

Rangers and Ministry of Water and Irrigation Cooperation Report

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HASHEMITE KINGDOM OF JORDAN
Ministry of Water and Irrigation



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Abbreviations

BGR	Bundesanstalt für Geowissenschaften und Rohstoffe, Federal Institute for Geosciences and Natural Resources, Hannover, Germany
GPS	Global Positioning System
HQ	Head Quarter
JVA	Jordan Valley Authority
MoU	Memorandum of Understanding
MWI	Ministry of Water and Irrigation
PSD	Public Security Directorate
RDEP	Royal Department for Environment Protection
TO	Technical Office
WAJ	Water Authority of Jordan
WALUP	Water Aspects in Land- Use Planning

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1 Introduction

Through a Memorandum of Understanding (MoU), the cooperation between the Royal Department for Environment Protection (RDEP)/ Rangers and the Ministry of Water and Irrigation (MWI) has started in 2011. Since then, the project “Water Aspects in Land Use Planning” (WALUP), implemented by the MWI and the German Federal Institute for Geosciences and Natural Resources (BGR), has been involved in supporting this cooperation.

A representative from Rangers technical office (Water Resources Protection Team) is on demand working with the project team at the office at MWI. This helps MWI, BGR and Rangers in understanding the needs, roles and responsibilities of each partner and by this is enhancing the cooperation. The representative officer supports the BGR/MWI project team by providing water related violation reports, takes over the responsibility of Ranger duties during water awareness campaigns, and coordinates field inspections by the respective Rangers branches in the project working areas.

Quarterly, semi-annual, and annual reports and statistics about the water related violation in Jordan are sent to BGR and MWI by the Royal Department for Environment Protection. These statistics show only a general situation about the nature of violations on a regional level, which is not sufficient to react to and mitigate to individual violations. Therefore, training courses were given to all Ranger branches in the Kingdom regarding the importance of GPS coordinates when filing a violation report as well as a clear description of the nature of the violation.

Furthermore, since 2012 two permanent representatives from Rangers HQ have been based at WAJ laboratory. They support WAJ laboratory in fieldwork, inspections and water sampling. Reports are sent to Rangers HQ and immediate reports for any major pollution.

In 2015 WAJ laboratory in cooperation with BGR undertook an intensive training for selected Rangers water quality and drinking and wastewater sampling.

Until mid of 2014, Kirsch (2014) evaluated the cooperation of the Rangers with the institutions in the Jordanian water sector. The report provides detailed information about the roles and responsibilities of each partner, and it showed the improvement in the cooperation as well as the obstacles that have been faced between the partners since the beginning of the cooperation in 2011.

This report documents the achievement of the cooperation until October 2015.

2 Workshops and training courses

2.1 Ranger training with regard to the water sector

Sharing yearly statistics does improve water safety but is not sufficient for MWI/WAJ to respond to individual violations. The coordinates and the detailed nature of the violation should be known for MWI and WAJ. This helps MWI/WAJ if any immediate action has to be taken. After analysing the daily reports and statistics of the violations which are sent from the branches to the Rangers HQ, a new patrol sheet was compiled including all water related violations.

Despite the fact that around 360 rangers from the branches were trained to use the GPS until the end of 2014, the GPS devices were either not used or no locations were added to violation reports by field officers. No violations coordinates were recorded/sent to Ranger HQ, therefore, the patrol sheet was updated to simplify the procedure of recording water related violations in the field. This will help the rangers in categorizing the nature of the violation as well as filling the coordinates of the violation.

Moreover, during the training, it has been noticed that usually the rangers don't know the legal action that should be taken about the individual violations. Therefore the legal decree and penalty of each violation was added to the patrol sheet by the BGR team. This new patrol sheet was approved by the legal advisor at MWI and the legal department of Rangers HQ.

