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***Building Confidence Between Israelis and Jordanians through  
Rainwater Harvesting and Wastewater Reuse***

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## **I. Abstract and Thesis:**

**Abstract:** The current status of water scarcity in Israel and Jordan threatens stability, security, and peace in the Middle East. Technology transfer and cooperation between Israel and Jordan have the potential to assist the region in sustainably managing its resources now and for the future. Joint cooperation in the water sector can provide great opportunities for confidence building between Israelis and Jordanians. What technologies and partnerships can be developed and implemented in Israel and Jordan to increase available water supplies and create opportunities for confidence building measures? Technology transfer and multilateral cooperation between Israel, Jordan, USAID, and Friends of the Earth Middle East, through the techniques of rainwater harvesting and wastewater reuse, have the potential to expand available water resources, reduce demands on limited resources, and offer increased opportunities for confidence building. Technology transfers between Israel and Jordan can inspire confidence between people on the ground and establish a more long lasting and viable peace that can be shared with the West Bank and Gaza. This research includes case studies of USAID and Friends of the Earth Middle East water technology projects in Israel and Jordan, a theoretical exploration of confidence building and environmental peace building literature, and interviews with academics and think tank fellows to develop a policy proposal for Israel and Jordan that will increase available water supplies and opportunities for confidence building.

**Thesis:** Technology transfer and multilateral cooperation between Israel, Jordan, USAID, and Friends of the Earth Middle East, through the techniques of rainwater harvesting and wastewater reuse, have the potential to expand available water resources, reduce demands on limited resources, and offer increased opportunities for confidence building. Technology transfers between Israel and Jordan can inspire confidence between people on the ground and establish a

more long lasting and viable peace that, in turn, can be shared with the West Bank and Gaza.

## **II. Research Question and Introduction:**

**1. Research Question:** What technologies and partnerships can be developed and implemented in Israel and Jordan to increase available water supplies and create opportunities for confidence building measures?

### **2. Introduction and Background:**

The Middle East is one of the most water scarce regions of the world, creating challenges for development, prosperity, and peace. Israel and Jordan face substantial water challenges due to their arid climate, limited freshwater resources, and history of conflicts. With inadequate surface and ground water resources, high rates of evapotranspiration, and unpredictable rainy seasons, the riparians of the Jordan River Basin have to carefully manage their water. As populations and standards of living continue to grow, Israelis and Jordanians face increasing challenges in managing their water resources to meet the needs of all of their citizens. The Middle East has a history of utilizing rainwater harvesting (RWH) and wastewater reuse to manage and expand resources, but there is an unequal distribution, utilization, and investment in these technologies between Israel and Jordan.

Water resources in Israel and Jordan are limited and stressed due to the climate of the region and the human demands for sustenance and development. The semi-arid to extreme-arid climate of the region provides an estimated annual water supply of less than 250m<sup>3</sup> per person, designating the region as water scarce.<sup>1</sup> The limited amount of rain that comes to the region is usually in the form of spring floodwaters, which are often quickly evaporated before they can infiltrate into groundwater supplies.<sup>2</sup> The Jordan River Basin is a major source of freshwater for Lebanon, Syria, Jordan, Israel, and the West Bank. The Jordan River and its northern tributaries

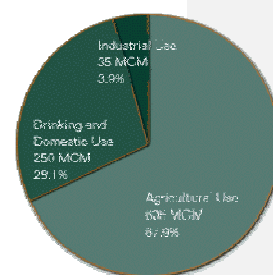
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<sup>1</sup> Tal, Alon. 2004. "Seeking Sustainability: Israel's Evolving Water Management Strategy." *Science*, 313, 1082.

<sup>2</sup> USAID. "Wastewater Reuse in Jordan: A USAID Initiative." *USAID- Jordan*, 1-2.  
<http://jordan.usaid.gov/upload/features/Jordan%20Wastewater%20Reuse%20Case%20Study.doc>

provide much of the freshwater to the region. Also, groundwater aquifers along the western banks of the Jordan River and the Mediterranean coast provide crucial freshwater resources and serve to naturally collect and store floodwaters.<sup>3</sup> The Sea of Galilee in the Golan Heights serves as the major water storage system in the region, storing Israeli and Jordanian floodwaters for spring and summer crops (see Figure 2). The water quality of the region is also poor due to the natural high salinity of the surface and groundwater sources. The many draws on the system lead to salt water intrusion of some aquifers.

The Jordan River riparians utilize their water resources for agriculture, industry, health and human services, and tourism. These uses drain the limited water supplies and have encouraged creative water management techniques throughout the region. Agriculture plays a key role in the economy of Jordan and in the national pride of Israel. This takes water away from other domestic needs and exports it around the world through the sale of crops.<sup>4</sup> According to a USAID report, “agriculture is considered to be the largest consumer of water in Jordan”<sup>5</sup> with about 68% of water allocated to agriculture (see Figure 1). In Israel, agriculture currently utilizes approximately 50% of the country’s water resources.<sup>6</sup> Population growth and increases in the standard of living are also straining an already fragile water supply system. In recent years, a “deficit between the supply and the demand” of the region has grown as individuals and states continue to develop and grow their economies.<sup>7</sup>



**Figure 1: "Water Usage by Sector 1997"** The Office of Geography and the Environment. *The Hashemite Kingdom of Jordan*. <http://www.kinghussein.gov.jo>

**Comment [RG1]:** You're quoting something, but then it's not cited. Or is this a commonly used phrase, and that's why you're quoting it?

<sup>3</sup> Isaac, Jad. 2000. "The Essentials of Sustainable Water Resource Management in Israel and Palestine." *Arab Studies Quarterly*, Vol. 22, no. 2, 14-15.

<sup>4</sup> USAID. "Wastewater Reuse in Jordan: A USAID Initiative." *USAID- Jordan*, 19-20. <http://jordan.usaid.gov/upload/features/Jordan%20Wastewater%20Reuse%20Case%20Study.doc>

<sup>5</sup> Ibid, 1.

<sup>6</sup> Shuval, Hillel. 28 April 2009. "The Agricultural Roots of Israel's Water Crisis." *Green Prophet*. <http://www.greenprophet.com/2009/04/28/8587/agriculture-roots-israel-shuval/>

<sup>7</sup> USAID. "Wastewater Reuse in Jordan: A USAID Initiative." *USAID- Jordan*, 1. <http://jordan.usaid.gov/upload/features/Jordan%20Wastewater%20Reuse%20Case%20Study.doc>

The natural ecological limitations of the area and additional growth and development are compounded by political tensions in the Middle East. During the 1994 Israel-Jordan Peace Treaty negotiations, water was one of many issues addressed by the parties. Jordan and Israel have successfully managed a careful balance of Yarmouk and Jordan River water allocations, and some exchanges from the Arava groundwater supplies.<sup>8</sup> The two riparians have successfully distributed water resources, but both have increasing deficits due to droughts and population growth. The effective management of water resources for the Jordan River riparians is crucial because water security is key to human rights, economic growth, and national security.

### ***3. Status of Technologies in Israel and Jordan:***

- **Wastewater Reuse**

Unique water management techniques and technologies play a key role in conserving current water resources and increasing additional water supplies. Israel is the regional leader in technological developments to increase water supplies, but these technologies and practices must be shared and expanded by all riparians in order to create increased water supply stability for the entire region.

Wastewater treatment and reuse has effectively expanded available water for agriculture in both Israel and Jordan. In 2006, recycled wastewater used to irrigate agriculture made up about one-fifth of Israeli water.<sup>9</sup> Currently, Israel recycles 75 percent of its sewage and utilizes the water for agriculture and to recharge aquifers.<sup>10</sup> Treated wastewater or effluents are used mostly in the south of Israel where there is less access to freshwater supplies (see Figure 2). At the end of January 2010, Israel passed legislation to create stricter regulations on effluent water quality, indicating a future of increased application of wastewater reuse throughout the country

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<sup>8</sup> Sosland, Jeffrey. 2007. *Cooperating Rivals, The Riparian Politics of the Jordan River Basin*, State University of New York Press, 174-176.

<sup>9</sup> Tal, Alon. 2004. "Seeking Sustainability: Israel's Evolving Water Management Strategy." *Science*, 313, 1082.

