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## Mitigating Transboundary Wastewater Conflicts (MTWC)

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### **Program Report**

October 1<sup>st</sup>, 2012 – September 30<sup>th</sup>, 2015

COOPERATIVE AGREEMENT # AID-294-A-12-00005

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\*Note: Appendixes 1 & 2 can be found in separate documents.

## Abbreviations and Acronyms

AIES - Arava Institute for Environmental Studies  
AOR – Agreement Officer Representative  
BGU – Ben Gurion University  
HWE- House of Water and Environment  
MTWC – Mitigating Transboundary Wastewater Conflicts  
PA – Palestinian Authority  
WB - West Bank  
TAEQ - Towns Association for Environmental Quality  
FY13 – Fiscal Year 2013  
FY14 – Fiscal Year 2014  
FY15 – Fiscal Year 2015  
RWT - Rahat Water Company

## I. Introduction

This program report summarizes the activities, achievements and challenges covered by the MTWC program in fiscal years 2013, 2014, and 2015. The overall objective of the MTWC program was for Israeli and Palestinian university students, decision makers and technicians, to build personal and professional relationships in order to provide a solid foundation for the reduction of cross-border wastewater conflicts and to maximize the opportunity of using treated wastewater in irrigation. These goals were achieved through workshops and household greywater treatment and reuse **demonstration systems**. The workshops aimed to foster the development of a network of transboundary decision makers, university students and wastewater technicians. To inform and develop awareness of the issues of cross-border wastewater treatment and reuse in Israel and the West Bank with a long-term commitment to resolving transboundary wastewater issues, according to a realistic timeframe for interventions. The research and demonstration systems showcase the challenges of centralized versus decentralized wastewater systems and the cost and benefit sharing of these systems for communities that are not serviced with a sewage network i.e.: off-grid communities.

## II. Activities and Accomplishments

### Objective 1: Program Set Up

Activity 1.1: Selection and approval of household demonstration greywater treatment and reuse systems in coordination with the AOR.

*Completed*

Activity 1.2: Set up of the operational framework for project implementation.

*Completed*

All required operational systems, policies and procedures are now in place at AIES in accordance with USAID WB/Gaza mission trainings and post award meeting guidance.

Activity 1.3: Website creation

<http://arava.org/arava-research-centers/center-for-transboundary-water-management/decentralized-wastewater-treatment-and-reuse-for-rural-communities/>.

*Completed. Content is continuously being updated.*

## Objective 2: Stakeholder Mapping

Activity 2.1: Stakeholders mapping.

Stakeholders have been identified, engaged and compiled within a database of stakeholders.

*Completed*

## Objective 3: Master student selection

Activity 3.1: Selection and recruitment of two Masters Students.

Two masters' students have been identified in FY2013 and will be studying at Ben Gurion University. The first student is a Palestinian studying Desert Studies and the second is an Israeli studying Urban Planning. Both students are working on transboundary wastewater management within their program and for their thesis.

An Israeli student, Ori Tarabulas, is enrolled in the Department of Geography at Ben Gurion University of the Negev and will complete his studies in September 2015.

The Palestinian student selected and approved for his Masters studies, backed out of the program unexpectedly. Due to the fact that the project will end in April 2015 there is not sufficient time remaining to recruit another Palestinian student. Therefore it has been decided that the \$30,000 scholarship fund will be reallocated to other project activities in coordination with the USAID Program Officers.

During the first quarter of FY2014-15 selection and recruitment of two Master Students was completed.

#### Objective 4: Participant recruitment

Activity 4.1: A recruitment strategy was implemented for 13 workshops in FY13, FY14, and FY15.