According to the yearly statistics of the Rangers, about 1723, 591, 824 water related violations were recorded in 2012, 2013, and 2014 respectively. However, trusting in the significant contribution of the Rangers to support MWI and WAJ in providing safe drinking water to the Jordanian population by being aware of pollutions and to support WAJ in inspecting facilities, training was launched for the all branches, highlighting the following topics:

- **GPS Training** was given by Rangers technical office. This training focused on the following items:
 - The importance of taking GPS coordinates.

Besides the nature of the violation, the accurate location of the violation helps WAJ/MWI team in evaluating the threat's degree on the water resources, consequently, judging if any immediate action has to be taken.

- How to use the GPS device.
- The possibility of using smart phones to acquire the coordinates through smart phone applications.
- **Protection Zones Training** was given by the BGR team. This training focused on the following items:
 - General hydrogeological information.
 - General situation of the water resources in Jordan.
 - Definition of the three protection zones (according to (WPR Guideline 2011))
 - How could pollutants reach water sources (wells ,springs and dams)
 - How to use the new patrol sheet
 - How to use the PZ maps for each area and mark the coordinates of the water related violations on the map. (focusing on PZ 2)
 - Updating the patrol sheet.
- **Training regarding mechanisms of water pollution** was given by the WAJ laboratory team. This training focused on the following items:
 - General introduction about the water quality situation and standards in Jordan.
 - The pollution types and sources.
 - Showing some records about the water quality in the particular areas; how was the water quality affected and what expected sources of pollution in the area are.

Along with this training, maps of A1 size and pin marks with different colours were delivered to all the branches. Each branch was given a map for their area of jurisdiction including the main water sources, PZ (if existing), roads, villages and main remarks in the area. This should help the Rangers in pinpointing the location of the violation as well as the nature of the violation. Ultimately, it should give them a clear image about the main violations in their area of jurisdiction.

The one-day training courses were divided into four different areas according to the regional distribution of the branches in the Kingdom and to the section of each branch (Capital, North, South or Middle section). Each section includes 5 -7 branches; therefore, each training day targeted 5 to 7 branches. The number of participants varied from training day to training day, depending on the number of rangers that had to stay in each branch and the duty request of officers at each branch (e.g. increased duty at branches required due to demonstrations in the branch's area).

Generally, the Rangers involved in the training showed high attention and concern about the topics and the highlighted subjects of the training were new for most of the participants. However, the organizers of the training course (BGR, WAJ, Rangers Technical Office) were not satisfied with the audience participation during the first training since the Rangers did not share their knowledge and experience among each other as it was intended in the first training day which was held in Amman.

This directed the organizers to subdivide the groups into 5 – 6 subgroups according to the branch that they belong to and the geographical locations of the branches, since similar locations have similar violations and stimulate discussion by the subdivision into smaller groups.

After the presentations of the organizers, the discussion session started and each subgroup discussed the following topics:

- Pros and Cons of the use of GPS device and smart phones to take coordinates.
- The communication with WAJ, is it easy to report water related violations to WAJ?
- What are the main violations in each area of jurisdiction?
- The importance of the coordinates of violations.
- Pros and Cons of the proposed new patrol sheet.
- The categorization of violations in the new patrol sheet, does it need to be modified according to their experience in the field?
- What are the social challenges the rangers face during their inspectiona?

The results of the discussion sessions are summarized as following (a more detailed description can be found in section 5.1)

- No standard procedure is defined to communicate with WAJ when any water related violation is observed.

- Modifying the category of the violations in the patrol sheet according to the field experience of rangers.
- The following branches don't have GPS devices:
 - Al-Karak
 - A-Hasa
 - Al-Azraq
 - Al - Tafila
 - Al - Dhulail
- Using smart phones to take coordinates is not efficient as many remote places have low coverage by the network and not all Rangers have smart phones
- The area of jurisdiction is huge in some branches; consequently, controlling all violations is almost impossible.
- Identifying the location of the violation whether if it inside or outside the (PZ 2), gives the Rangers in the field an indicator about the level of the threat of the violation. Therefore the shapefiles of the PZ 2 should be uploaded to the branches' GPS devices.

