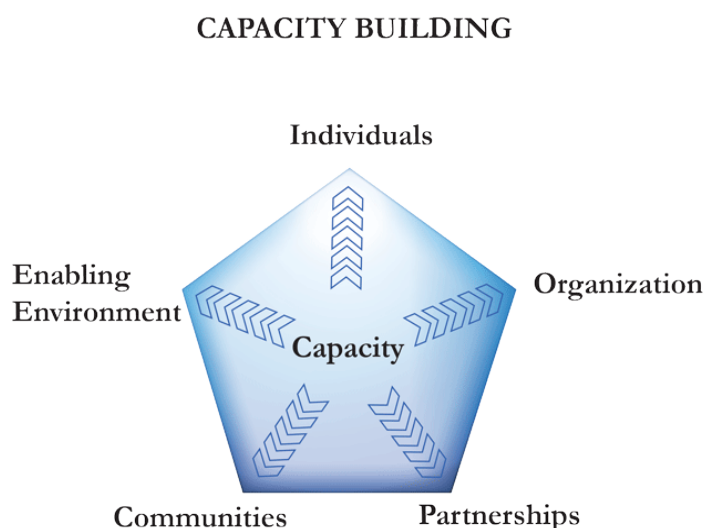
We contacted ANSA, responsible for coordinating standards for drinking water in Afghanistan. Now ANSA is the focal point for quality control systems check reliability of results.

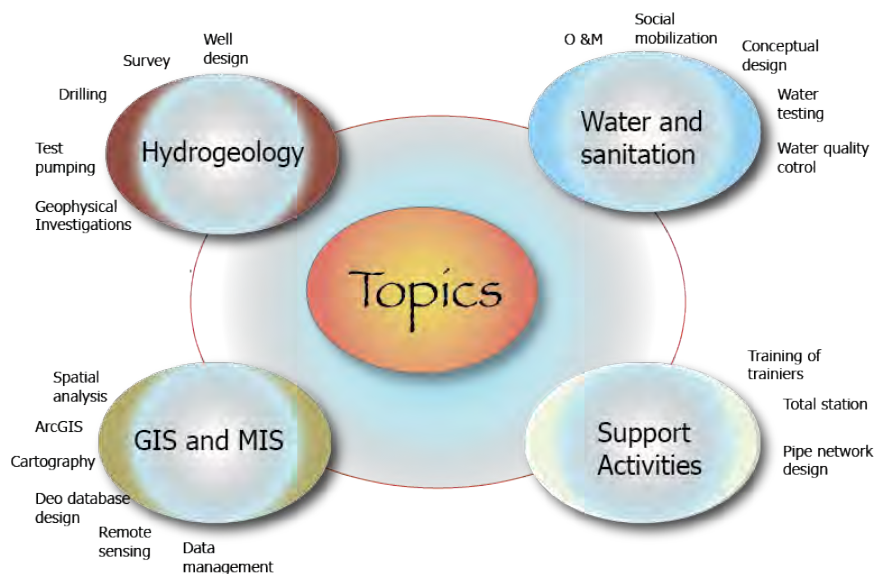
During the year of 2014, 4 meetings have been held with water testing laboratory owners, ANSA, Ministries, UNICEF, DACAAR and others to develop a framework for a quality assurance system in Afghanistan. Three workshops have also been held with laboratory staff to generate awareness that quality matters. It was apparent that none of the labs has adequate standards for checking results, nor instructions for calibration of equipment. Procedures and checklists have now been planned and developed, as well at inter-laboratory calibration work. This work needs further support and Norplan hope funding can be provided to lead this important work forward.

4.4. Training and capacity building.

The main focus of this project has been capacity building. Local staff and organizations were to be given the ability to continue both the training but also groundwater surveys and mapping to cover the whole of Afghanistan using Faryab province as a model.

As the diagram shows, the focus for capacity building would have many aspects. The planning for this component started during the inception





phase with consultation with most of the key stakeholders who were present at the inception workshop. So in the inception report, a training program was developed. In the inception report from 2012 about 30 training courses were proposed with durations from 1 to 5 days. It was stipulated that 899 staff would participate in courses covering an anticipated 97 training days. In addition, it was envisaged that some Afghans were to be sent abroad for M.Sc training.

Extended stakeholder participation agreed on in the inception. Academia should be involved, relevant ministries such as MoM, MEW, MAIL, AGS and well as national and international NGOs. It was also mentioned and suggested that links should be sought with overseas relevant institutions in Norway.

Initially the training needs assessment outlined some of the main courses to be delivered. However, at the training progressed, and the trainers could observe where the actual training gaps appeared, the training plan was adapted to fit. The training calendar shows all the course events conferences and seminars. The key topics are shown in the figure below. In addition to the actual technical topics, improvement in basic expertise for data management using Excel, and access software was also given priority. Similarly, focus on data quality control, data cleaning had to be repeated and demonstrated frequently to point out the difference between trustworthy and non-trustworthy data and the implication of using wrong planning information.

4.4.1. Course planning and documentation for courses.

Good procedures were developed for



planning, implementation and reporting on all training courses. In addition, capacity building is of course training of personnel, but also provision of developed materials such as methods, guidelines, procedures, templates etc. which can be used later for training purposes but also for implementation of practical technical work in the ministries of with other sector stakeholders.

For each training course once identified, the following documents were prepared before implementing the course:

- Training course summary sheet.
- Course agenda
- Invitation letter.

After the course the following documents were produced and published (on the web) and some of the key course material was given to course participants on a DVD disk.

- Course presentation
- Reference books/ documents
- Tutorials

Later course information:

- Course photographs
- List of participants
- Course evaluation
- Training course report

Training courses overview:

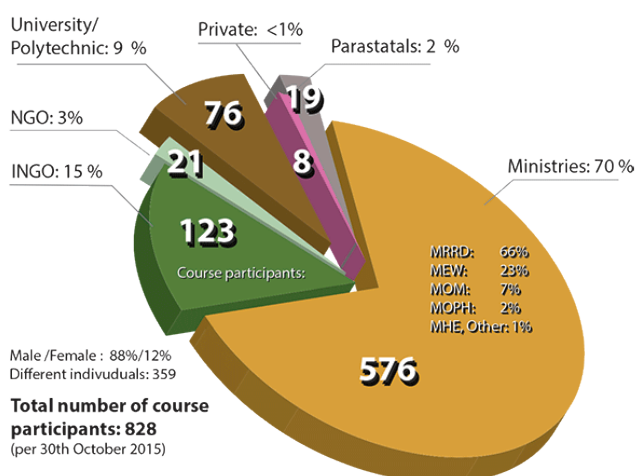
All the close to 45 training courses implemented are listed on the next page. Some of the courses were repeated twice while others were modified based on revised and observed needs.

4.4.2. Participants in training courses:

70% of the 828 course participants came from government ministries. International NGOs and universities and polytechnics sent most people besides staff from ministries.

From the different ministries MRRD, sent about 66% and MEW 23% of participants. Other government staff came from AGS and MAIL mainly.

WHO HAS BEEN TRAINED?



Training Calendar for 2013 till 2015

Revised 28th October 15 / Prof/Engr

Training Calendar 2013

Month	January	February	March	April	May	June	July	August	September	October	November	December
Week no	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
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Sunday	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10
Monday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Tuesday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Wednesday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Thursday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Friday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10

Training Calendar 2014

Month	January	February	March	April	May	June	July	August	September	October	November	December
Week no	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Date of first day of week	1 11 18 25	1 8 15 22 29	1 8 15 22 29	5 12 19 26	3 10 17 24 31	1 8 15 22 29	27 28 29 30 31	24 25 26 27 28 29 30 31	21 22 23 24 25 26 27 28 29 30 31	18 19 20 21 22 23 24 25 26 27 28 29 30 31	15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Saturday	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10
Sunday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Monday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Tuesday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Wednesday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Thursday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Friday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10

Training Calendar 2015

Month	January	February	March	April	May	June	July	August	September	October	November	December
Week no	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Date of first day of week	1 11 18 25	1 8 15 22 29	1 8 15 22 29	5 12 19 26	3 10 17 24 31	1 8 15 22 29	27 28 29 30 31	24 25 26 27 28 29 30 31	21 22 23 24 25 26 27 28 29 30 31	18 19 20 21 22 23 24 25 26 27 28 29 30 31	15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Saturday	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10	4.11 1.10
Sunday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Monday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Tuesday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Wednesday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Thursday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10
Friday	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10	1.10 1.10

Key code:

Public holidays

- 1.1 Groundwater investigation
- 1.2 Geophysical survey, 7 daysx2
- 1.3 Well drilling methods, 4 daysx2
- 1.4 Well design and completion, 5 daysx2
- 1.5 Planning and implementation of provincial hydrogeologic survey
- 1.6 Training methods, 2 daysx2
- 1.7 Geophysical borehole logging, planning and, 6 days x 2
- 1.8 Geophysical borehole logging interpretation of data
- 1.9 Well construction and pumping test (KAE)
- 1.10 Practical pumping test interpretation
- 1.11 Practical interpretation of Geophysical data
- 1.12 Advanced topics in hydrogeology
- 1.13 Practical Pumping test Interpretation
- 1.14 Geophysical borehole logging, planning and operation

Hydrogeology I (Norplan)

- 2.1 Interpretation of data, 5 daysx2
- 2.2 Preparing thematic maps, 5 daysx2
- 2.3 Water quality testing and GPS use in the field
- 2.4 Practical Geophysics. Investig. and Siting-in the province
- 2.5 Well construction and pumping test(Province)
- 2.6 Pumping test and data collection of exploratory well(Farab)
- 2.7 Data capturing, 1 day (Norplan)
- 2.8 Cartography, 2 days (Norplan)
- 2.9 GIS for hydrogeologist
- 2.10 Remote sensing
- 2.11 Data Management 2 (Excel & ACCESS)
- 2.12 Cartography- x2
- 2.13 Using water Dem software with GIS.5 days/Mr.Iqbal
- 2.14 ArcGIS software intermediate 4 days
- 2.15 Arc GIS online maps