<sup>10</sup> Sibley, Lisa. 26 January 2010. "Israeli wastewater firms to benefit from new regulations." *CleanTech Group*. Accessed 29 January 2010. <http://cleantech.com/news>

once industries attain the new standards.<sup>11</sup> The Ministry of Environmental Protection in Israel reports that “reuse of water and especially use of treated effluent for agriculture will gain more freshwater to address the needs of increasing population in the Mediterranean” and reduce demands on shared aquifers and rivers between the riparians.<sup>12</sup>

Wastewater reuse is a smaller part of the Jordanian water supply, due to less infrastructure and investment in wastewater treatment and to challenges in meeting international water treatment standards for exported crops.<sup>13</sup> Jordan has a less advanced water infrastructure than Israel, but in the last ten years the country has built multiple wastewater treatment plants (both centralized and decentralized) and made commitments to further expansion. In July of 2009, USAID and the Water Authority of Jordan partnered to build a new wastewater treatment plant that will also recycle wastewater for the agricultural needs of one local community. This is a small sized plant model, which Jordan hopes to replicate in other communities.<sup>14</sup> The plant empowers the local community by increasing water supplies, reducing demands on shared water resources, and properly managing wastewater. In 2006, USAID assisted Jordan in developing a date palm nursery that utilizes



**Figure 2: Israel's Water Resources**  
Alon, Tal. "Seeking Sustainability: Israel's Evolving Water Management Strategy." *Science*, 313, 1082

<sup>11</sup> Israel Ministry of the Environment. 28 January 2010. "Israel Approves Stringent Regulations on Effluent Quality." Accessed 29 January 2010. <http://www.environment.gov.il>

<sup>12</sup> Kloosterman, Karin. 9 January 2010. "Water Security in the Middle East: from the Desk of Israel's Ministry of Environmental Protection." *Green Prophet*. Accessed 29 January 2010. <http://www.greenprophet.com>

<sup>13</sup> USAID. "Wastewater Reuse in Jordan: A USAID Initiative." *USAID- Jordan*, 19-20. <http://jordan.usaid.gov/upload/features/Jordan%20Wastewater%20Reuse%20Case%20Study.doc>

<sup>14</sup> U.S. Fed News Service. 9 July 2009. "U.S. Agency for International Development, Water Authority of Jordan Launch Construction of North Shouneh Wastewater Treatment Plant." Accessed 29 January 2010. <http://proquest.umi.com>

recycled wastewater.<sup>15</sup> This nursery has been very successful and provided the community with crops that utilize limited freshwater resources. Wastewater reuse is only applied on a small-scale basis in Jordan and there are still some cultural barriers reducing individuals' willingness to use "unclean" water. USAID and Jordanian government projects work to educate individuals about the value and cleanliness of recycled wastewater, encouraging increased application and use.<sup>16</sup> Additional research, development, investment, and application of wastewater reuse can assist the region in maintaining its agricultural interests while limiting its freshwater use.

- **Rainwater Harvesting**

In both the urban and rural areas of Israel and Jordan, rainwater harvesting has the potential to stretch water resources for the growing population. Urban and rural areas can utilize rooftop rainwater harvesting systems that can be attached to roof gutter systems, and rural areas can also engage in large-scale reservoir rainwater capture. The Jewish National Fund (JNF) in Israel has funded the building of 178 reservoirs throughout the wetter regions of Israel.<sup>17</sup> These reservoirs replenish groundwater aquifers and provide Israel with 7% of its water supply.<sup>18</sup> Rainwater harvesting (RWH) can be utilized on an individual basis, serving the needs of homes or office buildings. A new Israeli company called Geshem Artzenu, started by an American immigrant, is working to sell rainwater-harvesting equipment and install systems for individuals.<sup>19</sup> These collection systems would offer building owners the opportunity to utilize rainwater for both indoor and outdoor non-potable purposes, reducing strains on national water supplies. The application of rooftop systems requires the approval of the Health Ministry and the

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<sup>15</sup> U.S. Fed News Service. 25 April 2006. "Ambassador Hale inaugurates date palm nursery that uses recycled water to grow crops for export." Accessed 29 January 2010. <http://proquest.umi.com>

<sup>16</sup> De Chatel, Francesca. 22 April 2004. "Recycled Water Turns Jordan's Deserts Green." *IslamOnline*. Accessed 29 January 2010. <http://islamonline.net/>

<sup>17</sup> Tal, Alon. 2004. "Seeking Sustainability: Israel's Evolving Water Management Strategy." *Science*, 313, 1082.

<sup>18</sup> Ibid.

<sup>19</sup> Waldoks, Ehud Zion. 20 January 2010. "New immigrant looks to make rainwater harvesting popular." *Jerusalem Post*. Accessed 29 January 2010. <http://www.jpost.com>



Water Authority.<sup>20</sup> Gessem Artzenu has not yet obtained government approval, but when they receive it, they hope to decrease demands on freshwater resources, prevent non-point source pollution (pollution from non-direct sources like city streets), and reduce strains on relationships with water sharing neighbors.

The Abdulla and Al-Shareef study *Roof rainwater harvesting systems for household water supply in Jordan* indicates that since the mid 1990s RWH has been utilized and promoted by the Jordanian government as a means of increasing available water. As of the 2004 census, approximately 3.5% of all households had roof rainwater catchment systems.<sup>21</sup> In addition, the government is now requiring new homes to have water storage tanks, but there are no national programs to encourage and incentivize rainwater harvesting.<sup>22</sup> NGOs and research institutions have piloted some rooftop rainwater harvesting systems to collect rainwater for both potable and non-potable purposes.<sup>23</sup> In both rural and urban areas, cistern projects have provided users with additional water for agricultural and domestic purposes. These systems have helped poor rural communities manage floods, increase economic and agricultural productivity, and combat global warming by planting trees that absorb CO<sub>2</sub>.<sup>24</sup> The Jordanian government has made a commitment to water projects and requested international funding to assist in their implementation. Deputy Prime Minister and Minister of Finance Ziad Fariz said, “Challenges facing the water sector are on the rise, particularly as competition for joint water resources between countries is leaning

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<sup>20</sup> Waldoks, Ehud Zion. 20 January 2010. “New immigrant looks to make rainwater harvesting popular.” *Jerusalem Post*. Accessed 29 January 2010. <http://www.jpost.com>

<sup>21</sup> Abdulla, Fayez A. and A. W. Al-Shareef 4 May 2008. “Roof rainwater harvesting systems for household water supply in Jordan.” *Desalination*, 243, 198.

<sup>22</sup> Ibid, 198-199.

<sup>23</sup> Namrouqa, Hana. 6 July 2007. “Pilot water-harvesting techniques to be adopted in Jordan.” *Jordan Times*. Accessed 29 January 2010. <http://www.menafn.com>

<sup>24</sup> “Collecting rainwater yields fruit trees and income.” 27 November 2009. *IFAD, Enabling poor and rural people to overcome poverty*. Accessed 29 January 2010. <http://www.ifad.org/climate/perspectives/jordan.htm>.

towards escalation and quotas instead of dialogue and finding practical solutions.”<sup>25</sup> NGOs and the international community have increased attention and support for RWH and wastewater reuse in an effort to enhance water resources and improve relationships between Jordan River riparians.

Jordan’s urban application of rainwater harvesting and Israel’s large-scale reservoir collection systems have the potential for expanded opportunities, collecting water during the rainy season that is often lost to floods and evaporation.<sup>26</sup> Israel has not explored rooftop-harvesting systems in urban centers and Jordan has not tapped into large-scale reservoir collection systems. Expansion of these programs is needed throughout the region to reduce stormwater runoff, pollution of waterways, and water deficits.

The Middle East has a long history of water scarcity and conflict that has exacerbated the region’s ability to sustainably manage water resources. Currently, all of the Jordan River riparians are experiencing water deficits, leading to overpumping of groundwater aquifers, salt-water intrusions, and mismanagement of the limited freshwater resources available. Israel is a global leader in water technologies, and has the potential to share these technologies and resources with Jordan to reduce strains on their shared water resources. Despite Israel’s development and use of large-scale RWH and wastewater reuse for agriculture, it has not adopted rooftop rainwater harvesting. Jordan has benefited from a variety of pilot programs and small-scale applications of rooftop rainwater harvesting and wastewater reuse facilities, but its infrastructure could be greatly expanded to further meet the needs of its people and lessen demands on shared resources. Partnerships over RWH and wastewater reuse technology have the

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<sup>25</sup> Namrouqa, Hana. 6 July 2007. “Pilot water-harvesting techniques to be adopted in Jordan.” *Jordan Times*. Accessed 29 January 2010. <http://www.menafn.com>

<sup>26</sup> Abdulla, Fayez A. and A. W. Al-Shareef. 4 May 2008. “Roof rainwater harvesting systems for household water supply in Jordan.” *Desalination*, 243, 196-199.

potential to increase available water supplies and further cooperation between the riparians.

#### ***4. Multilaterals and Peace between Israel and Jordan:***

Coming out of the Madrid Peace process in 1991, the Multilateral Working Group on Water Resources provided some initial successes in establishing cooperation over water in the Middle East. Some of the projects approved during the multilaterals include a rainwater catchment project in Gaza, a literature review on water technologies, and wastewater treatment and reuse for small communities.<sup>27</sup> An important topic area of the working group was to explore the possibilities of “new” or expanded water resources. The working group studied both large and small-scale projects, but were ultimately more supportive of smaller, less costly, and more feasible projects.<sup>28</sup>

The multilaterals gave the international community a forum to support and invest in studies, technology, and research in the Middle East.<sup>29</sup> The working group was able to effectively engage a wide variety of actors including regional countries and global leaders. Since the second Intifada in 2000, they have been essentially dormant and today the working group is relatively inactive.<sup>30</sup> The working group was seen as successful in achieving its goals because the group focused on technical issues and not political ones.<sup>31</sup> The topic of technology transfer could be an issue to help reinstate the working group and bring the Israel and Jordan together with the support of the international community.