2.2 Water Sampling Training

Appropriate sampling is the most important step for defining water quality. Therefore, to maintain the representativeness and integrity of collected samples a sound sampling procedure and plan should be implemented and carried out.

However, as mentioned previously, only two officers from the Rangers are based permanently at WAJ laboratory supporting the WAJ team during field visits, inspection and water sampling. Water samples should be taken in the field in an appropriate manner. In order to sensitize Rangers for water sampling a four days training was given by Water Quality and Monitoring Section at WAJ laboratory for a group of selected Rangers from different branches. The training included the following topics:

- What does sampling mean? What is the importance of sampling?
- The roles of WAJ and Water quality and monitoring section.
- Jordanian Standard JS 286/2008, which specifies the flowing
 - The annual sampling plan
 - The methodology for

- Physical and Chemical tests
 - Microbiological tests
 - Radiological Tests
- The responsibility of :
 - Assisted Secretary General
 - Director of monitoring directorate
 - Drinking water and monitoring section head
 - Drinking Water Quality Section staff
 - Director of Laboratories
 - The Heads of the Analytical Sections
- The importance of proper sample labelling and different forms
- The importance of field documentation at the sampling point
- Different types of forms
- Sampling Methods
 - Freshwater sampling
 - Wastewater sampling
- The size and material of bottle for the different analytical parameters
- Sample storage
- Defining the maximum transport time and temperature for potable and drinking water samples.
- The sampling techniques for the following :
 - Microbiological analysis sample .
 - Chemical analysis sample.
 - Volatile Organic Compounds sample.
- Which analyses can be done with the mobile laboratory?
- Safety considerations during sampling.
- The following should be taken into consideration when practicing Quality Assurance (QA) and Quality Control (QC) of sampling procedure :
 - Icebox Temperature
 - Icebox Swabbing
 - Chemical and Microbiological field blank
 - Duplicated samples
 - Control chart to verify the distribution of check standards

3 Achievements

Kirsch (2014) presents the efforts that have been done by BGR since the beginning of cooperation until mid 2014, as well as their vital inputs to this cooperation. Since the beginning of 2015 BGR, through the WALUP project, has continued its efforts to foster the Ranger-MWI-WAJ cooperation also by implementing recommendations given by Kirsch (2014).

BGR contribution was not limited to technical support, but it also supported the cooperation financially by printing material (e.g. Manual booklets, patrol forms and maps), covering all the logistic expenses during the trainings and workshops as well as providing the Rangers with hardware (GPS devices).

The contribution of BGR has been highly valued and appreciated by all partners. Following are the achievements accomplished during 2015.

3.1 GPS, Protection Zone and Water Quality training

All Rangers' branches in the Kingdom were involved in GPS, Protection Zones and Water Quality Training. During these trainings 171 Rangers from branches all over the Kingdom (Table 1) were trained about using the GPS, marking the violation's location on the given maps (Figure 1) and understanding the importance of protection zones as well as realizing the effect of surface pollutants contaminating water resources (including groundwater).

Table 1 : The total number of Rangers participating in the GPS, PZ and Water Quality Training in 2015

Region	Branches	Location	Date	Number of Participants
Amman	South , North , and HQ	WAJ building	23-Mar-15	22
North	Ajloun, Jarash, Ramtha , Mafraq, west and East Irbid	Irbid Municipality Building	5-Apr-15	52
Middle	Zarqa, Madaba, Balqa, Russaifa, Dullail , Middle section and Badia section (Inc. Azraq)	Zarqa Commercial Chamber	13-Apr-15	77
South	Aqaba, South Section (Inc. Tafila , Karak And Hasa Branch)	ASEZA	30-Apr-15	20

Since March 2010 around 560 members of the Rangers have been trained using GPS devices. However, 2015 has the highest number of Rangers trained (around 200 rangers have been trained in 2015) when compared to the previous four years (Figure 2).