Hydrogeology II (DACAAR)

- 3.1 National hydrogeological conference
- 3.2 Development of hydrogeological water atlas-half day
- 3.3 Training course evaluation Med-term review workshop
- 3.4 Water Quality Control Development Workshop
- 3.5 Annual meeting-2014

GIS

- 4.1 ArcGIS Software Introduction
- 4.2 ArcGIS Databases
- 4.3 ArcGIS Spatial analyses
- 4.4 Introduction to Online GIS maps
- 4.5 Practical use of Online GIS maps
- 4.6 Advanced Online GIS maps
- 4.7 Data capturing, 1 day (Norplan)
- 4.8 Cartography, 2 days (Norplan)
- 4.9 GIS for hydrogeologist
- 4.10 Remote sensing
- 4.11 Data Management 2 (Excel & ACCESS)
- 4.12 Cartography- x2
- 4.13 Using water Dem software with GIS.5 days/Mr.Iqbal
- 4.14 ArcGIS software intermediate 4 days
- 4.15 Arc GIS online maps

Water and sanitation

- 5.1 Planning using water atlas, 2 daysx2 (Norplan)
- 5.2 Conceptual design 3 daysx2 (Norplan)
- 5.3 O&M 1 dayx2
- 5.4 DACAR policy, 4 daysx2
- 5.5 DACAR
- 5.6 DACAR
- 5.7 DACAR
- 5.8 DACAR
- 5.9 DACAR
- 5.10 DACAR
- 5.11 DACAR
- 5.12 DACAR
- 5.13 DACAR
- 5.14 DACAR
- 5.15 DACAR
- 5.16 DACAR
- 5.17 DACAR
- 5.18 DACAR
- 5.19 DACAR
- 5.20 DACAR
- 5.21 DACAR
- 5.22 DACAR
- 5.23 DACAR
- 5.24 DACAR
- 5.25 DACAR
- 5.26 DACAR
- 5.27 DACAR
- 5.28 DACAR
- 5.29 DACAR
- 5.30 DACAR
- 5.31 DACAR

In MRRD, 69% came from RuWatSIP, 16% from engineering department and 11 % from RRD in Faryab. Since RRD Faryab only have 4 professional staff, the meant that some of the RRD staff attended many of the training courses.

4.4.3. Course evaluations by participants:

All course evaluations have been made available on-line on the project web, and the summaries are shown in the adjacent pie charts.

Much of the feedback is positive. In cases where participants were not wholly satisfied, it was often the case that the participant's background was unsuitable for the course, suggesting the need for better pre-course screening of participants on future occasions.

4.4.4. National Conferences;

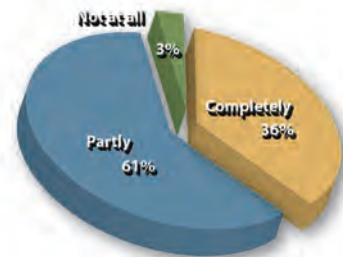
Two important conferences were organized taking the project lessons, findings and proposed way forward to be discussed with key national stakeholders. In the National Groundwater Conference, MEW and other key ministries and actors agreed for the need to develop a national action plan to continue groundwater mapping nationwide.

In the National GIS conference, the key professional GIS users met and agreed to find a forum for follow up meetings and for better exchange of information, training activities and for keeping a dialogue with government to facilitate for better access for general from government activities. Surprisingly, it appeared that of the 16 organizations present in the conference, only 4 were represented on-line and sharing information electronically. This exposed great potentials for improvement as all agreed to follow up and also discuss in the follow up conference celebrating the World GISDAY.

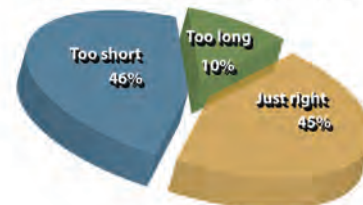
4.4.5. International conference in Rome.

Key professionals from the project from RuWatSIP, professor from Kabul University and one of the senior hydrogeologists were to attend the IAH Conference in Rome. The purpose was to build links to the international professional forum for hydrogeologists. At the same conference most of the participants were to present findings of relevance and interest about the Faryab project in particular and Afghan hydrogeology in general, to the international community of specialists.

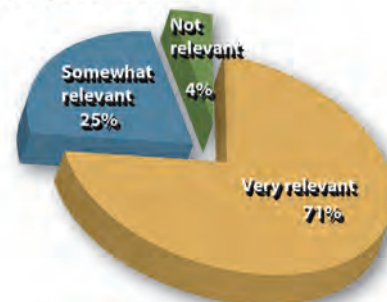
Did the training meet your expectations?



Overall length of the course?



How relevant for your organization or project needs?



Most unfortunately, the Afghan delegation did not receive visas in time. The international expert on the project, David Banks presented the project to the conference.

M.Sc. Training abroad

Under the project, provisions had been made for sending Afghans abroad for M.Sc. studies in relevant disciplines. Universities in India has been identifies for Afghan candidates, but MRRD did not present candidates for such training.

4.4.6. Location of training courses:

Most of the training courses were conducted in Kabul in RuWatSIP conference room. Some training was also organized at MEW as was the practical training and demonstration of drilling equipment. MEW also conducted training in soil sampling and sieving analyses.

DACAAR conducted decentralized training in Maymane and Mazaar for technical staff. Training in water supply O&M, use of GPS and water testing while social mobilization were conducted at DACAAR premises.

4.4.7. Female involvement.

Efforts were made to encourage female participants for the training. It was discovered that it was difficult to locate female hydrogeologists in the ministries. However, at Kabul University, the female contingent was significant and thus female students were invited. More ladies worked in water testing laboratories, training facilities and in the engineering department in MRRD than in hydrogeology departments. In total, the female participation reached about 12% which is reasonable and representative gender balance working with groundwater mapping.

4.5. Coordination and institutional Cooperation

Water is a very important factor for development in Afghanistan. From the government side, MEW is now tasked with the management of both surface water supply as well as groundwater resources. MEW has only handled the groundwater sector since that responsibility was transferred from MOM to MEW a couple of years ago. The whole groundwater department in MOM was then transferred to MEW with the change of responsibilities. So for all groundwater mapping it is essential to work closely with MEW.

AGS is also an important organization which is responsible for preparing geological maps. AGS has been working closely with international organizations such as USGS and BGS. AGS and USGS provided important base files for GIS presentations which MRRD and other organizations need.

MRRD is an important planner and developer of ground water sources for the rural population. Similarly so is also AUWSSC, MAIL, different NGOs and private sector. NEPA and MoPH are also

List of training courses, Conferences and Seminars implemented or attended under the project

NO	Name
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HYDROGEOLOGY COURSES:

- 1.1.1 Groundwater investigations
- 1.2.1 Geophysical Surveys
- 1.3.1 Well drilling methods
- 1.4.1 Water well design
- 1.5.1 Well hydraulics
- 1.6.1 Hydrochemistry, interpretation of data
- 1.7.1 Planning and implementation of Provincial hydrogeological surveys
- 1.7.2 Planning and implementation of Provincial hydrogeological surveys
- 1.8.1 Geophysical borehole logging, planning and operating equipment
- 1.9.1 Geophysical borehole logging interpretation of data
- 1.10.1 Well construction and pumping tests
- 1.11.1 Practical Pumping Test Interpretations
- 1.11.2
- 1.12.1 Practical Geophysical interpretations (Working on Faryab Data)
- 1.13.1 Advanced topics in hydrogeology
- 2.1.1 Water quality testing hydrochemical data
- 2.3.1 GPS reading and Water Quality Testing, -in the province
- 2.4.1 Geophysical Investigation and Siting; practical-in the province
- 2.5.1 Drilling methods and Well Construction
- 2.5.2 -in the province
- 2.6.1 Test Pumping and Data Collection -in the province (Mazaar)
- 2.6.2 Test Pumping and Data Collection -in the province (Faryab)

TRAINING METHODS

- 3.1.1 Training of trainers methods

GIS- & DATA MANAGEMENT

- 4.1.1 ArcGIS Software Introduction
- 4.2.1 ArcGIS Databases
- 4.3.1 ArcGIS Spatial analyses
- 4.4.1 Introduction to online GIS maps
- 4.5.1 Practical Use of Online Maps
- 4.6.1 Advanced online GIS Maps
- 4.7.1 Data Management 2, (Excel & ACCESS, Summary of 4.12/4.17)
- 4.8.1 Data Capture
- 4.9.1 Introduction to Cartography
- 4.10.1 Introduction to GIS for Hydrogeologists

NO	Name
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- 4.11.1 GIS - Remote Sensing
- 4.12.1 Data Management 2
- 4.13.1 Cartography II
- 4.14.1 ArcGIS Spatial analysis II
- 4.17.1 Data Management MS ACCESS,
- 4.19.1 ArcGIS Software Intermediate

WATER SUPPLY - ENGINEERING

- 5.1.1 Planning water supply using water atlas
- 5.2.1 Conceptual design for of sustainable water supplies (seminar)
- 5.3.1 Planning and implementation of O&M for rural water supplies
- 5.3.2 Planning and implementation of O&M for rural water supplies
- 5.4.1 Social aspects of Water and Sanitation, WASH policy, gender issues
- 5.4.2 Social aspects of Water and Sanitation, WASH policy, gender issues
- 5.6.1 Training in use of total-station for water/ wastewater, network survey (delayed)
- 5.7.1 Laboratory Quality Control
- 5.8.1 Water Testing using field kits
- 5.9.1 Autocad Civil 3D
- 5.10.1 Quality Control for Water labs
- 5.10.2 Quality Control for Water labs.