### **III. Literature Review**

Confidence building is the process whereby adversaries engage in shared tasks and pursue common goals in an effort to build trust between the parties. Confidence building

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<sup>27</sup> Wolf, Aaron T. and Joshua Newton. 2007. *Case Study Transboundary Dispute Resolution: Multilateral Working Group on Water Resources (Middle East)*, Transboundary Waters, Oregon State University, 6-7.

<sup>28</sup> Sosland, Jeffrey. 2007. *Cooperating Rivals, The Riparian Politics of the Jordan River Basin*, State University of New York Press, 198.

<sup>29</sup> Ibid, 199.

<sup>30</sup> Ibid, 198.

<sup>31</sup> Ibid, 200.

measures (CBMs) are the means by which shared goals are achieved through cooperative efforts.<sup>32</sup> Examples of CBMs include security verification measures, sharing of states' water flows, joint oversight of holy sites, and trade agreements. David Guinn of the International Human Rights Law Institute states that "a confidence-building measure involves the creation of a collaborative effort composed of the two (or more) parties in potential or actual conflict in which the parties undertake tasks of mutual interest and limited threat to the other."<sup>33</sup> Guinn applies his definition to the Arab-Israeli conflict and specifically the protection of holy sites in Jerusalem. Guinn and many others see CBMs as a non-military way of connecting the parties over smaller scale issues that can benefit both sides.

Theorists view confidence building through a variety of different approaches. As seen in the Oslo Accords and other international negotiations, CBMs can be used to enforce treaties, disengagement, demilitarized zones (DMZs), and international agreements. Traditionally, confidence building has been utilized as part of larger peace negotiations to establish early commitments and trust. The strategic political means of achieving peace and cultural exchanges to address the psychological nature of the conflict are two major categories used to divide confidence building. Gabriel Ben-Dor describes four types of CBMs: verification and monitoring, psychological, gradual negotiations, and mediation.<sup>34</sup> Ben-Dor's first, third, and fourth types can be fused together into the category of strategic and political means of confidence building because these are efforts to reduce opportunities for conflict and build trust for direct peace negotiations.

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<sup>32</sup> Ben-Dor, Gabriel. 1994. "Confidence Building and the Peace Process." *From War to Peace*, edited by Rubin, Ginat, and Ma'oz, New York, 63.

<sup>33</sup> Guinn, David. 2006. *Protecting Jerusalem's Holy Sites, A Strategy for Negotiating a Sacred Peace*, Cambridge University Press, 109.

<sup>34</sup> Ben-Dor, Gabriel. 1994. "Confidence Building and the Peace Process." *From War to Peace*, edited by Rubin, Ginat, and Ma'oz, New York, 64.

Researchers Jenny Drezin and Jill Junnola note the political and strategic role of confidence building measures by stating that CBMs “can establish an ‘operational’ or working level trust that can catalyze ‘structural’ agreements.”<sup>35</sup> Michael Krepon and Peter Constable have studied the use of aerial inspections as a type of CBM to ensure compliance with agreements.<sup>36</sup> The authors find that aerial inspections by an agreed upon third party “might be employed to lessen tensions, quiet borders or introduce a measured degree of transparency that does not impinge on the security of any participating state.”<sup>37</sup> These measures have the potential to build trust between the parties by sharing decision making over a joint concern. Krepon, Constable, Drezin, Junnola, and Ben-Dor note the use of cooperative monitoring, search and rescue, and enforcement of DMZs as a means of establishing trust between governments, preparing the way for an end to conflict, and finalizing formal peace agreements. Strategic and political confidence building measures that focus on security, treaty enforcement, and mediation can and have provided a variety of opportunities for trust between governments and political elites, but other forms of CBMs can be utilized to build relationships between people on the ground.

Some individuals are critical of confidence building measures, especially in the Middle East because they argue that CBMs place process over substance.<sup>38</sup> In addition, it is argued that CBMs just “skim the surface” and are unable to lead to peace, but instead lead to a more secure status quo. These arguments have validity because CBMs do not always work and sometimes they only address political or security concerns without changing the mentality of the people. For this reason, this research focuses on building partnerships that will directly impact the quality of

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<sup>35</sup> Drezin, Jenny and Jill Junnola. 1999. “Arab-Israeli Accords and CBMs.” *Global Confidence Building, New Tools for Troubled Regions*, edited by Krepon, Newbill, Khoja, and Drezin, 101.

<sup>36</sup> Krepon, Michael and Peter D. Constable. January 1992. “Confidence Building, Peace-Making and Aerial Inspections in the Middle East.” *Stimson Center Occasional Paper* 6, 1.

<sup>37</sup> Ibid.

<sup>38</sup> Ben-Dor, Gabriel. 1994. “Confidence Building and the Peace Process.” *From War to Peace*, edited by Rubin, Ginat, and Ma’oz, New York, 65.

life for thousands of individuals. CBMs that address the psychological underpinnings of conflict have the potential to break the cycle of distrust and skepticism by targeting the root of conflicts—the lack of understanding and awareness of the other side.<sup>39</sup> CBMs can play a pivotal role in establishing trust and understanding because they can deal with the psychological issues without delving too far into the major political issues of conflict. Individuals are able to establish a shared narrative and consciousness with the other side that can lead to new opportunities for all. This research project is unique, as it assesses confidence building in the Middle East by focusing on Israel and Jordan, which already are at peace and have mutual respect among political elites, but distrust and animosity between their peoples. As a result, this work will focus on confidence building as a means of improving the psychological state between Israelis and Jordanians on the ground.

Ben-Dor defines one type of CBMs as “intended to reassure the adversary about the basically peaceful nature of our intentions.”<sup>40</sup> This is exhibited through an open exchange of ideas, culture, science, trade, and technology. Parties are able to reduce misunderstandings and conflict between the sides, by providing the people with more knowledge about the other side and a greater understanding of the similarities between them.<sup>41</sup> Guinn agrees by stating that the ultimate goal of CBMs is “...to advance understanding within civil society about the problems and the perspectives of each side.”<sup>42</sup> Confidence building that is aimed at changing the lives and perspectives of individuals involved in conflict has the potential to lead to greater opportunities for reconciliation. Lisa Schirch believes that reconciliation requires transformation of identities

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<sup>39</sup> Ben-Dor, Gabriel. 1994. “Confidence Building and the Peace Process.” *From War to Peace*, edited by Rubin, Ginat, and Ma’oz, New York, 65.

<sup>40</sup> Ibid, 64.

<sup>41</sup> Ibid.

<sup>42</sup> Guinn, David. 2006. *Protecting Jerusalem’s Holy Sites, A Strategy for Negotiating a Sacred Peace*, Cambridge University Press, 109.

in order to move forward.<sup>43</sup> Individuals in conflict need to establish shared connections and identities with their adversaries in order to engage in deep and meaningful paths towards peace. “Those people who have expanded their understanding of their own and their adversaries’ identities and are able to find some shared identities seem to become the peacemakers.”<sup>44</sup> Mutual understanding of a shared identity and experience allows individuals to have a sense of collective challenges and concerns. This is especially the case with environmental issues, which transcend political boundaries and affect both Israelis and Jordanians.

This research expands on the psychological goals of confidence building measures by targeting identity building and cultural exchange for non-elites. Through community engagement and people-to-people interactions, relationships can be made and developed. This research emphasizes the building of these connections by policy makers, businessmen, education institutions, and communities. This multifaceted approach to confidence building hopes to encourage trust through every level of society.

There is currently growing literature and research in the area of environmental peacebuilding and the opportunities for cooperation over shared environmental resources. In 1990, Mostafa Tolba, Executive Director of the United Nations Environment Programme described the environment as rising to the top of the global agenda and having the potential to unify individuals to improve the global environment.<sup>45</sup> Tolba believes that the severity of current environmental challenges “...are changing the rules, making cooperation and partnership, not confrontation, the only viable course to take.”<sup>46</sup> Nicole Harari of the University of Berne recently conducted an analysis of environmental peacebuilding theory and practice for FOEME and

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<sup>43</sup> Schirch, Lisa. 2001. “Ritual Reconciliation, Transforming Identity/Reframing Conflict.” *Reconciliation, Justice, and Coexistence*, edited by Mohamed Abu-Nimer, 152.

<sup>44</sup> Ibid, 152.

<sup>45</sup> Tolba, Mostafa K. September 1990. “Environment for Peace.” *FUTURES*, 765.

<sup>46</sup> Ibid, 767.

defines environmental peacebuilding as “using the environment as one possible linking element between parties to a conflict to foster peace in an area of protracted conflict.”<sup>47</sup> This idea is different from the often studied and cited concept of “conflict resolution,” which hopes to resolve scarcity or abundance of resources through shared management and allocations.<sup>48</sup> Instead of looking at environmental issues as solving resource needs, environmental peacebuilding challenges adversaries to use the environment as one linking issue to build confidence.