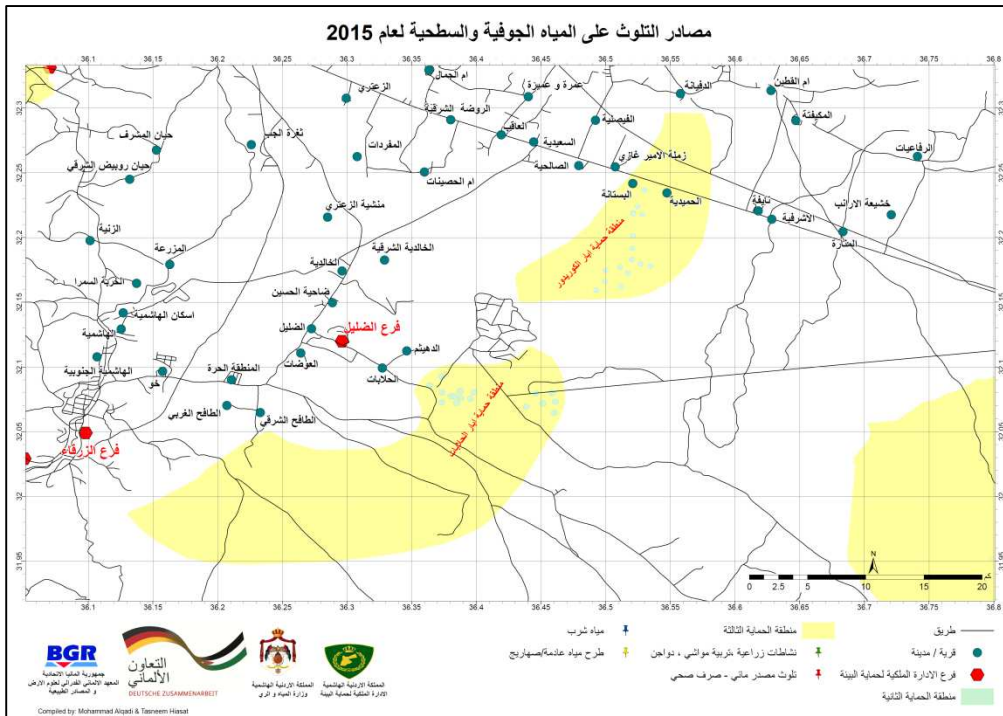


Figure 1: Sample of the distributed A0 map including respective area of jurisdiction, protection zones, water resources, streets and villages.

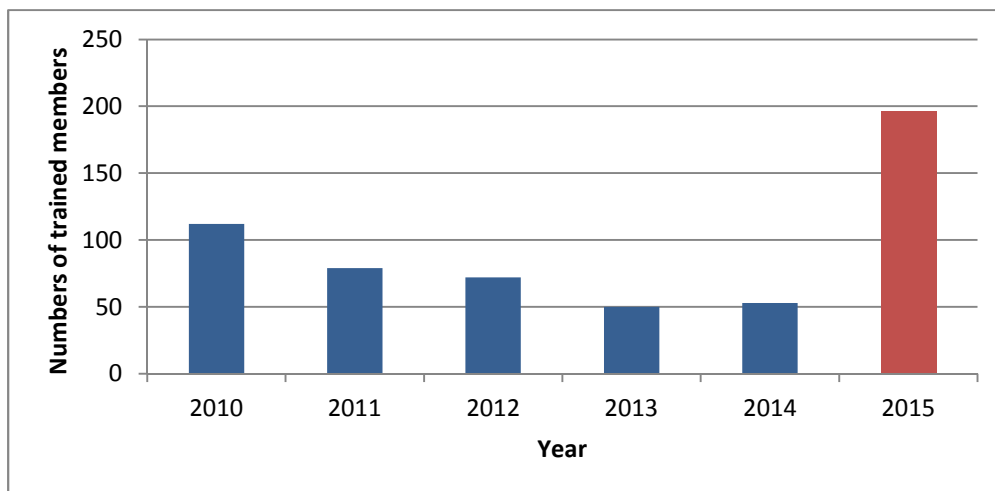


Figure 2: Trained Rangers in the application of GPS-devices during the project period.