Key: Black : completed courses
Blue: courses to be completed in 2015

NATIONAL CONFERENCES

- GROUNDWATER CONFERENCE
- NATIONAL GIS CONFERENCE

INTERNATIONAL CONFERENCES

- International Association of Hydro geologists, Rome



organizations keenly interested in knowledge and monitoring the groundwater quality and thus need information as well as they can provide important information.

4.5.1. Coordination during training

Through this project, coordination has taken place and many levels. Technical coordination has worked well by having technical staff working together and discussing common issues solutions and challenges. By inviting many key resource persons from both universities, NGOs or government organizations, information is shared easily during the training. After the training the information is shared through the project web.

4.5.2. Coordination through invitation/ participating in strategic meetings.

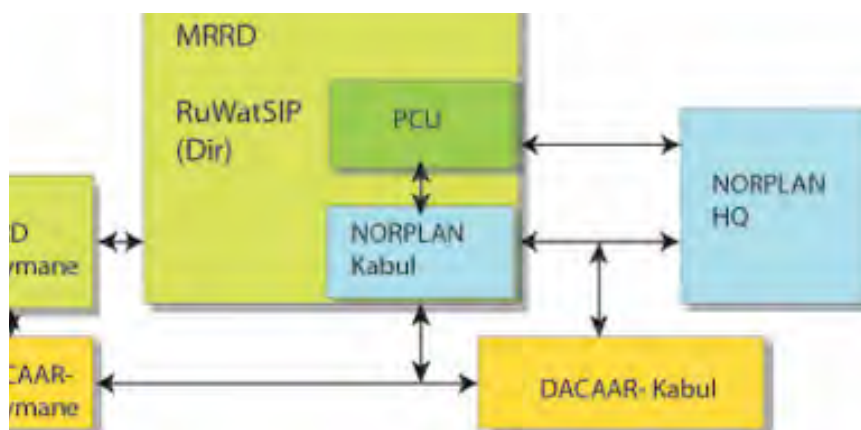
Norplan and Norplan staff has been invited to strategic meeting in MEW, World Bank, UNICEF, ADB and other active sector organizations and thus share information about developed groundwater planning activities. In addition , MRRD/ RUWatSIP also informs about project development work thus spreading information.

By having two university professors as part to the project team they share information and ideas at the university to students but also to meetings and sector venues they are invited to join. This has also been seen as an important networking and information discrimination factor.

Project staff have also been invited to hold lectures as Kabul university and the Afghan Civil society as in meetings with Afghan Engineer's Associations.

4.6. Project management

The project management framework was designed as shown in the figure below. As can be seen Norplan was reporting to MRRD/ RuWatSIP and to at Project Coordination Unit. (PCU) DACAAR is reporting directly to Norplan. Norplan has no formal links directly to NORAD under this project.



NORAD has before the project start agreed with MRRD that DACAAR should be the local partner

GROUNDWATER: ROLES AND RESPONSIBILITIES

ACTIVITY	MEW	AGS/MoM	MRRD	MAIL	MoPH	NEPA	University	ALWSSC/MUD	NGOs/DACAAR	Private Sector
Groundwater management										
Aquifer discharge plans	●									
Aquifer recharge assessment										
Groundwater regulation										
Issuing extraction permits/license										
Groundwater extraction for development										
Urban water supplies							●			
Rural water supplies								●	●	
Irrigation	●		●	●				●	●	
Other (incl. industry)	●						●		●	
Hydrogeological mapping capacity										
Hydrogeological surveys	●	●	●					●	●	
Geophysical investigations	●	●	●					●	●	
Hydrogeological reporting	●	●	●					●	●	
Making hydrogeo. maps										
• Paper maps	●	●	●					●		
• GIS maps	●	●	●	●				●		
• Web- maps	●	●								
Monitoring groundwater resources										
Water quality (water analysis)	●	●	●		●			●	●	●
Groundwater quantity /water level	●	●	●					●	●	
Groundwater pollution control										
Pollution control	●				●	●				
Training and capacity building										
Hydrogeological surveys	●	●	●				●	●		
IT – data processing and development of GIS maps	●	●	●				●	●		
Plan water supplies using hydrogeo. data	●	●	●				●	●	●	
Water quality -pollution assessment	●	●	●		●	●		●	●	

Draft outline v3- unofficial Oct-2013

with the Norwegian consultant selected for this project.

Norplan International Staff

Teamleader, Dr. Svein Stoveland
Senior Hydrogeologist: David Banks
Senior Hydrogeologist/GIS Andreas de Jong
Gender specialist: Elisabeth Eikaas
Training coordinator: Asbjørn Nordbø
GIS expert: Tor Gunnar Øverli,
GIS expert Stain Runar Bergheim
GIS expert: Frank Haugan
Hydrogeologist: Gisle Grepstad
Financial analyst: Alexander Kristiansen
Admin finance HQ: Berit Hultmann

Norplan local Staff

Deputy team leader/ Kabul office manager Eng. Naqibullah Abrar
National training expert Prof. Naim Eqrar /Muhammed Hamid
GIS adviser, Prof. Saub Zarinkhail
GIS Adviser/ backstopping: Abdul Munir
Training logistic officer: Abdul Nasir
Security officer Habib Fayaz
Admin finance. Ramzia Yusofi

DACAAR has been providing technical expertise of resource persons both in Kabul and in Faryab. In addition, DACAAR has been provided security information to NORPLAN staff with same advise as given to own personnel. Norplan has also received security briefs from DACAAR security officer.

4.6.1. Working arrangement at MRRD between consultant and client.

For project management and key technical discussions, the project coordinator A. Safi was the key contact person for the project as project coordinator. He was available for advice and consultation. Eng. Safi is also the key policy adviser for the director for RuWatSIP and thus quite busy. For any management, programmatic and contractual issues discussions had to be held with the director. For project management, these two persons was in fact the management representing the client.

The PCU was not operative as planned. Norplan did not have counterpart staff as such but worked closely with the director and the project coordinator on management issues. Technical issues such as hydrogeology was organized by working closely with senior hydrogeologists at RuWatSIP. For the first years, Prof. Zarinkhail was manager of the MIS /GIS unit and had no counterpart. During the last year, RuWatSIP engaged is own staff.

From the Norplan side, the team leader were following up all main issues with the client. If he was not present, the deputy team leader was coordinating activities with the client as well as managing

the project office, logistics for field work, support for all training activities. The deputy team leader was also the project manager for the Kabul Norplan office located in the RuWatSIP building at MRRD. The team leader and his deputy relied on effective dialogue using skype video conference regularly and many times per week. This worked well. Frequently all the international and local Norplan staff could coordinate planning activities in Skype meetings.

Training activities were initially handled by Eng. Nordbø, but later Dr. Stoveland took over this assignment making planning and follow up with Prof. Eqrar more effective. Prof. Eqrar was tasked with preparing the training calendar and organized the training program together with the responsible presenters and co-trainers. Prof. Zarinkhail was coordinating GIS and MIS activities and thus working very closely with international GIS experts for developing templates and database framework to be used for presenting hydrogeological data. Later, as RuWatSIP recruited more GIS- MIS personnel, Prof. Zarinkhail liaised with the new GIS-MIS manager in RuWatSIP.

4.6.2. Annual meeting and project guidance.

Each year the annual meeting were presented with revised project implementation plans and revised budget. The project progress, challenges and achievements were discussed. Unfortunately, it was difficult to receive clear instructions whether the revised plans and budgets were approved or not. Norplan implemented most of the project assuming that unless any written instruction was given to stop the project, the project implementation could proceed in line with revised plans and budgets.

4.6.3. Working with DACAAR as a partner

DACAAR was probably the best partner for Norplan for implementation of the project since DACAAR had good knowledge about much of the planned work with groundwater mapping and field surveys. DACAAR was probably also the best sources for providing technical hydrogeological data which Norplan needed for the surveys in Faryab.

Norplan believes that DACAAR also benefited from the cooperation by joining in capacity building as participant, co-trainers or as trainers. DACAAR who is a key training organization, also benefited from the training on quality control focus, hydrogeological survey methods including well logging techniques, but also on design on online ArcGIS map utility software. It is believed that DACAAR as well as University lectures who participated as co-trainers under the training program could if required to do so rerun the developed training courses and thus improve sustainability of groundwater mapping activities.

4.7. Project information Management

How can water sector staff in Afghanistan benefit from this project?

This project is aimed at capacity-building in MRRD but also within other sector agencies working in Afghanistan. A number of organizations are involved with the mapping, management and devel-

opment of groundwater resources.

Some of the members of the Norplan team ha experience in the challenges faced by poor communication and coordination of water sector activities in Afghanistan. Many organizations and project operated relatively secluded and seems to prefer to work with least possible interference from others. For this project, the idea was to develop methods and approaches for one province which hopefully could be scaled up to be used throughout the country.

Since no organizations were envisaged to have adequate resources to scale up groundwater mapping throughout Afghanistan, it was assumed that good coordination and teamwork would be necessary and important. For progress with groundwater mapping, effective sharing of information, experiences and ideas would be very important. In the developed world, the information management is the key for making planning and decision-making make development move and likewise this should be a clear focus also in Afghanistan. This was developed and tested under this project . In order to strengthen sustainability of activities developed, all information was shared, and so were documents, methods, photos, videos, training materials, reports, etc.