1. Kick off workshop conference with students, decision makers, and technicians. Hosted at AIES, Kibbutz Ketura, Israel. December 17-19, 2012. 76 Participants.
2. Student workshop titled "Water and Sewage Management in the West Bank: Opportunities and Challenges, Case study: Kidron Basin Project", West Bank. April 10, 2013.
3. Technician's workshop in cooperation with the biannual WATEC conference in Tel Aviv. October 22-24, 2013. 23 Participants.
4. Technician workshop in cooperation with the Towns Association for Environmental Quality in Sachnin, West Bank. January 12-16, 2014. 8 Participants.
5. Arava Institute Student Workshop in Israel and the West Bank. April 1-3, 2014. 28 Participants.
6. AIES, Peres Center for Peace, and Palestine Wildlife Society Student Workshop on Greywater treatment and biogas digester systems on Kibbutz Ketura. April 29-May 1, 2014. 42 Participants.
7. Wastewater Workshop for Decision Makers in Beit Jalah, West Bank in cooperation with Ben Gurion University of the Negev. June 26, 2014. 39 Participants.
8. Homeowners and technicians workshop, Nablus and Deir Al Hatab, West Bank. October 30<sup>th</sup>, 2014. 20 participants.
9. Decision Makers workshop, Neot Hovav Eco-Industrial Park, Israel. The recruitment strategy included close coordination with HWE and participants from previous workshops and trainings. February 24-25, 2015. 20 participants.
10. Student workshop, Student Water Trip: Challenges of Water and Wastewater Treatment in the ME, Israel and West Bank. March 17-18, 2015. 43 participants.

11. Decision Makers workshop, Palestinian-Israeli Cross Border Wastewater Workshop. Beit Sahur, West Bank. Recruitment strategy included close coordination with HWE and participants from previous workshops and trainings and a partnership with Ben Gurion University, Sde Boker Campus. May 25, 2015. 36 participants.
12. Wastewater Treatment and Management Conference: Israel and the West Bank. Kibbutz Ketura, Israel. The recruitment strategy included close coordination with HWE and Israeli Water Association and participants from previous workshops. September 7-9, 2015. 33 participants.
13. Greywater Recycling System Installation & Training Workshop. Hosted in Auja, West Bank. September 29, 2015. 11 participants.

### Objective 5: Demonstration Greywater treatment system design and construction

Activity 5.1: Identify potential construction sites, two in Israel and six in the West Bank.

The sites selected are:

1. Towns Association for Environmental Quality – Beit Netofa, Sakhnin – Constructed in July, 2013
2. Halhul Municipality - Constructed in November, 2013 (relocated to another residency in Halhul, February 2015 - see activity 5.2)
3. Dar Salah Municipality – Constructed in January, 2014
4. Al Sanabel School, Um Battin – Constructed in January, 2014\* (constructed but relocated to Rahat Water Company - see activity 5.2)
5. Zawata Municipality – Constructed in March, 2014
6. Deir Al Hatab Municipality, Nablus – Constructed in January, 2014
7. Rahat Water Company, Rahat - Constructed in January, 2015 (relocated from Um Battin)
8. Halhul, MBR System – Constructed in July, 2015
9. Auja, MBR System – Constructed in September, 2015

Activity 5.2: Identify all the required construction permits, regulations and ministerial commitments (Health, Environment etc.) to construct in Israel and the West Bank.

All West Bank approvals were received.

As requested by the homeowner of the wetland system installed in Halhul, the system was moved from his premises, new permits and requirements were submitted and approved. This system has been working successfully in the new location since February, 2015.

\*Approval from the Al-Quasoom Regional Authority was obtained for the Al Sanabel School, in Um Battin. However, approvals from the Ministry of Health for reuse of the treated greywater for irrigation at the school were not obtained. This meant that the system could not be used as designed and was relocated to the Rahat Water Company in the city of Rahat.

*Completed*

Activity 5.3 Finalize Implementation Plan for greywater demonstration systems:

A staged implementation plan for Fiscal Year 2015 has been confirmed and completed between AIS and HWE.

*Completed*

Activity 5.4 Detailed design of system.

*Completed*

Activity 5.5 USAID Approvals

Environmental evaluation documentation has been completed and submitted for all sites.