Harari’s literature review highlights the work of many authors who support her definition of environmental peacebuilding and the ability it has to establish confidence between states in the Middle East. Harari begins by recognizing the research of Alexander Carius, who finds that cooperation over environmental resources can help to establish a “mutual trust, a creation of a common regional identity and the idea of mutual rights and expectation are likely to emerge.”<sup>49</sup> In addition, John Paul Lederach’s piece *Building Peace: Sustainable Reconciliation in Divided Societies* indicates that long-lasting peace requires connections between people on the ground through local efforts instead of directives from politicians.<sup>50</sup>

Geoffrey Dabelko, Director of the Environmental Change and Security Project at Woodrow Wilson International Center, states that the environment creates a unique opportunity for peacebuilding because “environmental issues ignore political boundaries.”<sup>51</sup> Harari finds that multiple authors agree on the role environmental challenges can have in creating opportunities for cooperation because individuals can work together to solve a common problem or threat

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<sup>47</sup> Harari, Nicole. January 2008. “Environmental Peacebuilding Theory and Practice, A Case Study of the Good Water Neighbours Project.” *EcoPeace/Friends of the Earth Middle East*, 12.

<sup>48</sup> Ibid.

<sup>49</sup> Ibid, 6.

<sup>50</sup> Ibid, 7.

<sup>51</sup> Ibid, 8 and Dabelko, Geoffrey D. “From Threat to Opportunity: Exploiting Environmental Pathways to Peace.” *Environment, Peace and the Dialogue Among Civilizations and Cultures*. <http://wilsoncenter.org/>



instead of competing for scarce resources.<sup>52</sup> Finally, the FOEME report indicates that environmental cooperation projects as confidence building measures have great potential between Israel and Jordan because even though the countries have peace, there is still deep animosity and distrust between their people.<sup>53</sup>

Israel and Jordan have a unique opportunity to work together to combat their shared limitations of a water-scarce arid climate. Both countries have and continue to develop opportunities for sustainable water management techniques. Wastewater reuse and RWH allow the riparians to expand existing water resources, improve the local environment, and increase trust between their people. After the opening of the Israeli Ashkelon desalination plant, the Jordanian Water Minister Hazan al-Nasser stated “From our experience, water is an element of peace-building and co-operation...All countries are ready to co-operate when it comes to water.”<sup>54</sup> There is high demand for water in Jordan and great interest by the Jordanian government to explore partnerships and technologies to solve their deficits. The literature on confidence building measures and environmental peacemaking indicates that there are great possibilities for the proposed project to meet shared water needs and establish confidence between Jordanians and Israelis.

#### **IV. Research Methodology**

Israel and Jordan are a good case to study for technology transfer as a confidence building measure, because they have formal peace, but lack confidence between their peoples. Water technology projects that involve both countries and directly impact the lives of individuals in local communities have the potential to change the psychological understandings and perceptions of the other side. Jordan is eager to engage in new water opportunities for their

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<sup>52</sup> Harari, Nicole. January 2008. “Environmental Peacebuilding Theory and Practice, A Case Study of the Good Water Neighbours Project.” *EcoPeace/Friends of the Earth Middle East*, 9.

<sup>53</sup> Ibid, 10.

<sup>54</sup> Leyne, Jon. 7 September 2004. “‘Water factory’ aims to filter tensions.” *BBC News*. <http://news.bbc.co.uk/>

people, and Israeli businesses have made significant advancements in their water capabilities.

Case studies were conducted to assess rainwater harvesting and wastewater reuse projects conducted by USAID and Friends of the Earth Middle East. By utilizing “controlled comparison,” the research assessed whether these cases were congruent or incongruent in their ability to expand available water supplies and establish confidence between groups.<sup>55</sup> Interviews with individuals and publications from USAID and FOEME that answered “a set of standardized, general questions of each case” allowed for consistency in comparison of the cases and development of the thesis.<sup>56</sup> By using a structured set of questions to compare multiple cases from different organizations and groups, the research highlights the validity and need for the proposed policy solutions.

In addition, a theoretical understanding of confidence-building measures will be explored through literature by conflict resolution and Middle East experts David Guinn, Gabriel Ben-Dor, Jenny Drezin, Jill Junnola, Michael Krepon, Peter Constable, and Lisa Schirch. In addition, developments and theory on environmental peacebuilding by Nicole Harari and Geoffrey Dabelko assisted in highlighting the potential application of theory and environmental solutions to the Middle East.

This research also describes the benefits of rainwater harvesting and wastewater reuse over other technologies because of the feasibility, success rate, and powerful impact these systems can have in local communities. In addition, the author outlines incentives for Israel, Jordan, and the international community to implement, engage, and invest in these projects to expand water supplies and increase cooperative efforts between the peoples of Jordan and Israel.

Finally, this paper explores the best policy proposal to implement successful technology

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<sup>55</sup> Van Evera, Stephen. 1997. *Guide to Methods for Students of Political Science*. Cornell University Press, 57.

<sup>56</sup> George, Alexander and Andrew Bennett. 2005. *Case Studies and Theory Development in the Social Sciences*. MIT Press, 69.

transfer of water technologies. Interviews from economist and water negotiator Dr. Franklin Fisher of MIT and research associate Rachel Posner from the Center for Strategic and International Studies, assisted in developing the financing and feasibility of this proposal. Interviews with Jim Franckiewicz, USAID Water Team Leader, and Sara Borodin, USAID West Bank and Gaza Desk Officer provided information on USAID programs and practices. In addition, interviews were conducted with Mira Edelstein, FOEME Resource Development Associate, and Ladeene Freimuth, Former Deputy Director of FOEME. This research hopes to utilize theory, case studies, and interviews to develop a policy proposal for Israel and Jordan that will increase available water supplies and opportunities for confidence building.

## **V. Water Technology Projects and Technology Transfer**

### ***1. Rainwater Harvesting***

Rainwater harvesting is the process of capturing, storing, and using rainwater to replenish water supplies and meet human needs. There are two major types of rainwater harvesting that are utilized in the Middle East. The first type of rainwater harvesting system is cisterns, which are large tanks above or below ground used to collect rainwater. Cisterns can be complex systems with pumps to deliver water to end users, filters to treat the water, and overflow and bypass systems to manage high flows. Typically, cisterns are placed underground because of their size and are used for larger water application projects such as businesses, residential complexes, and industries.<sup>57</sup> The second type of rainwater harvesting is large-scale reservoirs built to collect water and then directed to infiltrate into the underground aquifers or treated and used in municipal water supplies.

Rainwater harvesting can provide a variety of benefits to Israel and Jordan. The Middle East is an arid climate with limited rainfall, but high-powered floods mark the rainy season of

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<sup>57</sup> Gold, Allison, Robert Goo, Lisa Hair and Nancy Arazan. August 2009. "Rainwater Harvesting: Policies, Programs, and Practices for Water Supply Sustainability." *U.S. EPA*, 3.

this region. The ground is unable to absorb all of the water and about 85% of rainfall is lost to evapotranspiration.<sup>58</sup> RWH has the potential to capture some of the rainwater before it is lost to evaporation. The 2009 Abdulla and Al-Shareef report, *Roof rainwater harvesting systems for household water supply in Jordan* estimated that “the volume of water lost in this manner [evaporation] exceeds all the utilized sources of water in [Jordan], so harvesting this water should be a priority.”<sup>59</sup> In urban centers, RWH has the potential to reduce the volume of stormwater runoff in sewer systems. Rainwater is captured before it can be polluted by the variety of impervious surfaces and pollutants found in urban centers. “As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment [and] other pollutants that c[an] adversely affect water quality...”<sup>60</sup> There are few run-off sewer systems in Jordan, meaning that stormwater is normally not directed to human needs.<sup>61</sup> The damage of winter floods is also reduced by capturing and using stormwater runoff.<sup>62</sup> Rainwater harvesting reduces the challenges of managing stormwater runoff from floods and decreases opportunities for pollution of freshwater supplies.

Rooftop rainwater harvesting is a low cost solution to meeting the needs of the region and gives water management control to individuals and businesses. In Jordan, access to water is typically based on a rotation system of water distribution organized by the government.<sup>63</sup> For an extremely water scarce country, efforts to reduce water scarcity and expand supplies have great financial and social benefits. The government will be able to transport and pump less freshwater

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<sup>58</sup> Abdulla, Fayez. A., A.W. Shareef. 4 May 2008. “Roof rainwater harvesting systems for household water supply in Jordan.” *Desalination*, 243, 196.

<sup>59</sup> Ibid, 199.

<sup>60</sup> “Stormwater Program.” 1 April 2009. *National Pollutant Discharge Elimination System*. US EPA [http://cfpub.epa.gov/npdes/home.cfm?program\\_id=6](http://cfpub.epa.gov/npdes/home.cfm?program_id=6)

<sup>61</sup> Abdulla, Fayez. A., A.W. Shareef. 4 May 2008. “Roof rainwater harvesting systems for household water supply in Jordan.” *Desalination*, 243, 195.

<sup>62</sup> Ibid, 205.

<sup>63</sup> Ibid, 197.

resources or may be able to better distribute water to more scarce regions of the country.