So making use of the free web, information could be shared. The project started sharing information such as:

4.7.1. Use Internet for communication

The project is one of few projects which has developed a project web page for communication, exchange of data, maps and training materials. All information collected should be made available

Overview over documents and information for sharing with stakeholders:

Hydrogeology documents

- Water Atlas for Faryab
- Field survey methods (English/ Dari)
- List of equipment for field surveys
- Design and use of well logger

GIS- MIS

- Hydrogeological PDF maps
- ArcGIS electronic hydrogeological Maps for Faryab
- Data Management procedures
- GIS solutions for planners and water engineers
- GIS training materials and manuals

Water and Sanitation

- Quality control for water testing labs
- Water testing labs
- Conceptual design for water supply and sanitation services
- Testing water technology

solar stills and membrane filtration

Capacity building - training

- List of Afghan resource experts/trainers
- Training videos, course photographs
- Training course material, lectures, presentations, tutorials
- Power point presentations
- Reference books
- Course evaluations

Project management - information

- Terms of Reference for project
- Progress reporting
- Work schedule
- Project and sector staff

to all sector stakeholders in Afghanistan to facilitate service provision and rational resource development. All such development requires reliable and readily available information.

All information from this information is available for review or downloading on the internet. We are also making information available in both English and in Dari languages. Training material can be downloaded and used for future training courses in MRRD, other ministries, University/ Polytechnics or by NGOs for serving development in Afghanistan.

On the adjacent diagram, a listing of available documents is shown, together with their location on the internet.

www.norplan.af.

The screenshot displays the NORPLAN website interface. At the top, a navigation bar includes links: HOME, OBJECTIVE, ACTIVITIES, OUTPUTS, FARYAB, GENDER, KEY ACTORS, NEWS, CONTACT US, RUWATSIP, STAFF, COORDINATION, HYDROGEO., GIS-MIS, WAT-SAN, TRAINING, MANAGEMENT, and PROGRESS. Below the navigation bar is a banner image of a desert landscape with a person in the foreground. The main heading reads: "Capacity Building and Institutional Cooperation in Hydrogeology with MRRD with Faryab as Pilot Province". Below this heading are icons for various resources: Picture Gallery, Short Videos Training, Web Maps, R & D Solar still, and Thematic Illustrations. The left sidebar contains a "News heading" section with links to "more news", "Used landcruiser rebuild for use at well logger vehicle", "Quality Control workshop for laboratories", "Training on Practical use of GIS Maps", and "Database over training courses and participants". The main content area features a "Project Focus" section with a background image of a drilling rig, stating the goal to develop hydrogeological methods to map groundwater resources in Faryab province, focusing on sustainability and training MRRD staff. Below this is a "Schematic Diagram below showing Project Activities and Outputs". The diagram is a flowchart with four main columns: DEVELOPMENT OF METHODS, PROJECT ACTIVITIES, TRAINING & CAPACITY BUILDING, and OUTPUTS. It details the process from designing hydrogeological methods and GIS-MIS systems to training 200-400 persons and developing a hydrogeological survey methodology. Logos for RUWATSIP, MRRD, NORPLAN, and DACAR are visible at the bottom of the diagram.

Snapshots of electronic information from project (ON WEB)

This page illustrates some of the information derived from project activity, which is freely available for all to use.

The Project's website welcome page menu directs users to objectives, activities, staff, co-ordination, hydrogeology, GIS-MIS, watSan, training, management and progress. This web page is updated as the project progresses. It works well for information and reference .

The overview and project history is easy followed under the NEWS menu item.

Field survey methods

Training videos

Reference books and documents

Photographs from activities.

Project outputs - Maps, Water Atlas and more...

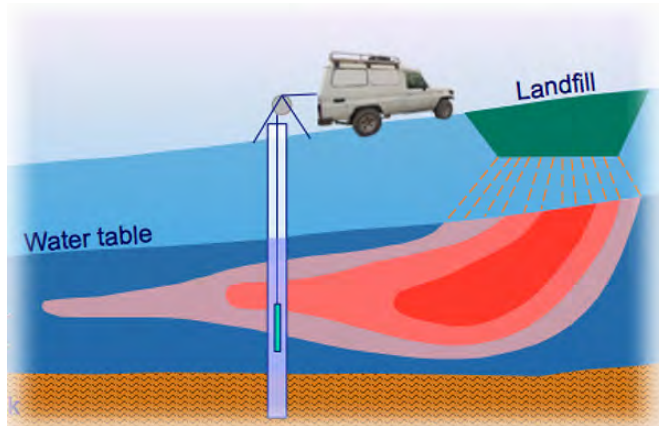
And More

Here we have tried to show how Project information is stored and can be found. You'll find over 100 web pages of information here about groundwater mapping in Afghanistan. We hope that you, as users, will be able to employ the information and training materials that we have provided.

Happy viewing.

5. Well logging equipment introduced

Under this project specialized equipment were purchased for inspection of wells as well as undertaking geophysical investigations using sophisticated logging equipment.



This equipment will help to collect information on groundwater and geological conditions in boreholes.

The purpose of the geophysical borehole logging is:

Geological Mapping

- Identification of lithology
- Measurement of lithological parameters.
- Stratigraphic correlation between boreholes.

- Identification of aquifer units.
- Identification of fractures & secondary porosity.

Ground Water Quality

- Determination of groundwater quality. E.g. EC
- Identifying saline intrusion & contaminant plumes.

Well Inspection

- Verifying well construction.
- Determining status of old water wells.
- Plan fishing operations.
- Pre & post well rehabilitation surveys.



A special vehicle was designed and fitted in Kabul for the GeoVista logging equipment. The equipment was commissioned and tested with good results. Now MRRD (and DACAAR) has improved expertise and competence for geophysical surveys and inspections as a result of this project.

DACAAR used later the same design and procure similar equipment for their own project activities. This shared use of information and system could be valuable in the future when training and spare parts are required.



6. Preliminary design of up to three water supply schemes

The planning and design for three rural towns could not be implemented as indicated in the TOR. It was suggested that three towns were to be identified in Faryab for possible detailed planning and design.

The main problem with starting the planning work is that rural water supply and sanitation development assumes close interactive planning with the communities. The community mobilization is assumed essential in order for the communities to assume responsibility for operation and maintenance of the developed facilities. Mobilization of the communities can only happen if there is a clear agreement of who does what and what the different parties will contribute for the success of the project. Given this background framework, it was not considered possible to mobilize the community to prepare plans for water supply and sanitation facilities only for the communities to be told that funds was not available for implementation of the plans.

An attempt was made to ask DACAAR and NCA to cooperate on planning and implementation of the three towns with Norplan assisting with the planning and one of the NGOs to assist with the implementation and funding of construction. In discussion with the Provincial Governor and PRRD, three towns were initially identified (see attachment for watsan / Faryab). The towns of Damqul, Astana Baba and Shurhab Villages were all identified as candidate towns. On closer consultation during a meeting in the provincial council, it appeared that NGOs had already plans in good progress to cover the mentioned towns. It was not possible for the province nor in discussion with the different NGOs to share development of water supplies for three towns in Faryab. Further planning for water supplies for three towns was thus put on the shelve. NORAD endorsed this in the annual meeting in 2014, that it had no meaning to pursue the town water supply planning without funds available for follow up construction of planned facilities.

7. Human and financial resource spent

The table opposite page shows time spent for the consultant staff under the project. Most of the staff included in the table are as planned for in the original project proposal as outlined in the inception report. The right hand column coloured in yellow show the planned for man months presented in the inception report in April 2012. Based on those figures, the man-months for international staff has increased from 53 to 93 man months. For local staff the equivalent figures are increases from 137 to 230 man-months.

7.7.1. Changes due to external delays.

The project were between 9 to 12 months delay in the start-up due to administrative problems with the authorization of signing the NORAD- MRRD agreement by MRRD. Since the Afghan Ministry of Finance were the only ministry with authority to approve tax exceptions for project implemented in Afghanistan, delays occurred due to uncertainty about handling of payments and clearance of imported goods. The mentioned problems also resulted in more that 6 months delay in payment to the consultant which generated uncertainties about project implementation timing and Schedules. As a result visiting Faryab province was delayed and the first visit did not take place before 10 months after project start-up. This initial delays directly affected the overall duration of the project and the annual meeting in 2014 agreed to 12 months project extension till the end of 2015.

7.7.2. Change in time/ duration of staff.

As a result of the general increase in the project duration, this meant one year extension for local staff which basically explains most of the increases in local staff time. One addition of local staff was the recruitment of a GIS-MIS Adviser as approved by the Annual meeting in 2012. GIS- MIS was an integral part of the project and RuWatSIP were to coordinate discussion of how best to plan database specification for GIS and hydrogeological database. In parallel, UNICEF were about to engage a local consultant to develop a functionality database for all rural water supply systems. With two separate consultants about to discuss technical issues with RuWatSIP problems arose since RUWatSIP did not at the time have expertise to lead and handle such difficult technical discussions. As a result, NORAD agreed that a GIS-MIS adviser should be recruited under the project and work for RuWatSIP coordinating all GIS- MIS work and spending 50% of this time on NORAD project and the rest on the UNICEF funded activities under RUWatSIP.

Other changes of significance has been the extension of time of Dr. Stoveland, the team leader. The project has at times been quite challenging and this has required much follow up by the team leader. The other change made was that Dr. Stoveland were to manage the training and thus phasing out Eng. A. Nordbø. This was necessary in order make more effective use of international personnel. Since the capacity building activities grew to courses were modified and developed as the training gaps were exposed, effective management was required.

The second major increase in international time used was the increased and extended training

Table showing man-months as planned in the inception document and as spent on the project.