Activity 5.6 Operation and Maintenance

Numerous site visits and assessments with household beneficiaries conducted in FY14, in the West Bank, revealed that there were aesthetic odor problems from some of the systems. The Halhul beneficiary, without our prior knowledge, decided to independently disconnect the system. As soon as we learnt about this, we met with the beneficiary who explained that he disconnected the system due to the odor issue. He subsequently asked to have the system relocated.

There are a number of possible reasons for the odor problem:

1. The initial septic tank stage is not working properly
2. The greywater from the kitchens may be overloading the system with organic material
3. The use of chemical detergents is negatively affecting the bacterial community of the system

During a site visit, 9-10<sup>th</sup> of June, 2014, we provided the beneficiaries of the Dar Salah, Deir al Hatab and Zawata systems biological detergents that will not degrade the bacterial community. We have followed up with the beneficiaries to see whether these new detergents reduce the odor. We also noticed that not all systems have the same odor problems and that a part of the odor

problem is related to the location of the system in relationship to the house and the proximity of the system to the house's septic tank.

Reeds were planted at the end of September, 2014 in all gravel tanks of the operating systems to further aid in promoting bacteriological activity and reducing odor problems. During winter months, plant growth is slow, but full adoption of the reeds in the gravel systems still occurred.

The system in Dar Salah was disconnected from the kitchen inflow, because the location of the system and its proximity to the house accentuates aesthetic odor issues, which, in any other location are minor. Disconnection from the kitchen inflow means a higher quality greywater inflow and thus a reduction in odor. The system is now connected to sinks, showers and a washing machine.

Engineering reassessment of the first stage septic tank were considered, but at this stage minor inflow piping modifications were sought as appropriate solutions to ensure the optimal operation of the first stage septic tanks.

In FY14, multiple site visits were conducted by AIES and HWE to continuously support and train households on system operation and maintenance. A memo was produced outlining the Arava Institute's' satisfaction with demonstration greywater treatment systems operation and maintenance, on November 15<sup>th</sup>, 2014. The Arava Institute confirms the efficiency and effectiveness of the operation of the demonstration greywater treatment systems and the effluent water quality.

## Objective 6-7: Implement Capacity Building Workshops

Activity 6.1 and 7.1:

Thirteen total workshops were held during FY13, FY14, and FY15. A complete workshop report can be found in Appendix 1.

1. The kick off workshop conference conducted at the AIES from December 17-19<sup>th</sup>, 2012. This was a combined workshop for all three stakeholder groups (students, decision makers, and technicians).
2. Student workshop titled "Water and Sewage Management in the West Bank: Opportunities and Challenges, Case study: Kidron Basin Project" was conducted on the 10th of April 2013, in the West Bank



3. A technician's workshop was held on October 22<sup>nd</sup> -24<sup>th</sup>, 2013 as part of the Water Technology and Environmental Control (WATEC) Conference (<http://www.watec-israel.com/>) in Tel Aviv Israel.
4. Technicians workshop, January 12-16, 2014, in cooperation with TAEQ
5. Arava Institute Student Workshop (April 1<sup>st</sup> – 3<sup>rd</sup>, 2014) in Israel and the West Bank
6. AIES, Peres Center for Peace, and Palestine Wildlife Society Student Workshop on Greywater treatment (April 29<sup>th</sup> – May 1<sup>st</sup>, 2014) on Kibbutz Ketura
7. Wastewater Workshop for Decision Makers (June 26<sup>th</sup>, 2014), Beit Jalah, West Bank in cooperation with Ben Gurion University of the Negev
8. Technicians and homeowners workshop, October 30, 2014 in Nablus and Deir Al Hatab, West Bank. In cooperation with HWE.
9. Decision Makers Workshop, February 24 - 25th, 2015 in Neot Hovav Eco Industry Park, Israel. In cooperation with HWE and Neot Hovav.
10. Arava Institute Student Workshop (March 17-18<sup>th</sup> of 2015) in Israel and the West Bank.
11. A Decision Makers Workshop was held at Beit Sahour, Palestine on May 25, 2015. In cooperation with HWE, WEDO, Ben Gurion University.
12. Final workshop. All stakeholders approached during the duration of the project here gathered on the facilities of the Arava Institute at Kibbutz Ketura, Israel. 7th-9th September 2015.
13. Training workshop, September 29<sup>th</sup>, 2015 at the site selected for a Greywater Recycling System installed in Auja, West Bank.