Personal control of water supplies through RWH greatly improves the lives of individuals by creating more stability in available water supplies. Former Deputy Director of FOEME, Ladeene Freimuth, explained that in Jordan girls cannot go to school if there is not water for the bathrooms. This is because then they would have to go outside, which is unsafe and socially unacceptable. FOEME rainwater harvesting projects at schools have increased the number of days girls can attend school. This empowerment of women through education is key to democracy building and peace in the region.<sup>64</sup> A relatively inexpensive rainwater cistern system can dramatically impact the quality of life for women in many communities. RWH can assist the international community in reaching some of the UN Millennium Development Goals, including the elimination of gender disparities in education,<sup>65</sup> provision of safe drinking water, and integration of sustainability into governments' environmental policies.<sup>66</sup>

Cisterns are very effective and relatively inexpensive for aid groups and NGOs. Abdulla and Al-Shareef found that in Jordan the cost of a 30m<sup>3</sup> cistern is approximately \$1500-2800, but costs are reduced when added to new construction instead of retrofitting buildings.<sup>67</sup> The largest expenses are the large tank(s) and the construction of an underground system. For international aid groups, the cost of \$1500-2800 is very manageable and the impacts that it can have on individuals are tremendous. The cost of a rainwater catchment system can be increased by the high quality filters/treatment of the rainwater (if it is intended for potable purposes) and the costs

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<sup>64</sup> Interview with Ladeene Freimuth, Former Deputy Director of FOEME, March 16, 2010.

<sup>65</sup> "Promote Gender Equality and Empower Women." *United Nations Development Goals*.  
<http://www.un.org/millenniumgoals/gender.shtml>

<sup>66</sup> "Ensure Environmental Sustainability." *United Nations Development Goals*.  
<http://www.un.org/millenniumgoals/enviro.html>

<sup>67</sup> Abdulla, Fayez. A., A.W. Shareef. 4 May 2008. "Roof rainwater harvesting systems for household water supply in Jordan." *Desalination*, 243, 205.

of construction.<sup>68</sup> The system can be a wise financial choice for families that are already supplementing their water with private water delivery, as is the case throughout much of Jordan. The construction of a RWH system can also increase the value of a home, creating an additional financial incentive.

Israel utilizes large-scale rainwater reservoirs, which involve expensive equipment and infrastructure but have the capacity to collect and treat large amounts of water. Harvested rainwater is either pumped underground to replenish aquifers and naturally treat the water or is connected to irrigation systems and used for agriculture. Reservoirs are also sometimes used to store treated wastewater during the winter season so it can be used during the drier parts of the year.<sup>69</sup> Large rainwater reservoirs are expensive and require significant investment, but they yield high results and can be used to store treated wastewater or floodwaters.

The Jordanian government has already recognized rainwater harvesting as an effective means of expanding water supplies, but is unable to incentivize the practice due to budgetary constraints. Israel has limited application of rooftop rainwater harvesting systems and could benefit from the research done in Jordan. In addition, Israelis could benefit from modeling a similar governmental policy requiring rainwater catchment systems in all new construction, like in Jordan. Israelis and Jordanians can benefit from both rooftop rainwater harvesting systems and large-scale reservoirs. There is a great deal of knowledge and experience that can be shared to create opportunities for confidence building and meet the challenges of water scarcity.

## ***2. Wastewater Reuse***

Wastewater is the used water from municipal purposes including toilets, bathing, laundry, and cleaning. “In general it is estimated that about 60-80% of the total water supplied to an urban

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<sup>68</sup> Ibid, 206.

<sup>69</sup> Ibid.

community becomes wastewater.”<sup>70</sup> Large amounts of wastewater require communities to properly manage and treat wastewater so that it does not contaminate local freshwater sources. The water can be treated and returned to the natural ecosystem or treated to a higher standard and reused to meet human water needs.<sup>71</sup> Treated wastewater is most typically used for agriculture, because large amounts of water are required for food production. Wastewater reuse requires careful attention to water quality to prevent water contamination and reduce ecological and human risks. Basic water treatment that is not intended for reuse does not necessitate the same quality standards.

Israel is a global leader in wastewater reuse, and was the first country to set national standards for wastewater reuse in 1953.<sup>72</sup> Israel quickly recognized the opportunity to use treated wastewater to meet agricultural needs. Improvements have been made to the quality of treated wastewater throughout Israel’s history. Generally, water is initially treated through an activated sludge system and then injected into the ground. This method utilizes natural treatment techniques in underground aquifers and dilution of contaminants with freshwater supplies.<sup>73</sup> As of 2006, 71% of treated wastewater is recycled, making up 1/5 of Israel’s water supplies.<sup>74</sup> Jordan also utilizes wastewater reuse to meet their agriculture needs. As of 2006, there were 19 wastewater treatment plants in Jordan producing 80 million meters<sup>3</sup> of water.

The greatest benefit of wastewater reuse in Israel and Jordan is its application to agriculture. Agriculture plays integral roles in the social and economic make up of both countries and increasing populations demand more freshwater for municipal purposes instead of the

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<sup>70</sup> Agthe, Donald A., R. Bruce Billings, Nathan Buras. 2003. *Managing Urban Water Supply*, Water Science and Technology Library, Vol. 46, Kluwer Academic Publishers; pg 20.

<sup>71</sup> Ibid.

<sup>72</sup> Tal, Alon. 2004. “Seeking Sustainability: Israel’s Evolving Water Management Strategy.” *Science*, 313, 1082.

<sup>73</sup> Ibid.

<sup>74</sup> Ibid.

agricultural sector. Recycled wastewater has the potential to meet many of the water needs of farmers and industry. Israel has done significant research on the appropriate treatment techniques and effluent quality needed to meet the challenges of water treatment in arid climates.<sup>75</sup> The Knesset recently passed legislation mandating higher effluent standards to ensure protections of human health. Israel's expertise with wastewater treatment technology, application, and legislation should be shared with Jordan.

Wastewater reuse involves high levels of treatment, ensuring that pollutants do not contaminate local ecosystems and waterways.<sup>76</sup> Traditionally, wastewater was added to water sources without any form of treatment, contaminating all water supplies and causing ecological damage. Wastewater treatment is now the norm in many places, but reuse of wastewater prevents mixing of fresh and used water sources. In addition, recycling of wastewater reduces demands on already strained water sources. Water can continually be used and recycled. There is great potential to expand water supplies in Jordan through the implementation of more wastewater reuse facilities and improved treatment technologies found in Israel.

### **3. Technology Transfer**

Technology transfer is the means of sharing, trading, and implementing technical information and technology between individuals, groups, and countries. Technology transfer between nations can allow countries to gain resources and grow through the dynamics of globalization and trade. Israel and Jordan already engage in technology transfer through their shared markets in business and industry, but efforts can be made to expand technology transfer in the water sector through shared investment, education, and trade. In 2001 the United Nations Food and Agriculture Organization put together a report identifying major areas of research,

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<sup>75</sup> Tal, Alon. 2004. "Seeking Sustainability: Israel's Evolving Water Management Strategy." *Science*, 313, 1082.

<sup>76</sup> "Water and Wastewater Reuse." *United Nations Environment Programme*.  
<http://www.unep.or.jp/letc/Publications/>



development, and technology transfer for donors in Jordan.<sup>77</sup> Wastewater reuse and other water conservation technologies were indicated as high priorities for Jordan. Water technology is an important part of Israel's growing economy as well, providing new opportunities for R&D, investment, and application within the region. Israel has successfully engaged in technology transfer around the globe, allowing the technology sector to play a large role in the Israeli economy.<sup>78</sup> Increased opportunities for partnerships, investment, and development can be facilitated between Israel and Jordan to provide benefits for both countries.

## **VI. Case Studies—USAID and Friends of the Earth Middle East**

### ***1. United States Agency for International Development (USAID)***

The United States Agency for International Development plays an important role in funding development projects around the globe. Their approach is a combination of policy priorities set by Congress, requests by host countries, and assessment by field agents.<sup>79</sup> This allows USAID to fund projects based on the interests and needs of the host country and U.S. foreign policy goals. USAID funds both large and small-scale projects, recognizing the need for community-based initiatives and larger infrastructure projects. In addition, USAID fosters confidence and cooperation building through a variety of programs. USAID implements projects of their own and also gives funds to NGOs in the region to support USAID missions and goals.

- **Programs:**

The Middle East Regional Cooperation (MERC) Program offers grants to joint Israeli and Arab scientific research projects. MERC projects are chosen based “on their technical merit, development potential, relevance to the region and Arab-Israeli cooperation.”<sup>80</sup> MERC has consistently given grants for water cooperation projects in the region. Multiple wastewater

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<sup>77</sup> “Water Conservation R&D and technology transfer opportunities.” March 2001. *UN Food and Agriculture Organization*. [ftp://ftp.fao.org/agl/iptid/PFR\\_7.pdf](ftp://ftp.fao.org/agl/iptid/PFR_7.pdf)

<sup>78</sup> Senor, Dan and Saul Singer. November 2009. *Start Up Nation: The Story of Israel's Economic Miracle*. Hachette Book Group, New York, NY.

<sup>79</sup> Interview with Sara Borodin, USAID West Bank and Gaza Desk Officer, March 18, 2010.