Re	Name of Staff	Position / project phase:	Project total	Inception	Planning	Implementation	Planned Inception
	Foreign Norplan Staff	Project months			Months		
1	Dr. Svein Stoveland	Team leader Water and sanitation sector expert	40.5	2.4	10.1	28.1	20.0
2	David Banks	Senior Hydrogeology Expert	11.4	1.1	3.4	6.9	7.0
3	Asbjørn Nordbø	Senior Training expert	7.1	0.7	4.8	1.5	7.5
4	Tor Gunnar Oeverli/ Frank Haugan	GIS expert	4.1	0.8	2.9	0.4	4.8
5	Andreas de Jong	Hydrogeologist - GIS expert	12.9	0	0	12.9	0
6	Alexander Kristoffersen	Financial Analyst	0.3	0.1	0.1	0	2.3
7	Knut Terje Ellefsen	Socio economic analyst	5.4	1.3	2.7	1.8	8.5
8	Elisabeth Eikaas	Social Anthropologist/ gender					
9	Magne Kløve	Backstopping water supply design					
10	Trond Kaulum	Training expert					
11	Gisle Grepstad	Senior Hydrogeologist					
12	Berit Hultmann	Admin. Finance HQ.	12.1	0	1.8	10.3	3.5
	Sub sum International staff:		93.8	6.4	25.4	62.0	53.6
	Local Norplan Staff	Project months			Months		
1	Naqubullah Abrar	Norplan Deputy	48.2	2.7	12.7	34	30.8
2	Prof. M. Hamid/ Prof Eqrar	National training expert	36.8	2.1	5.5	28.8	13.8
3	Abdul Munir	GIS backstopping expert	0.7	0	0.5	0.3	5.8
4	Prof. S. Zarinkhail	GIS- MIA Adviser	36.7	0	1.7	34.0	0
5	Naseer	Logistics officer, training	24.0	0	0	24.5	0
6	to be recruited	Provincial eng Faryab	0	0	0	0	0
7	Ramzia Yosoufi	Admin Finance officer	44	0	9	35	33.5
8	Habib Rahman	Office security, support staff	40	0	6	34	0
	Sub sum local staff:		230	4.8	35.4	189.7	137.0
	TOTAL man months:		323.7	11.2	60.8	251	191
	KEY:						PLAN

activities handled by Andreas de Jong. During the initial training needs assessment it was assumed that the training needs were less than realized. In addition to training in specialised use of equipment, it was also need for more basic training of hydro-geologists in how to handle, clean and treat data using basic software like excel, access and GIS tools. Much of the courses were very practical with practical training modules. This additional input required more courses and more time. Andreas de Jong was also the hydrogeologist who handled the training of the procured well logger equipment which was assembled, commissioned and developed at MRRD. The same person also introduced ArcGIS on-line software for publishing hydrogeological data for Faryab. This was very successful training and a useful tool for all to use since it was free software to use as long as all data published on public domain platforms.

7.7.3. Change of personnel

As indicated above, Dr. Stoveland assumed also the function of managing the training and capacity building program and phasing out A. Nørdbø. It became increasingly clear that MRRD hydrogeologists wanted to focus on practical training and to learn how to use equipment for geophysical surveys which MRRD already had but with the staff had not been given appropriate information and training how to use. With the security situation in Kabul and Faryab not very good, it was not easy to find senior international experts willing to spend adequate time in Kabul for training. Fortunately Andreas de Jong agreed to join the training team. He had years of field expertise from hydrogeological survey but also good knowledge in GIS application and use with hydrogeological data. Thus introducing Andreas greatly strengthened the training team. The practical training was considered very important. The other hydrogeologist in the project Mr. David Bands, focused on developing methodologies for hydrogeological surveys, preparing survey reports for faryab, developing the Water Atlas and for supervising/ guiding the field surveys and exploratory drilling work in Faryab.

After the unfortunate death of Professor M. Hamid, Professor Naim Eqrar from Kabul University was engaged to handle the assignment as national training expert and training coordinator for the project.

In the Norplan office, a training logistic officer was recruited to provide support to all the preparation and logistic support for organising all the training course. This was quite essential for preparation of stationary, documents, tea and lunches as well as administrating the payment of allowances for course participants who travelled to the training and were thus entitled to receive expense payments.

7.7.4. Change in management requirements.

Working in a fragile state means improvisation and experience in order to guide a project to successful completion. In addition it also requires time. During the implementation of the project many unforeseen challenges arose. It was found necessary for both the team leader, deputy teamleader and admin/finance officers to use more time than anticipated. The increased time required were reflected in each revised implementation plan and revised budget and thus this helped the project to proceed well.

7.7.5. Financial resources

The project was in many ways well designed in the sense that changes in the project environment could be accommodated in the project. This meant that after the inception phase, and after the planning phase, revised budget and project plans were presented for the client and NORAD. Subsequently, revised budgets were drafted and presented annually to the annual meetings for approval. The last revised budget presented to the client and copied to NORAD was submitted in February 2015.

Form F2: SUMMARY OF COSTS				
Form F2: SUMMARY OF COSTS				
Item	Inception Stage	Planning Stage*)	Implementation Stage	Total Cost
	(NOK)	(NOK)	(NOK)	(NOK)
Foreign Staff Remuneration	Total from Box A	Total from Box B		
Carried over from Form F3	1,261,250	3,870,000	5,375,500	10,506,750
Local Staff (DACAAR) Remuneration				
Carried over from Form F3	133,250	399,750	1,865,500	2,398,500
Sub Total Remuneration	1,394,500	4,269,750	7,241,000	12,905,250
Reimbursable Costs	Total from Box C	Total from Box D		
Carried over from Form F4	323,228	1,018,432	9,318,465	10,660,125
Equipment Procurement at Mobilisation	Total from Box E			
Carried over from Form F5	945,359			945,359
Equipment Procurement prior to Implementation				
Carried over from Form F5		4,619,425		4,619,425
Sub Total Reimbursable	323,228	5,637,857	9,318,465	15,279,550
Total Amount	2,663,087	9,907,607	16,559,465	29,130,159
Figures in <i>italic</i> = Provisional Sum (PS)				
*) Indication only, subject to findings during the Inception Stage				

7.7.6. General trends for the project in terms of funding.

The project expenditures has used funds for procuring equipment as originally planned in the inception report. The local partner, DACAAR has been engaged for 3 years and 6 months longer than originally planned. In the original budget, a provisional sum was set aside for procurement of equipment etc. Some equipment has been procured such as the well logger and one additional car for the well logging equipment and drilling equipment and fuel expenses. Except for that, much of the provisional funds has been used for running training courses (45), national conferences and seminars covering local traveling costs for participants, and food and facilities.

As indicated earlier, the staff time has increased and this is also reflected in the budget changes from 2012 to 2015. All staff time has been reimbursed based on time spent on the project. The increased consultants time has been accommodated by substantial saving in consultants hotel and per diem costs. A saving of close to NOK 6 million was made through the limited expatriates

expenditures for upkeep in Kabul. The additional increase in consultants costs were met by adjustment in approved consultants budget which at all times was kept within the budget frame of the agreement between NORAD and MRRD.

7.7.7. Budget status at the end of the project.

As per November 2015, the total expenditures for the project is shown in the table. The budget as prepared and updated in February 2015 was total NOK 34,997 million. Since the project is to be closed by 31st of December 2015, the expenditures for the last month of December covers staff costs plus final payment to DACAAR, payment to a local consultant for modifying a database to facilitate for data entry to be made in English, Dari and Pasto languages, and also some expected costs for repair of some well logging equipment sent to England for repair. (Sent to GeoVista who made the geophysical equipment).

As can be seen in the financial table there is also NOK 99,683 on a disputed invoice for procurement

SUMMARY OF COSTS - BUDGET AND EXPENSES

Now updated for expenditures to date:				30.11.2015
Item	Inception Stage (NOK)	Planning Stage (NOK)**)	Implementation Stage (NOK)**)	Total Cost (NOK)
Foreign Staff Remuneration				
Budget Feb 15 - Form F3	1,314,558	5,660,657	16,033,043	23,008,258
Expenditure per 30.11.2015	1,314,558	5,660,657	15,827,078	22,802,293
Local Staff (DACAAR) Remuneration				
Budget Feb 15 - Form F3	133,000	396,906	3,084,000	3,613,906
Expenditure per 30.11.2015	133,000	396,906	2,111,560	2,641,466
Sub Total Remuneration	1,447,558	6,057,563	19,117,043	26,622,164
Total expenditure Remuneration per 30.11.2015	1,447,558	6,057,563	17,938,638	25,443,759
Reimbursable Costs	Total from Box C	Total from Box D		
Budget Feb 15 - Form F4	261,952	839,097	3,042,209	4,143,258
Expenditure per 30.11.2015	261,952	839,097	2,812,299	3,913,348
Sub Total Reimbursable	261,952	839,097	3,042,209	4,143,258
Total expenditure Reimbursable per 30.11.2015	261,952	839,097	2,812,299	3,913,348
Equipment/Procurement/Training	Total from Box E			
Budget Feb 15 - Form F5	834,935		3,396,890	4,231,825
Expenditure per 30.11.2015	834,935		2,882,863	3,717,798
Sub Total Equipment	834,935		3,396,890	4,231,825
Total expenditure Equipment procurement 30.11.2015	834,935	0	2,882,863	3,717,798
Total Amount, budget revised	2,544,445	6,896,660	25,556,142	34,997,247
Total expenditure 30.11.2015	2,544,445	6,896,660	23,633,800	33,074,905
Budget December 2015				1,120,000
Invoice No.530166 total stations				99,683
Remaining budget unused				702,659

of Total Stations from Singapore, when Norplan was fraudulent cheated to make payments for goods not delivered. The case was reported to the police in Norway but amount too small for police to take action.

According to the expenditures, there should be about NOK 702,659 remaining as unspent under the NORAD- MRRD agreement.

Norplan is of the opinion, that the output from the project justifies the expenditures and that the expenditures in line with the Terms of reference. This was also greatly the observations reported by an external consultant during the mid term review.

Summary of costs (Form F2) as presented in February 2012.

8. Assessment of effectiveness of the project

We believe the capacity building was very effective. By running about 45 training courses, training over 800 course participants and organizing three national events was effective. The interactive training methods made it possible to tune the training to the knowledge level with the participants. Training is a process of inducing change in behaviour and that process needs time. The two last years when most training was done was very effective.