## Objective 8: Monitor Greywater Systems

### Activity 8.1: Implement influent and effluent monitoring and analysis in demonstration system

1. A protocol for influent and effluent monitoring and analysis of the installed demonstration greywater treatment and reuse systems has been developed and monitoring has begun. Water samples are tested both on-site and at government-approved labs in Israel and the West Bank during the quarter April-June 2014. The lab samples allow for a detailed water quality assessment, enabling us to compare the results and assess the accuracy of our measurements.
2. A first round of water quality monitoring was conducted in June, 9-10, 2014 at Dar Salah, Zawata and Deir el-Hatan systems. Both lab analysis and in-field sampling was carried out. Lab analysis was carried out at the Zuckerburg Water Resources Institute of the Ben Gurion University of the Negev. For all water quality parameters that were measured there was a high and satisfactory level of pollutant removal in the water quality between influent and effluent. The lab data was deemed more reliable however, than the field data,

due to inconsistencies in field data measurements whilst in the field.

3. Appendix 2 summarizes the results for the above three greywater systems. The Halhul system was not included for sampling as it was disconnected by the family because the family complained about the odor coming from the system. HWE made three visits to the system to rectify the odor problem and instructed the homeowner to not make any changes to the system independently. However, the homeowner did not follow this advice and disconnected the system on his own initiative.
4. In October 2014, a comprehensive monitoring and analysis was conducted. An internal scientific effluent water quality report was produced and can be found in appendix 3.
5. On April 5<sup>th</sup> of 2015, a comprehensive monitoring and analysis of treated greywater was conducted. Samples were collected at two active sites (Dar Salah and Halhul) and tested for a variety of physical and chemical parameters. DO, turbidity, pH, EC, sulfate, phosphates, and total residual chlorine were tested in the field, while BOD5, COD, TSS, fecal coliforms, EC and pH were tested in the lab. Testing pH and EC in both the field and the lab allowed for validation of field test methods compared to lab tests (which were assumed to be more accurate).
6. In May 20-21<sup>st</sup> 2015, a comprehensive monitoring and analysis of treated greywater was conducted. Samples were collected at four active sites (Dar Salah, Halhul, Deir Al Hatab and Zawata) and tested for a variety of physical and chemical parameters. See point 5 (above) for specific parameters tested.

## Objective 9: Demonstration sites

### Activity 9.1-2: Design and implement grey water systems

Grey water systems are functioning in:

1. Kibbutz Ketura (AIES sponsored) – CW system
2. TAEQ Sakhnin CW system
3. Dar Salah – CW system
4. Dair Al Hatab – CW system
5. Zawata – CW system
6. Rahat – CW system
7. Halhul – MBR system
8. Halhul – CW system

## 9. Auja – MBR system

### III. Crosscutting areas

In FY13 169 people participated in USG-supported workshops, 59 were women (35%).  
In FY14 140 people participated in USG-supported workshops, 36 were women (26%).  
In FY15 157 people participated in USG-supported workshops, 60 were women (39%).

From FY13 – FY15, 466 people participated in USG-supported workshops, and 155 were women (33%).

### IV. Progress against work plan

Significant progress was achieved in FY13, FY14, and FY15. We met each fiscal year's implementation plan.

### V. Challenges, remedial actions and lessons learned

FY13: While AIES faced initial challenges with constructing systems according to the timeline plan, this fiscal year proved quite successful and productive. Difficulties arose from securing relevant permissions from local authorities and confirming that the sites in the West Bank were in Area A. There was a steeper learning curve than expected in terms of the capacity building required by HWE (the sub-awardee) in building the greywater units. The lessons learned are that more time was needed for capacity building of the sub-awardee and that vetting of beneficiaries is triggered according to a \$5,000 threshold for each system.