<sup>80</sup> “The Funding Process.” Middle East Regional Cooperation Program. *USAID*. [http://www.usaid.gov/our\\_work/merc/funding\\_process.html](http://www.usaid.gov/our_work/merc/funding_process.html)

research projects were funded focusing on cost effective ways of delivering quality recycled wastewater and the ecological benefits that can be gained from reducing the amount of untreated wastewater affecting the Jordan River.<sup>81</sup> MERC works to build cooperation through professional connections between Israelis and Arabs. Each project must include one Arab and one Israeli, giving individuals an opportunity to build partnerships that are often continued throughout their careers. Israelis and Jordanians are reported as partnering in the highest number of projects and water is the second highest research topic behind agriculture for research grants.<sup>82</sup> Many of the projects have also been implemented or used as part of larger donor projects in the region, spreading the use, influence, and power of these technical developments and CBMs.<sup>83</sup>

USAID also engages in general infrastructure projects in Jordan by working with the government of Jordan to target the needs of its people. USAID focuses on water resources management as one of its sectors of support. Two areas of focus within this sector are wastewater reuse and water conservation. USAID has contributed significant funds to wastewater treatment plants and water pipelines to expand available supplies and more efficiently distribute water resources. Since 1952, the United States has contributed over \$6 billion to USAID projects in Jordan, with much of the funds targeted towards the water sector.<sup>84</sup> USAID has water experts and field agents that plan and oversee construction of these projects. Projects examples include wastewater reuse plants and demonstration sites that have been implemented throughout the country. In addition, USAID donates some funds to local NGOs that are carrying out water projects on a smaller scale, such as rainwater harvesting systems. USAID

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<sup>81</sup> "MERC Project Success Stories." Middle East Regional Cooperation Program. *USAID*.  
[http://www.usaid.gov/our\\_work/merc/success\\_stories.html](http://www.usaid.gov/our_work/merc/success_stories.html)

<sup>82</sup> "MERC Current Statistics & Program Accomplishments." Middle East Regional Cooperation Program. *USAID*.  
[http://www.usaid.gov/our\\_work/merc/current\\_stats.html](http://www.usaid.gov/our_work/merc/current_stats.html)

<sup>83</sup> Ibid.

<sup>84</sup> "Country Profile: Jordan." 2009. *USAID*. <http://jordan.usaid.gov>

has identified improvements to the water sector as necessary for improved economic development and stability in Jordan.

- **Project Examples:**

Water Conservation in Rural Jordan: USAID and Mercy Corps partnered together to offer small loans to Jordanian families. USAID highlights the story of Basma a mother of seven who was able to benefit from a USAID loan for the construction of a rainwater collection cistern. Basma was concerned about the irregularity of the public water supply and the safety risks of sending her children to the spring alone. She went to the Fatmah Al-Zahra Cooperative, a local women's empowerment organization, and got a loan for construction of a cistern from USAID funds sent to the local NGO. The loan was granted for \$1,400.00 to construct a 30m<sup>3</sup> cistern and set to be repaid over 30 months. Fatmah Al-Zahra Cooperative calculated that the family saves \$14.00 a month in water costs with the cistern and there is a waiting list of families interested in the program.<sup>85</sup>

Jordan Wastewater Reuse Projects: Recognizing the challenges of drought conditions and increasing water demands in Jordan, the Government of Jordan has distinguished the potential of wastewater reuse as a means of meeting water demands and more effectively managing wastewater. USAID funded and executed three pilot water reuse systems in Aqaba, Wadi Musa, and Irbid in 2003 and 2004. These wastewater reuse treatment facilities have conducted studies on the level of treatment standards for safe effluents, crop tests, and marketing and pricing strategies to make wastewater reuse a viable and safe component of Jordan's water supplies.<sup>86</sup> USAID built three water reuse sites, conducted training and education in wastewater reuse, and made recommendations for government and institutional structures to support and

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<sup>85</sup> "Water Conservation in Rural Jordan." 26 November 2007. Features - Success Stories. *USAID in Jordan*. [http://mi.o2.ie/jordan.usaid.gov/features\\_disp.cfm?type=success&id=144](http://mi.o2.ie/jordan.usaid.gov/features_disp.cfm?type=success&id=144)

<sup>86</sup> "Water Resources Management." 12 June 2006 *USAID in Jordan*. <http://jordan.usaid.gov/>

regulate water reuse. Jordanians were given an opportunity to travel to the United States to observe water reuse facilities and develop curriculum for the Jordan University of Science and Technology.<sup>87</sup> These pilot projects and policy proposals by USAID have given Jordan a framework for further wastewater reuse infrastructure, programs, and regulation.<sup>88</sup>

This program provided for U.S.-Jordan partnerships through education exchanges, site visits in the U.S., and project development between the two countries. Israel could have contributed significant expertise, guidance, and support for these projects. Wastewater reuse in Jordan and the United States is very different because of variations in climate, which dictate special treatment techniques. Israel is a leader in wastewater reuse in arid climates and could have contributed greatly to these projects. Travel and cost expenses could have been reduced because of Israel's proximity to Jordan. USAID serves an important role as a donor for key water projects in Jordan, but opportunities for trilateral cooperation and CBMs are not being employed.

More recently USAID funded a date palm nursery using recycled wastewater. The date palm facility serves as a demonstration site for farmers to learn about opportunities to use treated wastewater in agriculture.<sup>89</sup> Date palms are ideal for treated wastewater because they naturally thrive on brackish water and are less water-intensive than other cash crops typically grown in the region.<sup>90</sup> Israel has been using wastewater to irrigate date palms commercially for a number of years, as a way to use wastewater from Eilat. There are date palm wastewater reuse research sites on both sides of the Arava Valley, and Jordanians and Israelis could benefit from shared research and experiences.

## ***2. EcoPeace/Friends of the Earth Middle East (FOEME)***

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<sup>87</sup> Jordan Water Reuse Implementation Activity Report. *USAID*, 13.

<sup>88</sup> Jordan Water Reuse Implementation Activity Report. *USAID*, 3.

<sup>89</sup> U.S. Fed News Service. "Ambassador Hale inaugurates date palm nursery that uses recycled water to grow crops for export." 25 April 2006. Accessed 29 January 2010. <http://proquest.umi.com>

<sup>90</sup> *Ibid.*

Friends of the Earth Middle East is a unique trilateral NGO that works to achieve environmental protection through confidence building and cooperation. FOEME acknowledges the severity of the water situation in Jordan, Israel, and Palestine and works to develop projects that encourage sustainable water management through environmental peace building.<sup>91</sup> According to FOEME, these shared landscapes, natural resources, and environmental challenges serve as a context for regional cooperation. Through local grassroots engagement and “top down” advocacy efforts, FOEME is able to implement projects that impact the lives of Arabs and Israelis, while working to change governmental policies as well.<sup>92</sup> FOEME partners with other NGOs and donor groups but is independent from any government. This independence from government and the trilateral offices in Amman, Bethlehem, and Tel Aviv give FOEME increased credibility with local communities.

FOEME focuses on community-based initiatives in order to effectively engage in CBMs between communities. Former Deputy Director of FOEME Ladeene Freimuth explains that smaller scale projects with great success are more financially worthwhile.<sup>93</sup> FOEME works with local mayors to gain community support for the projects. In addition, FOEME hires volunteers from within the community to assist in implementation of the projects and community engagement. The communities selected to partner in FOEME projects must share a water resource between an Israeli and Jordanian or Palestinian community. This creates a dynamic of shared investment in the outcome of water projects.<sup>94</sup> Partnerships and programs begin with the planning, development, and implementation of water projects. Freimuth explains that the “tangibility of protecting water resources, economic development, and provision of water help

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<sup>91</sup> “About Us.” *EcoPeace/Friends of the Earth Middle East*. [http://www.foeme.org/about\\_us.php](http://www.foeme.org/about_us.php)

<sup>92</sup> Interview with Ladeene Freimuth, Former Deputy Director of FOEME, March 16, 2010.

<sup>93</sup> Ibid..

<sup>94</sup> Ibid.

the local people understand the value of working together.”<sup>95</sup> The water infrastructure projects provide the major incentive for engagement from both sides, because communities are able to expand water supplies and gain new economic opportunities. Understanding of the other side and cooperation building grows from working together on the water projects.

- **Programs**

Good Water Neighbors Project: FOEME’s Good Water Neighbors Project (GWN) is an effort to connect Palestinian, Jordanian and Israeli communities over shared water resources. Communities are selected from the Israeli-Jordan border or the Israel-Green Line border and must share some water source (stream, aquifer, springs, or river). GWN encourages general environmental awareness and water interdependency.<sup>96</sup> Through education and water technology projects FOEME hopes to show that cooperation is the best method of achieving the communities’ mutual interests and environmental goals.

GWN includes three major tracks within communities to foster confidence building and sustainable water management. The first is education of youth in schools about their local environment, including ways to protect the natural landscape and workshops between the youth of both Arab and Israeli communities. The second is economic opportunities brought to the community that engage the adults. One example is “environmental tours” of the community for tourists about the historical, geological and environmental characteristics of the place. Further, the community realizes profits from new development and growth as a result of better water quality and regularity of supply. Major costs are also often saved from integrating systems between the communities and receiving mutual donor assistance. The third track is local political partnerships between mayors of the communities. The local leaders work across borders to

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<sup>95</sup> Ibid.