The project management was not very effective where project uncertainties in the start-up phase combined with varying challenges caused by the security situation in Kabul and Afghanistan made it very difficult to make firm and detailed schedules for activities.

The practical training was considered most effective. For all courses, the trainers could make immediate assessment whether the participants gained the understanding of the training and that they could show how to apply the knowledge in practice. The training sessions were generally based on small groups who could work with their own laptops or borrow one of the laptops made available by the project. Most participants gained skills as we could hope for.

Visiting Faryab and discussing provincial interactions was very difficult and slow for many reasons. Security was one such issue. It took close to one year before the first visit was made. The subsequent follow up visits were poor and difficult to organize for security reasons. The provincial engineers at MRRD in Faryab were not very keen on the project and that also slowed down the activities. At provincial level, expectations for the project were service provision, not capacity building and that message was not well managed. The information between MRRD and provincial administration and RRD was unsatisfactory.

MRRD was to provide an input to the project amounting to about USD 625,000. Most of this support should be in kind by providing drilling rigs for exploratory drilling and staff for field surveys. Unfortunately MRRD was very slow to mobilise such equipment. The first drilling rig only started working in Faryab on the project in September 2014 close towards the end of the project. This late arrival of drilling equipment affected the project implementation scope.

The development of surveying methodologies, GIS solutions, and Web Atlas was an effective way of illustrating how work could be done later by local staff. With the methods prepared, training given and most documents translated to Dari and all published and made available on the web this was effective use of delivering capacity building.

The regular project management unit was never established. The project was mainly linked to two persons in RuWatSIP, the director and the project coordinator. Both the two senior officers were very busy and had limited capacity to spend very much time on the project. For capacity building and training the dialogue was directly linked to the technical units in MRRD for planning and training activities and staff there had more time to participate in the project.

The project was effective in skills training to many different organizations and the technical level, the project brought the message of the importance of national groundwater mapping to senior government officials through national conferences. Lastly but perhaps most important, the project

demonstrated effective information sharing and information management accessible for all sector staff in Afghanistan.

9. Assessment of project impact, positive and negative, planned and unforeseen

9.1. Comments on project environment.

The focus of activities in MRRD may have changed somewhat over the last decade with increasing focus in projects and project implementation. When discussing work with MRRD and RuWatSIP, the focus is often on projects and activities. The consultant and his interpretation for the project has been that the hydrogeological mapping for Faryab was implemented with Faryab as the pilot project but with the whole of Afghanistan being the focus for scaling up of developed methods, designs, databases maps and general capacity building, thus the bigger picture always being of importance. This focus may not always be appreciated by the client.

MRRD and RuWatSIP has relatively few people working on policies and strategies for closing the service gap for water supply and sanitation service. This means the bigger implications of methods and systems are discussed with one or two people in RuWatSIP only. There may thus now be capacity for follow up action in RuWatSIP.

Outside MRRD, the project managed through participating in meetings and organising national workshops to inform the senior government organization of the importance of groundwater, the need to groundwater mapping and that methods to do this work is available. There is now also capacity to do much of this work. It is now up to the government organizations to decide whether this work should be prioritized or not. Key organizations like MRRD, MEW and AUWSSC are all aware of what is now required. The first challenge is still funding.

9.2. General positive project impact:

The project will have positive impact in a number of different ways.

- First this project probably implemented on of the largest technical training programmes of this nature implemented in Afghanistan.
- Local trainers and key resource persons have gained practical training on how to implement interactive training. The same trainers also have now received training material which some already have started using at the university,
- Project staff has been invited to lecture as Kabul University and for Afghan Engineer's Association (Civil Society) because the project has generated interest.
- The training sessions have created an "ad hoc" professional forum for hydrogeologists and

GIS experts to meet and discuss and learn from each other in way they never did before. .

- The project have linked key GIS users together. This was the first time this happened for a long time. It is likely that these meetings will continue.
- New free GIS software was introduced to GIS users and training was provided. There is all reasons to believe that use of this tool will continue.
- The project tried to mobilize women to participate in the training and in the project. This has been difficult, but many women student hydrogeologists from the university have participated in the training.
- A new well logger equipment has been designed, locally assembled and introduced to MRRD for inspecting of training boreholes.
- MEW has stated great interest in continuing national groundwater mapping in line with the methodology developed for Faryab.
- The National Conferences and seminars opened up the dialogue with senior government officials of key areas for need of national action plans and for closer cooperation.
- MRRD, with support of DACAAR, should now be able to provide effective support to MEW to develop expertise with groundwater mapping nationwide.
- The project web page has demonstrated how it is possible to disseminate information to all sector staff effectively. All project documents and training material is freely available for anybody to use. This is new, transparent and appreciated by many with about 80 daily visits to the pages.

9.3. Negative impact

There is currently no arrangements for project continuity.

- The Faryab province did not feel the project benefited the province as they had hoped for. Initial TV news about the project for support for water supply for Faryab generated expectation for construction of water supplies rather than capacity building and hydrogeological surveys for groundwater mapping. People were expecting water supply schemes not reports.
- The project started to assist the water testing laboratories as organized under ANSA to establish a national quality control framework. This work was not planned but a result of observations when collecting samples for analysis in Faryab. There was good progress and interested generated from most water testing laboratories and many ministries. However, the project could not mobilise alternative resources to help ANSA and the water testing laboratories to obtain the necessary support to introduce quality control systems for the labs so that the analysed results could be trustworthy. Failing to take the work to a conclusion may leave a negative impact.
- Attempts were made to establish institutional links between Norwegian organizations for Geological mapping (NGU), Norwegian Water Research Laboratory (NIVA) and University of Life Sciences at As , Oslo. Unfortunately the project failed to establish cooperation between MRRD and the Norwegian institutions who all were keen to work with MRRD,

10. Assessment of sustainability of the project

The main objective of this project was capacity building which in its definition is work undertaken for the purpose of improved development. The consultant focus throughout the project has been on making best efforts to make the project activities themselves, or the interventions undertaken generate outputs and results which would render the sector development sustainable. So before making the assessment, let's first outline how the consultant tried to optimize the likelihood for the project interventions being sustainable and for leaving impacts to remain after the end of the project.

10.1. Project focus for promoting sustainability

Just a small anecdote from previous evaluation work the author of this report was involved in. When evaluating a Capacity building project for urban infrastructure development in one African country there has been a large capacity building project where about 20 expatriates have participated. There were rumours that the project has gone wrong. So one year after the end of the project the evaluator came in and started what was called a "port mortem assessment" to see if there were any evidence that the project had ever existed. Well, this is off course extreme way of making an assessment, but when assessing sustainability, it is to some extent time which will be the better judge of success or failure. Considering this anecdote, the assessment of sustainability is probably premature at this stage but we can describe plans made to promote sustainability and possible indicators of progress.

The following strategies were applied to enhance sustainability:

10.1.1. Programmatic issues

- Do not anchor all knowledge in one place / basket or in one organization.
If one agency collapses, the knowledge and functions will continue in other organizations who participated in the capacity building. Ministries and organizations in developing countries are always in a flux, frequent reorganizations, etc. but the development needs remain.

10.1.2. Technical issues

- Provide training / practical training which gives direct feedback that the participants have gained a new skill and that they have shown with practical work that they know how to use the knowledge
By following this approach the consultant knows that the course participants have gained the desired expertise because the trainer can observe and see. In this respect, some basic courses have been repeated up to three times to assure the staff understand some of the essentials.
- Engage / work with other local resource persons and training institutions who can continue the training after the end of the project.
The project has engaged two professors who continuously lecture at the university. The same resource persons also are used as local consultants/ resource persons by different government ministries and organizations for project work and development. The project also engaged a number of "co-trainers" from other universities, from NGOs and other agencies to assist in the training alone or together with international experts. This is a kind of training of trainers which can easily work.
- Develop methods, designs, and textbook formats which can be used for replications for other areas.
International experts have prepared reports, survey methods, developed databases and assisted in preparing map templates which can just be used after the project by copying formats and using designs and methods

by any Afghan organization.

- **Procure and leave training equipment to be used after the project.**
All training material for all 45 training courses and presentations made at national conference and seminars has been distributed on CDs for training course participants and also published on the project web for anybody to download. There are all the training course summary sheets, agendas, power point presentations, and course evaluations and course summary report available for anybody to use.
- **Share and publish all work and training material with all key stakeholders working in the water sector in Afghanistan.**
All documents, training material, reports, photographs, training videos, links of reference books and documents and collected reports are made available for anybody to download and use. This is quite new approach in development work
- **Invite participants from many different organizations to each training event so as to establish professional forum for meetings and technical discussions and for learning who else work together with same topics and issues.**
This is very effective technical coordination for exchange on information and knowledge as well as to discuss and find good solutions to common problems. When inviting water laboratory staff to discuss quality control of data management, the participants indicated that this was the first time they have been attending such joint training. Similar expressions were given from participants of the National groundwater conference and also at the national GIS conference supported by this project.

10.1.3. Senior government decision makers made aware of groundwater issues and solutions

After working with technical personnel for the first three years, the discussions was brought to the decision makers and politicians. During the last year in particular, the project met with directors, and deputy ministers and ministers to make them aware of the important of national groundwater resource mapping, use of GIS tools for information sharing, and the importance of inter-ministerial coordination and close policy dialogue. Junior or technical personnel cannot change their approach to sustainable development unless enforced by their superiors. The national conferences and seminars have generated some awareness to the issues addressed under this project.

10.2. Assessment of sustainability of the project - or its components

We believe that many of the components covered by this project will be sustainable but the answer is varied.