FY14: In FY14 all greywater systems were constructed and operated. Three systems in the West Bank have begun the monitoring process, and new information is available as to the quality of the systems' outflow – see Appendix 2. The system in Halhul was disconnected and was relocated to another site in Halhul – see 5.6 Operation and maintenance. The system in Um Battin was also disconnected and was subsequently relocated to Rahat.

The alternative scenario for the Um Batin system occurred as follows:

AIES solidified a partnership with the Rahat Water Company (RWT) to assist them in setting up a water conservation and education program for Rahat, the largest Bedouin town in Israel. The RWT signed an agreement with the company Sodastream that has a factory in Rahat employing

700 residents. Sodastream supplied drinking water bottles to 15,000 Rahat school students. The RWT wanted to build on this initiative by expanding its educational and outreach activities. The RWT was interested in promoting greywater recycling at a local level and expressed interest in the MTWC project. The RWT director, Emad Elsana, committed to move the greywater system from Um Battin and installed it at his facility, in January 2015, which includes the wastewater treatment plant for Rahat and the surrounding region as a demonstration and educational system. The site is already designated as a wastewater treatment site, similar to that of the TAEQ in Sachnin. RWT agreed to take the system and to also cover the cost of the system's transport and installation at the RWT. Once the system was reinstalled at the RWT, AIES began work with the RWT to begin the water conservation and educational program. This program is targeted not just to Rahat but to the broader Bedouin community, including that of Um Battin.

FY15: During Q1 and Q2 1 remedial action was taken to relocate the system in Halhul. The beneficiary of the system in the original location requested for the system to be removed. A new site and beneficiary were located and once the new site was vetted, the system was successfully located in the new site (Refer also to Activity 5.2).

During Q3 and Q4 AIES began large-scale analysis of all collected questionnaire data over the past three years, and through this process, found some issues in current data collection and analysis procedures. In particular, these difficulties were concentrated in the wording and consistency of questionnaires. While the data collected from each individual workshop was valid, reliable and collected professionally, inconsistent wording from workshop to workshop as well as some difficulty consistently collecting intake and outtake questionnaires from each participant made the analysis challenging. For workshops in the coming quarter, AIES made modifications to the wording of the questionnaires to collect the highest-quality data possible and produce a more conclusive assessment of the data. See appendix 1 for more detailed analysis on this.

## VI. Upcoming activities

There are no upcoming activities. The contract for this award ended on September 30<sup>th</sup>, 2015.

## Appendix 3: Site Visit Pictures



*Picture 1 - Technician's workshop held on October 21-23, 2013 in cooperation with the biannual WATEC conference in Tel Aviv*



*Picture 2 – Participants from Technician's workshop held on October 21-23, 2013 in cooperation with the biannual WATEC conference, during day 2, site visit, Golan Heights.*



*Picture 3 -Deir el Hatab household demonstration greywater treatment system*



*Picture 4 – Demonstration Greywater treatment system in Deir el Hatab.*



*Picture 5 –Monitoring Deir el Hatab Demonstration greywater treatment system*



*Picture 6 –Monitoring Deir El-Hatab Demonstration greywater treatment system*



*Picture 7 – Site visit held at Halhul Wetland System on July 22<sup>nd</sup> of 2015*





*Picture 8 – View of the irrigable land of the selected site to install an MBR system at Halhul.  
July 22<sup>nd</sup> 2015*



*Picture 9 -Deir el Hatab household demonstration greywater treatment system. Site visit May  
21<sup>st</sup> 2015*



Picture 10 – Demonstration Greywater treatment system in Dar Salah. Site visit May 20<sup>th</sup> 2015



Picture 11 –Monitoring Zawata Demonstration greywater treatment system. Site visit May 20<sup>th</sup> 2015.



*Picture 12 –Installation of Auja MBR System. September 29<sup>th</sup> 2015*



*Picture 13- Installation Workshop at Auja MBR system. September 29<sup>th</sup> 2015*