3.2 The Training Manual Booklet

As mentioned previously, all the branches were involved in GPS, PZ, and Water Quality training, but unfortunately not all Rangers could attend the training. Therefore, a training manual booklet was prepared, printed, and distributed to reach all Rangers in the Kingdom.

Besides the training material about the use of GPS-devices and the nature of Water Protection Zones, the booklet also includes a general description about water resources, as well as the vision and current situation of the water sector in Jordan.

The booklet was printed in A5 size. Around 500 copies were distributed to the different branches in the Kingdom.

3.3 Patrol Sheet

Updating the patrol form is one of the most important outputs of the training. The Rangers in the branches were involved in updating the new patrol form. Each branch reported what the most recorded violations are and what the problems were that they faced in dealing with the violators. Some modifications of the presented patrol sheet were done according to the Rangers' experiences in the field.

However, during the discussion sessions it was noticed, that the Rangers don't have a clear knowledge about the different legislations dealing with different violations. Therefore, the legal decree and penalty of all the water related violations were added to the backside of the patrol sheet by the BGR team. The new patrol sheet was afterwards approved by the legal department at MWI and Rangers HQ (Figure 4 and Figure 5).

Recently, on the order of the Rangers' director, the patrol form has already been distributed to all of the branches in the Kingdom. The filled patrol sheet should be attached with the daily report and sent to the operation room at Rangers HQ. The operation room will contact the technical office at Rangers' HQ who is going to send it to WAJ laboratory to give WAJ Lab the opportunity to respond immediately to any serious violation. On another hand, an action feedback form to the patrol sheet was structured and given to the Rangers' officers in WAJ laboratory. This form should be filled and reported back to the Rangers HQ through the technical office (Figure 3).



Violation Details			
Date of Recorded Violation			
Section/ Branch			
GPS Details			
Coordinates	E	N	ALT (asl)
The Taken Actions by RANGERS in WAJ			Date of action
			Name
			Signature
The Taken Action by WAJ Laboratory			Date of Action
			Name
			Signature



Figure 3 : A translated copy of the action feedback form to patrol sheet

Patrol Info.			
Section/ branch			
Area			
patrol number			
GPS			
Device type			
Coordinates		N	E
		ALT	
Landmarks			
General Category	Violation category	Notes	
Agriculture activities ,Livestock , poultry	Cattle and Birds raising in residential areas		
	Animal death		
	Compost production / manure processing		
	Chemical Fertilizers		
	Wastewater Irrigation		
Water source pollution , Waste water	Illegal disposal of construction residues and burning tires		
	Gas station waste		
	Car workshops Waste		
	Carwash waste		
	medical waste - hazardous waste		
	Illegal disposal of wastewater		
	Sewer system		
	Slaughtering animals out of slaughterhouse		
	liquid and solid waste from factory		
Drinking water	selling and distributing polluted water		
	Tanker in violation to Ministry of Health regulations		
wastewater dumping	offload the contents of septic tanks or sewage tanks not in places allocated for them		
Others	Main pipeline violations		
	wastewater, desalination pumping station violations		
	polluting drinking water resources (springs, wells) ,polluting reservoir, pumping, desalination stations or WAJ pipelines		

Figure 4: The translated copy of the new patrol sheet (the inspection sheet)