10.2.1. The project - degree of sustainability?

The project support provided to MRRD of close to USD 6 million cannot continue using local funding. The government is short of local funds and can barely fund local staff. The situation in RuWat-SIP, MRRD is actually that most of the staff there are funded by UNICEF. Thus without project funds, continued work with groundwater mapping is likely to stop. If for instance, UNICEF is not in the favour that the personnel it support should give priority of groundwater issues, that it will be difficult for groundwater mapping to be continued to other provinces or areas in Afghanistan. MRRD was hoping that other projects would come on line to continue some of the activities undertaken by this project. World Bank has been in negotiation with MRRD for a \$100 million project for rural water supply. A couple of years ago, there were some discussion of linking the NORAD funded project activities with the planned World Bank funded project. However, the World Bank funded project

has been postponed and the continuity of activities with MRRD is currently uncertain.

A different issue which emerged during the implementation of the project. When the project started, Ministry of Mines (MOM) was formally in charge of ground water. However, that ministry focused more on minerals, oil and gas rather than groundwater. So about two years ago, the responsibility for groundwater was transferred to Ministry of Energy and Water (MEW). MEW is now in charge of both surface water and groundwater resource mapping. It make good sense to link there functions.

What also has been good is that MEW is, beside MRRD, the organization which has sent most staff for training so particularly technical staff in MRRD and MEW knows each other quite well now.

With the new government and some changes in top management in the ministries the communication and coordination between the ministries have improved much the last year. As such, MEW has invited MRRD for closer cooperation and for working together for continuing groundwater mapping nationwide. During the national Groundwater Conference, the conference declaration clearly stated that groundwater mapping must be a priority for the government and should continue. That is encouraging.

So project sustainability is very much linked to the available project funding for some years still whether with MRRD, MEW or both the two ministries. Of course, private sector and other organizations should also be engaged to work with the ministries to undertake the work needed,

The sustainability and continuity of training and use of hydrogeological surveys methods and mapping methods is likely to have good success. Different NGOs, local resource persons and universities, will and most likely make use of training materials for better quality work in Afghanistan. This work will continue and continued benefits can be expected. Some of the training material developed is already issued to student as Kabul University and that is positive.

11. Lessons learned

In a fragile state where infrastructure development is driven by external funding, focus for measuring output is frequently linked to project success rather than national success. This is also noticed in MRRD who is focusing on projects and less on national planning, policy development and on development of strategies for reaching all with basic water supply and sanitation services.

In the last annual meeting with the Deputy Minister in MRRD, we learnt that the government and MRRD will implement development in a more coordinated manner to sustain the service provisions better than in the past.

Training and capacity building can be an effective platform for harmonizing and strengthening quality of work on the technical staff in different ministries. This project has shown that there is a great need better coordination and cooperation between different ministries on the technical levels and also on the management level. The project as designed in the TOR worked relatively well on the technical level, but was inadequate to resolve challenges on the management level.

The dialogue between government ministries has improved during the last year. The project worked with Afghan civil society though Afghan Engineer's Association for convening conferences where senior political representatives could attend without having to compete about who was the "owner" of the project or conference. Initiative came from Afghans. This was a good platform for building bridges between organizations

The promotion and presentation of a project for capacity building is not very popular at provincial and district levels. People and planners there want services and physical facilities. It was unfortunate that the project did not include a component to meet some of their local expectations from Faryab. In the future, capacity building projects must contain components of physical service deliveries to attain support from most recipients.

Training need assessment can best be done by testing the people to be trained. Most of the people to be trained knew most of the theories, but had not worked with practical solutions. They had therefore difficulties in assessing training gaps.

Planning decentralized training for complicated services like hydrogeological mapping, surveying and development of databases and maps using advanced GIS software has little application at provincial and district levels. Such highly technical topics are mainly handled in specialised units and organizations in the capital so decentralised training for many of the highly technical topics were inappropriate to conduct outside Kabul. Furthermore, in Afghanistan there may be only a good handful of experienced and active hydrogeologists and they are all operating from Kabul. Of all the 800 training course participants attending any of the training courses, only 37 were trained as hydrogeologists.

At the universities and polytechnics, there are many lecturers and professors with good technical knowledge. However, very few professors have access to equipment and labs where practical

experimentation and develop their skills in implementing projects is possible. Updated practical skills are missing. People know how to do things in theory, but little or not experience how this is done in practice. So it is important to link universities to projects undertaken by ministries, NGOs of private sector so that the universities can train the students in methods and used by government and the commercial sector.

By extensively involving the university professors in the training as co-trainers and working with interactive training methods was most useful for all; for themselves, for the project and for future training and capacity building in Afghanistan

There are many bright and well educated Afghans looking for work. There is eagerness to learn more which makes training enjoyable.

11.2.1. Many times wrong staff are selected for training.

The effectiveness of the training could vary and one of the reasons was that staff was incorrectly selected for the training. It could be that the head of the different units did not fully appreciate what was required of qualifications of the participants or the selectors sent people to the course based on “whose turn it was for training”. In many training sessions, the agenda had to be modified to cover more basic training than was planned. Often the client could ask for advanced training, but when the training started, very few could follow so the training scope had to be modified. The practical work in the classroom was essential to make the training fit and thus be appropriate and useful.

11.2.2. Data quality control awareness lacking

One of the major observations all the international experts expressed, was that there were little appreciation of the importance of work quality, or quality control of data and information. What seems to matter was, numbers, many numbers, which are frequently uncritically used.

This work started with testing of water samples. It was discovered when sending same water sample to different laboratories, that the results were so different that none of the results could be trusted. For the 250 water samples collected in Faryab the analysis had to be done as an accredited laboratory abroad. When the issue was raised, there were keen interest to address and resolve this issue locally.

Similarly for data from water features. All data needs to be checked, and validated to avoid duplication of data, and for instance check that the coordinates are correct so the listed water point is in the “correct district” etc. This work is not fully appreciated. This takes time and it will come but quality control to get trustworthy data is essential.

Security issues

With the security situation as it is in Afghanistan and Kabul presently, having a consultant team working from different offices and communicating through video conferences/ skype on a regular basis work functions well. It is also better in many respects because the local team of consultants,

though or with whom the international consultants work, become resource persons after the end of the project and thus can continue activities is asked to do so as local resource persons. The local consultants have better networks which the international experts may have better technical expertise. Combining international and locals in a strong team generated an effective consultant team.

Using web pages for communication effective for national sector information sharing.

Using project web page for effective communication of project progress is a great method to demonstrate transparency. It also generate interest. For the project web used between 70 to 90 visits has been made to the web pages. This is good for sharing information and such pages should be encouraged further.

11.2.3. Donor coordination in Afghanistan still weak.

It seems to be so difficult to get the donors together to discuss with the Afghan government how to make best possible joint efforts for effective development. Unfortunately, many donors still seem to be comfortable with working with their own "clients" and not thinking holistic.

11.2.4. Donor coordination and information exchange is weak.

In countries with security issues, particular emphasis should be made in electronic information sharing.

The project has shown the effectiveness of using project webs for information sharing. In addition, the usefulness of GIS tools for information sharing and for planning activities can and should now be use for much more effective reporting of project outputs and results. Since online mapping facilities now can be made available for all to use a shareware, all offices with internet and a computer can upload information, thus helping monitoring and reporting much more effectively that in the past. Placing development on infrastructure on Google maps of equivalent makes all the difference for transparency and information exchange. Donors and funding agencies should make use of the information infrastructure which already exists in developing countries

12. Conclusions and recommendation

- Project implementation using bi-lateral funding worked well.
- The capacity building part of the project effective and can be continued.
- Continuation of the project with all activities requires funding which is not available with MRRD
- Local experience is essential for international organizations being effective in project implementation in fragile states like Afghanistan
- While focus in education and training has generally been placed on theoretical education, what seems to be lacking now is practical interactive training how to apply theories in practice.
- Few testing labs
- The project managed to develop a transparent information platform which clearly defines the terms of reference.
- The institutional and managerial framework for groundwater management is still very weak and needs strengthening and streamlining.
- Afghanistan does not have a groundwater monitoring system in place nor facilities for testing groundwater samples in a satisfactory manner.
- Quality control systems are lacking for essential water quality testing
- Funding is needed to develop an inter-ministerial action plan/concept for scaling up for mapping groundwater nationwide in Afghanistan

Recommendations

- Afghanistan needs to establish applied research programs both at Universities and in the ministries. Testing of technical solutions is difficult without experience on how to conduct applied research for adaptation of technical solutions for Afghanistan
- International support is needed to assist water testing facilities in establishing a quality control system so that results can be rendered trustworthy.
- External support is needed to assist in sustaining a momentum of enhanced coordination between sector ministries.
- Support is needed to develop a concept for inter-ministerial action plan for scaling up groundwater mapping in Afghanistan. Once the plan has been developed, external support would be needed to start the implementation for the first years.
- Universities and polytechnics should be assisted to make use of project training components by establishment of hydrogeological and GIS equipment at the teaching places.