<sup>96</sup> Interview and Email Exchange with Mira Edelstein, FOEME Resource Development, March 31, 2010, 1.

engage their communities in these projects.<sup>97</sup> Mira Edelstein from the Tel Aviv office of FOEME explains that after initial meetings, education, and project planning “they [Israelis and Jordanians] understand that it is actually in their interest to develop and implement joint projects – as this will benefit both of them.”<sup>98</sup>

FOEME reports that their projects and programs are well received by the local communities. There are always some skeptics, but they usually recognize the benefits gained at the end of the projects.<sup>99</sup> Environmental awareness, water conservation, and restoration are key goals of FOEME. The GWN program gives communities an opportunity to take action and connect with the other side. Mira Edelstein says, “Also, the reality in the Middle East is that we are very interdependent on one another in terms of our resources, and there is no better way to work together—politics and politicians aside—than by creating better living conditions for ourselves.”<sup>100</sup> Water technology transfer projects contribute to the regional consciousness of limited water resources and the need for cooperation between riparians in order to effectively meet the needs of Israelis and Jordanians.

- **Project Example**

*Community Agreements between Israeli and Jordanian Communities:* FOEME links Arab and Israeli communities through a Memoranda of Understanding (MoU), with respect to each project. The MoU acts as an agreement by each involved Arab and Israeli community to protect shared water resources. FOEME has targeted restoration of the Lower Jordan River as an important environmental issue and multiple Israeli and Jordanian communities have partnered together to address environmental concerns and engage in CBMs. The Muaz Bin Jabal community in Jordan and the Regional Councils of Jordan Valley as well as Beit Shean Valley in

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<sup>97</sup> Interview and Email Exchange with Mira Edelstein, FOEME Resource Development, March 31, 2010, 1-2.

<sup>98</sup> Ibid, 2.

<sup>99</sup> Ibid.

<sup>100</sup> Ibid, 2-3.

Israel signed a MoU in January 2007 to establish the Al-Bakoora / Naharyim / Gesher Peace Park to assist in preserving and restoring the Jordan River.<sup>101</sup> In January 2007, an additional MoU was signed between the Municipality of Safi in Jordan and the Regional Council of Tamar in Israel “to promote sustainable development at the southern shores of the Dead Sea.”<sup>102</sup> These local commitments have produced educational, development, and social opportunities on both sides of the Jordan River to protect water resources and build confidence between riparians.

## **VII. Analysis**

### ***1. Approach***

USAID utilizes both large scale and community-based approaches to implement development projects in Jordan. More recently, USAID has selected projects focused on community/local initiatives, even with larger infrastructure projects like wastewater reuse facilities. USAID recognizes the importance of training and educating communities to effectively use rainwater harvesting and wastewater reuse technologies. They have implemented a variety of pilot programs to facilitate these types of opportunities. USAID hopes to reach many individuals and use its funds and resources to make the largest impact, but they also distinguish the need for different approaches with different technologies. USAID executes RWH projects through community events or local NGO initiatives. Locals are educated about the effectiveness of RWH and then given the information, tools, and sometimes funds necessary to implement it in their own homes.<sup>103</sup> In addition, USAID tries to hire local businesses, contractors, and individuals from the community when possible.<sup>104</sup>

FOEME prides itself on its grassroots approach of pairing communities together to establish confidence building through shared water concerns. The GWN program involves

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<sup>101</sup> “Regional Updates.” February 2007. Newsletter Good Water Neighbors. *Friends of the Earth Middle East, Issue No. 43*. <http://www.foeme.org/water.php?id=23>

<sup>102</sup> Ibid

<sup>103</sup> Interview with Jim Franckiewicz, USAID Water Team Leader, March 24, 2010.

<sup>104</sup> Interview with Sara Borodin, USAID West Bank and Gaza Desk Officer, March 18, 2010.



FOEME staff and local volunteers, who implement the project and facilitate opportunities for dialogue. FOEME also works to influence politics in the region by conducting studies, lobbying politicians, and garnering grassroots support. USAID's approach is more multifaceted than FOEME because they have access to more resources and staff to target different needs through multiple programs and projects. Both organizations recognize the potential for community-based projects to facilitate opportunities for confidence building, which may eventually result in the achievement of larger political goals.

## ***2. Types of Projects***

Both USAID and FOEME employ wastewater reuse and rainwater harvesting technologies because these techniques effectively meet the water needs of this region. Jim Franckiewicz, the Water Team Leader at USAID, who used to be stationed in Jordan, explained that RWH is effective because it is a relatively simple technology that can easily be managed by individuals once they are given some basic information and resources.<sup>105</sup> RWH is popular because it gives individuals and communities more control over their own water management. Individuals are empowered to manage their own water and determine its use and conservation. RWH is non-centralized removing the potential obstacles of bureaucracy and corruption.

USAID and FOEME utilize wastewater reuse because of the need to properly handle wastewater and the high demands for additional water sources in the region. Wastewater treatment and reuse is a supported and accepted technology in Israel and Jordan because of the challenges the government and communities face in properly managing wastewater. Wastewater reuse protects underground aquifers from contamination and reduces the spread of diseases.<sup>106</sup> Israel is especially interested in the ability of Jordan and the West Bank to improve their wastewater treatment capacity because of concerns over contamination of shared water sources.

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<sup>105</sup> Interview with Jim Franckiewicz, USAID Water Team Leader, March 24, 2010.

<sup>106</sup> Ibid.

### ***3. Funding:***

USAID receives its funding from the federal budget allocated by Congress. As a result, USAID has a responsibility to use its funds to implement U.S. foreign policy goals. USAID makes a great effort to determine the needs of a country and work with its government to finance those initiatives. FOEME receives grants and funding from international aid groups, including USAID, but is also funded by private individuals and groups. Because of FOEME's goals and funding apparatus they are able to exclusively pursue their mission of environmental peacebuilding and confidence building through environmental projects between Israel, Jordan and Palestine. USAID has multiple policy goals and more funds available, requiring them to diversify their programs and projects. This means some programs, like MERC, specifically focus on Israel and Arab confidence building, while other projects, like infrastructure initiatives, do not include CBMs. According to a USAID official, projects going on in Jordan are completely exclusive from projects going on in the West Bank and Gaza and there is little communication between the groups.<sup>107</sup> USAID and other donor groups should inquire about the possibility of saving funds and resources by utilizing resources, research, and businesses in Israel, and, as a result facilitate more opportunities for CBMs.

### ***4. Mission and Goals of Projects:***

The missions of the FOEME and USAID and the goals of their projects dictate the prevalence of CBMs in their water technology projects. FOEME's infrastructure and technology projects have a dual mission of sustainable environmental resource management and confidence building between Arab and Israeli communities. Projects are planned with these two goals in mind and efforts are made to utilize shared environmental concerns as an opportunity for trust and confidence development. USAID combines confidence building and technology R&D in their MERC program and their Peace and Reconciliation Program, but the majority of

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<sup>107</sup> Interview with Jim Franckiewicz, USAID Water Team Leader, March 24, 2010.

infrastructure and development projects carried out by USAID in Jordan do not facilitate confidence building between Israel and Jordan because Israel is not included in these projects. USAID does not conduct projects in Israel because of Israel's developed status, but Israel could serve as a donor partner for projects in the region. If USAID were able to involve Israel through shared research, investment, and project implementation, there would be more occasions for cultural, scientific, and technological exchange between the peoples of each country.

#### ***5. Status of the People: Government, Water Experts, and People at Large***

- **Government Officials**

The governments of Israel and Jordan have encouraged cooperation between the two countries through a history of water negotiations and allocations. Initially there was some distrust, but the elites of both governments have since worked to establish allocation agreements that honor the rights and needs of both nations. Beyond these formal allocation agreements, there have been no shared investment projects or large-scale technology transfer programs between businesses to foster additional cooperation over shared challenges of water scarcity. Dr. Fisher, an economist and water allocation expert, observed through his experiences in promoting peaceful water allocation agreements that within the Jordanian and Israeli governments there is still a reciprocated lack of trust on both sides.<sup>108</sup> Nevertheless, within higher echelons of government there have been some major efforts towards cooperation in the form of peace treaties, trade agreements, and formal diplomatic relations.<sup>109</sup>

- **Water Experts**

Interviews with Dr. Fisher of MIT and Jim Franckiewicz of USAID indicate that water experts have been able to come together on water technologies and environmental protection because of mutual recognition of the severity of the problems that they face and a joint desire to implement change. Franckiewicz indicated that water technicians and experts are driven by the

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<sup>108</sup> Interview with Dr. Fisher, MIT Professor of Economics, March 5, 2010.