	Violation	Legal Decree	The Penalty
Agriculture activities ,Livestock , poultry	Cattle and Birds raising in residential areas	Article (4) / c law to prevent health abomination and waste collection No. 8/2014, issued under the Municipalities Act No. 13/2011	Anyone who violates it shall be punished a fine of one 100 dinar ,under the Municipalities Act No. 13/2011
	Animal death	Article 48 / A of the Agriculture Law No. 13/2015	Anyone who violates it shall be punished a fine of one dinar for every carcass chicken and ten dinars for all the other carcass, under Article (48) / b
	Compost production / manure processing	Article 20/e. of Agriculture Law No. (13) / 2015	The production of plant fertilizers or growth regulators not compliant with the country's specifications as well as trading, preparing, or changing the written specifications on the packaging of such goods, is penalized with a fee of three times the worth of these goods and confiscation of the goods.
	Chemical Fertilizers	Article No. (40) / 2008 of Public Health Law No. (47) / 2008	punishable by imprisonment for not less than four months and not exceeding three years or a fine of not less than five thousand dinars and not more than ten thousand dinars, or both penalties. Under Article 62 / A of the Public Health Law
	Wastewater Irrigation	Article No. (15) / e of Agriculture Law No. (13) / 2015	punished a fine of 300 dinars for each dunums or part of it was irrigated by waste water, and required to remove all irrigated crops by waste water under the supervision of the ministry, and, if he prevented to do so , the governor will order to be destroyed at the expense of the person and under Article No. (15) / e of Agriculture Law No. (13) / 2015
Water source pollution , Waste water	Illegal disposal of construction residues and burning tires	Article (4) / (b) of the system prevent hardship No. (8) / 2014, issued under the Municipalities Act No. 13/2011	Anyone who commits any violation of the provisions of this Act or any regulation issued on the basis after being found guilty shall be punished by a fine not exceeding twenty dinars under Article 62 of the Municipal Code (13) / 2011
	Gas station waste	Article No. (47) / f of Public Health Law No. (47) / 2008	inform the violator to move the offending violation within the period not exceed 7 days from the date of notification, otherwise all the expenses of removing the violation will be paid by the violator. But if the threat is clear and present danger , the Doctor/Manager has right to issue decision to close the shop until the court's decision issued , according article (48) A , public health law (47)/2008
	Car workshops Waste		
	Carwash waste		
	medical waste - hazardous waste	Article (62) / A / 3 of the Public Health Law No. 47/2008	punishable by imprisonment for not less than four months and not exceeding three years or a fine of not less than five thousand dinars and not more than ten thousand dinars, or both penalties. Under Article 62 / A of the Public Health Law
	illegal disposal of wastewater	Article (4) / (b) of the system prevent hardship No. (8) / 2014 issued under the Municipalities Act No. 13/2011	Anyone who violates it shall be punished a fine of one 100 dinar ,under the Municipalities Act No. 13/2011
	Sewer system		
	Slaughtering animals out of slaughterhouse	Article No. (53) / B of Agriculture Law No. (13) / 2015	Anyone who violates will be fined for 100 JoD and the slaughtered animal will be confiscated according the article (53)A of temporary Agriculture law No. (13) 2015. and article (13) from slaughterhouse regulation system No. (92)2009 and slaughterhouse regulation system in GAM law , article (19) /2008 issued according to ministry of municipal affair No (13) 2011
	liquid and solid waste from factory	Article No. (47) / f of Public Health Law No. (47) / 2008	Inform the violator to move the offending violation within the period not exceed 7 days from the date of notification, otherwise the violator will pay all the expenses of removing the violation. But if the threat is clear and present danger , the Doctor/Manager has right to issue decision to close the shop until the court's decision issued , according article (48) A , public health law (47)/2008
Drinking water	selling and distributing polluted water	Article (62) / A / 1 of the Public Health Law No. 47/2008	punishable by imprisonment for not less than four months and not exceeding three years or a fine of not less than five thousand dinars and not more than ten thousand dinars, or both penalties. Under Article 62 / A of the Public Health Law
	Tanker in violation to Ministry of Health regulations	Health regulations for potable water transport tankers issued in accordance with crafts and industries law No. (16) / 1953.	Violation of this law by not obtaining the health certificate mentioned is punishable by incarceration for a period not more than a week, or a fine of 10 JDs, or both penalties, in accordance law No. (14) / 5 of the crafts and industries law.
wastewater dumping	offload the contents of septic tanks or sewage tanks not in places allocated for them	Article 62 / c / 2 of the Public Health Law No. 47/2008	punishable by imprisonment for a term not less than three months and not exceeding one year or a fine of not less than one thousand dinars and not more than three thousand dinars, or both penalties. Under Article 62 / c of the Public Health Law
Others	Main pipeline violations	Article (30)/A/1 of water authority law No 18 (1998)	any violator shall be sentenced to prison for minimum one year and maximum five years, and shall be fined minimum 2000 JD and maximum 7000 JD
	wastewater, desalination pumping station violations	Article (30)/A/2 of water authority law No 18 (1998)	
	polluting drinking water resources (springs, wells) ,polluting reservoir , pumping, desalination stations or WAJ pipelines	Article (30)/A/3 of water authority law No 18 (1998)	