1. Appendix 1

1.1. Project general information

- 1.1.1. Project general objectives and TOR
- 1.1.2. Project information system using web (norplan.af) welcome page
- 1.1.3. Project events and milestones (news) /Maimana%20desk%20study%20v1.0.pdf9)

1.2. Hydrogeology

- 1.2.1. Surveying Methods
- 1.2.2. Field surveys
- 1.2.3. Maymane Desk study
- 1.2.4. Geophysical investigations
- 1.2.5. Exploratory drilling
- 1.2.6. Data templates
- 1.2.7. Hydrogeological survey,- Water Atlas
- 1.2.8. Well logger development

1.3. GIS and data manage

- 1.3.1. GIS Unit in RuWatSIP
- 1.3.2. Map design
- 1.3.3. Map templates
- 1.3.4. Online maps Faryab
- 1.3.5. Online test maps for Balkh and Nangahar

1.4. Water and Sanitation activities

- 1.4.1. Planning for 3 towns in Faryab
- 1.4.2. Surveys
- 1.4.3. Conceptual design for water supply
- 1.4.4. Technology testing and development, solar stills, membrane filtration
- 1.4.5. Laboratory quality control systems

1.5. Training activities

- 1.5.1. Guidelines for training courses
- 1.5.2. Course presenters
- 1.5.3. Training calendar (2012- 2016)
- 1.5.4. List of training courses
- 1.5.5. List of completed training courses and equipment
- 1.5.6. List of Reports from courses and course documents
- 1.5.7. Training videos
- 1.5.8. Reference books and documents
- 1.5.9. Equipment and software for training

1.6. Major conferences and seminars

- 1.6.1. National Groundwater Conference (Marble Palace, Kabul)
- 1.6.2. National GIS conference (MRRD)
- 1.6.3. Water supply and sanitation conceptual design for sustainable service coverage (MRRD)
- 1.6.4. International Hydrogeological Conference (Rome)

1.7. Project Management

- 1.7.1. Work plans
- 1.7.2. Norplan Kabul office
- 1.7.3. Procurement documents and procedures
- 1.7.4. List of equipment procures
- 1.7.5. List of software procured
- 1.7.6. Project management

1.8. Project Staff

- 1.8.1. RuWatSIP staff
- 1.8.2. Norplan personnel
- 1.8.3. Dacaar personnel

1.9. Project outputs

- 1.9.1. Photo gallery
- 1.9.2. Video gallery (training videos)
- 1.9.3. Documents and reports

2. Appendix 2

2.1. Training output report

3. Appendix 3

3.1. Electronic documents and report stored in separate DVD storage disc

Web page links to Appendixes

Project general information

Project general objectives and TOR	http://norplan.af/Page_Objectives1.html
Project information system using web	(norplan.af) welcome page
Project events and milestones (news)	Maimana%20desk%20study%20v1.0.pdf9)

Hydrogeology

Surveying methods	http://norplan.af/Page_hydrogeo_fieldsurvey_method_2.html
Fields surveys	http://norplan.af/Page_hydrogeo_fieldsurvey_1.html
Maimane desk study	http://norplan.af/DocumentsHGS/Hydrogeology/Maimana%20desk%20study%20v1.0.pdf
Geophysical investigations	http://norplan.af/Page_Coord_Geophys equipm.html
Exploratory drill- ing	http://norplan.af/Page_hydrogeo_Exploratory_drilling.html
Data templates	http://norplan.af/Page_hydrogeo_templates_reference_docs.html
Hydrogeological survey-Water Atlas Faryab	http://norplan.af/Page_hydrogeo_Atlas_content.html

GIS and data management

GIS Unit in RuWatSIP	http://www.norplan.af/Page_GIS_Status.html
Map design	http://www.norplan.af/Page_GIS_Maps.html
Map templates	http://www.norplan.af/Page_GIS_map_templates.html
Online maps Faryab	http://www.norplan.af/Page_GIS_Web_maps.html
Online test maps for Balkh and Nangahar	http://www.norplan.af/Page_GIS_Web_Online_maps_Baklh__prov.html

Water and sanitation activities

Planning for 3 towns in Faryab	http://norplan.af/Page_Wat_San_3towns.html
Conceptual design for water supply	http://norplan.af/Page_Wat_San_Conceptual%20design.html
Technology testing and development, solar stills, membrane filtration	http://norplan.af/Page_Wat_San_tech_options.html
Laboratory quality control systems	http://norplan.af/Page_Coord_WaterLabs_QC_ANSA.html

Training activities

Guidelines for training courses	http://norplan.af/Page_Training_2.html
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Training calendar (2012- 2016)	http://norplan.af/DocumentsHGS/Doc_training/Training_Calendar_2013_2015.pdf
List of training courses	http://norplan.af/Page_Training_3_table.html
List of Reports from courses and course documents	http://norplan.af/Page_Training_4_completed.html
Training videos	http://norplan.af/Page_Training_Videos.html http://norplan.af/Page_training_reference%20videos.html
Reference books and documents	http://norplan.af/Page_training_reference%20books_documents.html
Equipment and software for training	http://norplan.af/Page_Training_equipm_4.html
Course presenters	http://norplan.af/Page_Training_resourcePersonell_5.html
List of completed training courses and equipment	http://norplan.af/Page_Training_3_table.html
Major conferences and seminars	

Major conferences and seminars

National Groundwater Conference (Marble Palace, Kabul)	http://www.norplan.af/Page_Nat_Conf_Overview_.html
National GIS conference (MRRD)	http://www.norplan.af/Page_Nat_Conf_GIS_Overview_.html
Water supply and sanitation conceptual design for sustainable service coverage (MRRD)	http://www.norplan.af/Page_Wat_San_Concept_Seminar_.html
International Hydrogeological Conferece (Rome)	http://www.norplan.af/Page_Gallery_docuemnts.html

Project Management

Work plans	http://norplan.af/Page_Man_WPlan.html
Norplan Kabul office	http://norplan.af/Page_KabulOffice_P1.html
Procurement documents and procedures	http://norplan.af/Page_Man_Proc_documents.html
List of equipment procures	http://norplan.af/Page_Man_equipment_1.html
List of software procured	http://norplan.af/Page_Man_software_1.html
Project management	http://norplan.af/Page_Staff_Org.html

Project staff

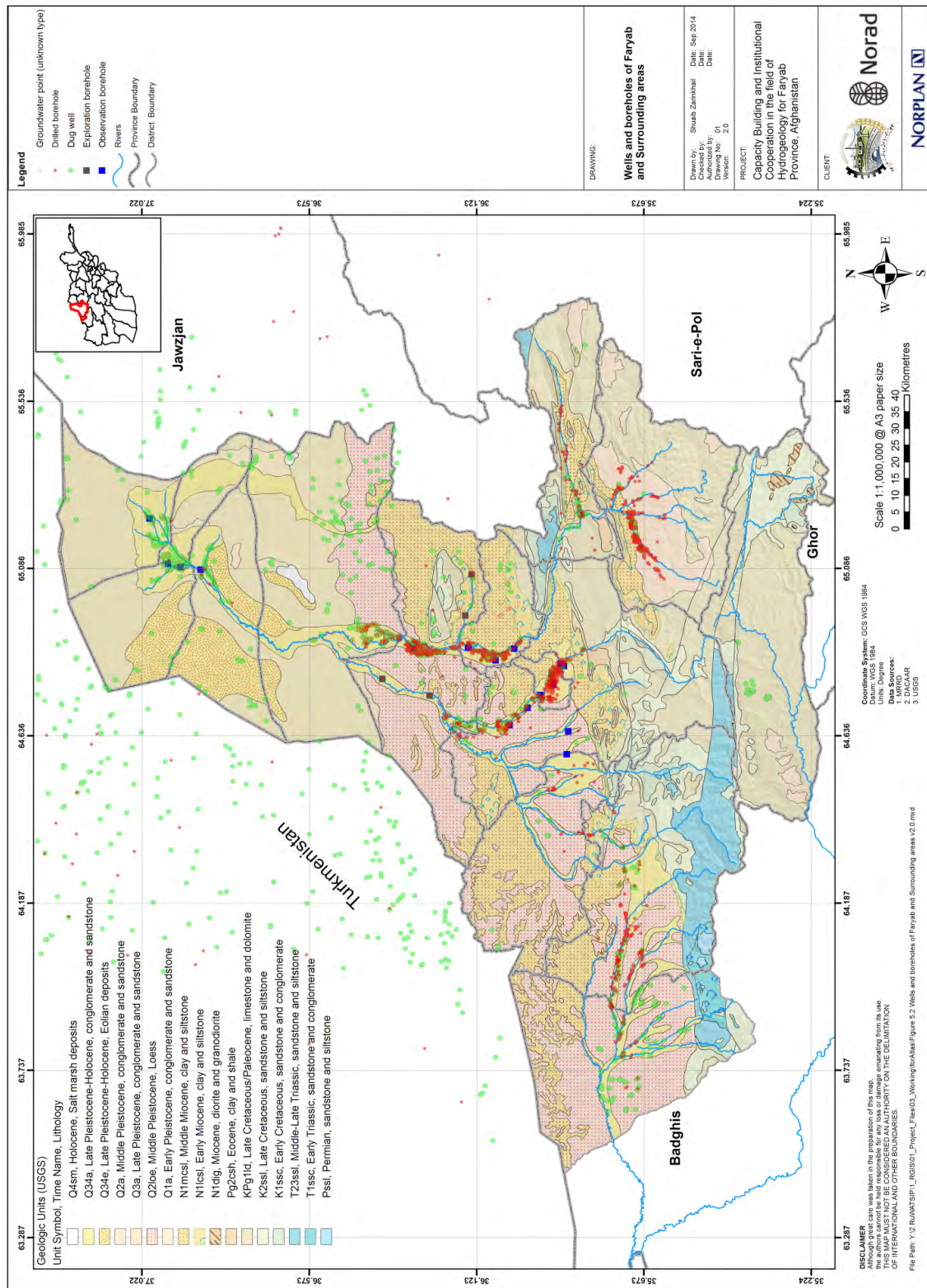
RuWatSIP staff	http://norplan.af/PageStaff_RuWatSIP.html
Norplan personnel	http://norplan.af/PageStaff_Norplan.html
Dacaar personnel	http://norplan.af/PageStaff_DACAAR.html

Project outputs

Photo gallery	http://www.norplan.af/Page_Photos_gallery.html
Video gallery (training videos)	http://www.norplan.af/Page_Training_Videos.html
Documents and reports	http://www.norplan.af/Page_Gallery_docuemnts.html

Example of Project Output

Provincial A3 Map layout Designed and Checked by NORPLAN Technical Team



OUTPUTS:

- Training materials
- Policy documents
- Technical guidelines
- Other publications
- Maps
- Reports
- Web atlas