Figure 5: The translated copy of the backside of the new patrol sheet (The legal decree and penalties sheet)

3.4 Water quality and Sampling training

In 2015, an intensive water sampling training was launched in WAJ laboratory for the Rangers. The trainees were selected according to the regional distribution (North, Middle, Capital, Badia and South Section). The director of the water sampling section (Eng. Taha Samara) trained five members from the rangers about water sampling, labelling and analysing (Figure 6).



Figure 6: Water sampling training for rangers in WAJ laboratory.

3.5 Rangers support to WAJ, MWI, and the WALUP project

Besides the trainings, and through the cooperation, Rangers from the Technical Office have joined the BGR team during the five field visits to Siwaqa well field for sampling and inspections (BRUCKNER et al 2015) and they have also joined the BGR team on seven field trips to Ajloun for olive mill inspection and installation of equipment. Furthermore, the Rangers have participated in water awareness workshops which were held in Jerash, Ajloun, Orjan, and Wadi Seer for the stakeholders and local community where the Rangers presented their duties, violations history in the respective areas and the contact information under which they can be reached in case of reporting violations.

Furthermore the Rangers supported WAJ Laboratory during many field visits and Rangers inspected protection zones (Ein Rahoub) and olive mills (Orjan area) on demand for the WAJ Laboratory in Irbid. Table 2 shows the common actions between the Rangers and the cooperating parties.

Table 2: Common Activities between WAJ, MWI, and Rangers (end 2014-2015).

#	Action	Date	Note
1	Altamween wellfield inspection	30-Nov-14	
2	Drinking water quality sampling and testing	13-Apr-15	random sampling for 4 drinkingwater tankers , the result shows that only 1 out of 4 had drinkable water quality
3	PZ1 inspection in Irbid	14-Apr-15	cowfarm next to PZ1; cows were inside the PZ1
4	Drinking water quality sampling and testing	16-Apr-15	samples from tanker
5	Zenya wellfield inspection	10-May-15	
6	Azraq spring pollution inspection	18-Aug-15	wastewater flooding in upstream wadi
7	olivemill inspection for Ajlun and Jarash	no date	
8	Accompanied the mobile laboratory for wells and stations in Aqaba and Disi for period of 33 days (sleepover)	no date	Task: protect the mobile laboratory and WAJ staff, Taking GPS coordinates , assissting the staff in sampling and transporting the samples
9	Beer company - zarqa	no date	common field visit:Ranger WAJ Lab & WAJ Lab
10	Arabic enma'a company - freezone	no date	common field visit:Ranger WAJ Lab & WAJ Lab
11	Alkasih company	no date	common field visit:Ranger WAJ Lab & WAJ Lab
12	Danich for yoghurt	no date	common field visit:Ranger WAJ Lab & WAJ Lab
13	Alrabic comp. for almnium	no date	common field visit:Ranger WAJ Lab & WAJ Lab
14	Baq'aa slauther house	no date	common field visit:Ranger WAJ Lab & WAJ Lab
15	Mediapharma drugs	no date	common field visit:Ranger WAJ Lab & WAJ Lab
16	Naseem jabri comp.	no date	common field visit:Ranger WAJ Lab & WAJ Lab
17	Alhussen thermal station	no date	common field visit:Ranger WAJ Lab & WAJ Lab
18	Beladi yoghurt compant	no date	common field visit:Ranger WAJ Lab & WAJ Lab
19	As salt treatment plant	no date	common field visit:Ranger WAJ Lab & WAJ Lab
20	Wadi shuaeb canal	no date	common field visit:Ranger WAJ Lab & WAJ Lab
21	Inflow of wadi shueb dam	no date	common field visit:Ranger WAJ Lab & WAJ Lab
22	Outflow of wadi shueb dam	no date	common field visit:Ranger WAJ Lab & WAJ Lab
23	Junidi for yoghurt	no date	common field visit:Ranger WAJ Lab & WAJ Lab

			Lab
24	Hadeel company for juice	no date	common field visit:Ranger WAJ Lab & WAJ Lab
25	Alarabia factory for drugs	no date	common field visit:Ranger WAJ Lab & WAJ Lab
26	union factories for drugs	no date	common field visit:Ranger WAJ Lab & WAJ Lab
27	Active in Water Awareness Workshop	29-Sep-14	Ajloun,TO Ranger, WAJ, MWI, BGR
28	Active in Water Awareness Workshop	16-Feb-15	Jerash,TO Ranger, WAJ, MWI, BGR
29	Active in Water Awareness Workshop	31-May-15	Rasoon,TO Ranger, WAJ, MWI, BGR
30	Active in Water Awareness Workshop	30-Sep-15	W. Seer,TO Ranger, WAJ, MWI, BGR

4 Recent developments, conclusion and outlook

Recently, through the Rangers technical office, GPS devices were distributed to the branches that had previously none. All branches were asked to collect main environmental hotspots locations within their area of jurisdiction.

Collecting the coordinates of the hotspot is ongoing. According to the accuracy of the coordinates the ability to use the GPS for each branch will be evaluated and assessed. Later on this assessment will help decide if further GPS training courses for individual branches is needed.

Some branches have already sent coordinates of hot spots. First interpretations showed that the ability of using the GPS varies from branch to branch. Some branches are not yet able to use it properly. For instance, the collected coordinates from Jerash branch were out of their area of jurisdiction while the Karak and Rusaifa branches have mixed-up latitude and longitude.

After defining the weakness of each branch in using GPS devices, a training course will be conducted by the technical office and, concurrently, the patrol sheet will be delivered to each branch. The training course will serve as a refreshment lecture on using the patrol sheet. Furthermore, a comprehensive lecture about all the error sources in using the GPS, which were noticed during the hotspot coordinates collection campaign, will also be conducted. Through the training course, the ability of using the patrol sheet and GPS will be improved consequently the number of recorded violations is expected not only to increase but also to be located on the ground.

A KFW implemented project (Energy Efficiency Improvement in the Jordanian Water Sector (Phase 2)), through Fichtner and Orient Consulting, will rehabilitate 109 wells in the Kingdom. This project will also rehabilitate 13 out of 16 wells of the AWSA well field. This project will include many measures which are wider than the scope of the BGR project (e.g. install a Scada system, rehabilitation of the whole well). Fences for the remaining three wells of AWSA well field will be implemented by the BGR project WALUP.

A new main road is being constructed to connect Azraq with Mafraq governorate. This road crosses the north eastern part of AWSA well field. New businesses (car maintenance shops, restaurants, supermarkets ... etc) are expected to be established along the road. Consequently, protecting the wells which are close to the main road is challenging without collaboration between the local community, Azraq municipality and Rangers in Azraq branch.

Azraq Youth Team (AYT), a team of volunteers, has shown high motivation to cooperate with all the counterparts in order to protect the water resources of Azraq. A workshop will be conducted in Azraq to raise the awareness of the local community about the importance of protecting the water resources and to introduce AYT to Azraq Rangers branch personnel.

Obviously, the cooperation has been improved during 2015, since the number of trained members has been increased significantly and the patrol sheet was updated. Furthermore, the communication between the WAJ laboratory and Rangers will be enhanced through the new patrol and the feedback form.

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