<sup>109</sup> Ibid.

opportunities for shared research and development. As a result, after overcoming social barriers, water experts from both sides of the Jordan River usually support efforts to work together.<sup>110</sup> According to Fisher's experiences in developing a water model with Israelis, Jordanians, and Palestinians, the parties were all initially suspicious of each other, but over time were able to trust one another and support each other's efforts and goals.<sup>111</sup> It is important that water technology transfer projects engage the expert community because these individuals already have some experience working together through joint water allocation agreements and they are all driven by the desire to provide more water and protect the environment for their people.

- **People at Large**

The majority of Israelis and Jordanians appear not trust the people of the other nation due to lack of interaction and negative preconceptions. According to Dr. Fisher, "The relatively uneducated people, especially in Jordan, don't want to deal with the Israelis under any circumstance."<sup>112</sup> This is due to a lack of trust between the sides. Many Jordanians come to the table "with the idea that [Israelis] have already stolen their water."<sup>113</sup> There is a belief among most individuals that "water is our right, we want our water back, and we don't want to cooperate."<sup>114</sup> This creates a great challenge for building confidence and trust on the ground. FOEME deals directly with these sentiments, and employs education and dialogue as a key part of understanding the experiences of individuals on both sides, but also to establish shared identities through joint environmental challenges and concerns.<sup>115</sup> Fisher says in order to get cooperation to happen, "you need to get people in the street to believe in it. [You] really have to

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<sup>110</sup> Interview with Jim Franckiewicz, USAID Water Team Leader, March 24, 2010.

<sup>111</sup> Interview with Dr. Fisher, Professor of Economics at MIT, March 5, 2010.

<sup>112</sup> Ibid.

<sup>113</sup> Ibid.

<sup>114</sup> Ibid.

<sup>115</sup> Harari, Nicole. January 2008. "Environmental Peacebuilding Theory and Practice, A Case Study of the Good Water Neighbours Project." *EcoPeace/Friends of the Earth Middle East*, Pg 16.

educate people who don't understand that cooperation is good for you."<sup>116</sup> FOEME projects have used the prospect of improved environmental conditions and economic opportunities as a means of bringing sides to the table.<sup>117</sup> Much of the confidence building literature discusses the ability of CBMs to facilitate an exchange of information between the two sides so that people can become more knowledgeable about each other and recognize their mutual interests.

### **VIII. Policy Proposal**

The current state of water scarcity and distrust between Israelis and Jordanians can be improved through a three-track process of bi-lateral agreements, multilateral support, and legislative policies within each country. This combination of government support, multilateral funding, and national commitments to water technology transfer and CBMs have the potential to encourage environmental peacebuilding and address water scarcity concerns. These policy prescriptions will facilitate opportunities for non-elite, community-based CBMs by partnering communities, businesses, and individuals in the exchange, development, and implementation of new water technologies. Israel and Jordan could easily pursue these policies separately, but both countries serve to gain from shared knowledge, research, and experience. In addition, water can serve as an issue to unite people and establish trust between individuals. The governments of these nations and international groups should exploit this opportunity to establish more opportunities for peace in the region. The three-track approach will ensure international support and national commitments by the Israeli and Jordanian governments to support and encourage water technology transfer as a means of confidence building.

- **Bilateral Agreement** between Israel and Jordan to invest in water use technology transfer projects and confidence building measures

Israel and Jordan should develop a bilateral agreement to jointly combat the common

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<sup>116</sup> Interview with Dr. Fisher, Professor of Economics at MIT, March 5, 2010.

<sup>117</sup> Interview with Ladeene Freimuth, Former Deputy Director of FOEME, March 16, 2010.

challenges of water scarcity their countries face through increased cooperation, technology transfer, and management of shared resources. An international agreement between the two countries would indicate a clear commitment to Israelis and Jordanians of the value of CBMs. Israel and Jordan should not work in parallel on water technology transfer, but instead work together through opportunities found in the bilateral and multilateral agreements.

***Examples of components for bilateral agreement:***

Communities would be charged to partner with each other to find solutions to shared concerns. For example, Tel Aviv and Amman both face the challenge of high-density urban living and could partner in the exploration of urban rooftop rainwater harvesting laws, practices, and technologies. Jordan has a national law requiring new homes to have water collection tanks and could share their experiences, challenges and successes, as Israel goes forward with more widespread applications.<sup>118</sup> Regions of each country could partner together based on shared climates, population size, and water infrastructure. These city-to-city partnerships would mimic the success of the FOEME projects that bring the incentive of infrastructure projects to communities and then facilitate educational and financial partnerships. These alliances can create avenues for confidence building by increasing connections, shared projects, and ultimately trust between Israelis and Jordanians.

An example of a successful cooperation agreement between Israel and Jordan is the designation of joint Israeli-Jordanian Qualifying Industrial Zones, which could be expanded for water technologies in a new bilateral agreement. QIZs allow some Jordanian companies and businesses to export duty free to the United States, if the products contain Israeli inputs.<sup>119</sup> This agreement went into effect in 1998 and works to encourage “substantial economic cooperation

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<sup>118</sup> Abdulla, Fayez. A., A.W. Shareef. 4 May 2008. “Roof rainwater harvesting systems for household water supply in Jordan.” *Desalination*, 243, 198-199.

<sup>119</sup> “Q.I.Z – Qualifying Industrial Zones.” Regional Cooperation. *State of Israel: Ministry of Industry, Trade, and Labor*. <http://www.moital.gov.il/NR/exeres/2124E799-4876-40EF-831C-6410830D8F02.htm>

between Israel and Jordan.”<sup>120</sup> This agreement was mutually beneficial for the economies of both countries and was facilitated with the assistance of the U.S. government. Jordan has gained increased profits, economic growth, and job creation through the QIZs.<sup>121</sup> Israeli and Jordanian companies were given an incentive to work together and develop successful relationships. A similar type of agreement should be facilitated with water technology projects, offering QIZs for water technologies designed, manufactured, and sold in Israel and Jordan. The agreements should also stipulate requirements for CBMs by incorporating both Israeli and Jordanian universities and companies in the production, planning, and implementation of local RWH and wastewater reuse projects.

Another potential avenue for collaboration lies in developing relationships between Israeli development towns and some Jordanian communities. Israeli development towns face significant infrastructure and employment challenges, similar to much of Jordan. Technologies that are successful in Jordan may meet the needs and restrictions of these lower income communities in Israel. This policy area could serve as a specific avenue for collaboration, engaging communities in the manufacturing and development of water technologies for their countries. QIZs for water technology should be set up in development towns and low-income regions to train more individuals in water technologies and reinvigorate local economies.

City water development partnerships, water technology QIZs, and development town projects are examples of ways to integrate confidence building into a bilateral agreement between Israel and Jordan. By utilizing decentralized wastewater reuse and rainwater harvesting, Israel and Jordan can expand their water resources without major ecological impacts—conveying

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<sup>120</sup> “Agreement Between The Hashemite Kingdom Of Jordan And Israel On Irbid Qualifying Industrial Zone.” *Jordan Economic and Commerce Bureau*. [http://www.jordanecb.org/pdf/QIZ\\_Agreement.pdf](http://www.jordanecb.org/pdf/QIZ_Agreement.pdf)

<sup>121</sup> “Q.I.Z – Qualifying Industrial Zones.” Regional Cooperation. *State of Israel: Ministry of Industry, Trade, and Labor*. <http://www.moital.gov.il/NR/exeres/2124E799-4876-40EF-831C-6410830D8F02.htm>

a regional commitment to sustainability. The Jordanian and Israeli governments can partner to facilitate technology transfer programs between them that serve to improve relations between people on the ground, reduce strains on shared water resources, and sustainably manage currently available freshwater sources. The more opportunities for Israelis and Jordanians to interact and develop relationships the sooner they will be able to establish confidence and trust as neighbors. This should promote peace between the two countries and enhance the future of water management in the region.

- **Multilateral Agreements** from donor nations to finance projects and facilitate opportunities for confidence building

The international community can play a vital role in facilitating water technology transfer and infrastructure projects. The Middle East has a history of receiving international support in order to encourage development opportunities, cooperation, and peace. USAID, GTZ (German international development organization), and the Swiss Agency for Development and Cooperation are just some of the major donor groups prevalent in the Jordan River Basin.<sup>122</sup> These groups have made significant financial contributions to finance key infrastructure and development projects. Some organizations have specific cooperation and peacebuilding programs, but there are opportunities for these agencies to do more to facilitate confidence building on a large scale and through micro financing. Projects in each nation should utilize businesses, scientists, and universities in the other. Whenever possible, efforts can be made to further integrate these two countries in their efforts to combat water scarcity.

The United States has the potential to serve as a leader in this effort to incorporate confidence building and water technology into development projects in the region. As one of the

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<sup>122</sup> “Jordan, Syria, and Lebanon.” *SDC Swiss Agency for Development and Cooperation*.  
[http://www.sdc.admin.ch/en/Home/Countries/Near\\_and\\_Middle\\_East/Jordan\\_Syria\\_Lebanon](http://www.sdc.admin.ch/en/Home/Countries/Near_and_Middle_East/Jordan_Syria_Lebanon)  
“Priority Areas in Jordan.” GTZ, Partner for the Future Worldwide.  
<http://www.gtz.de/en/weltweit/maghreb-naher-osten/1511.htm>



largest donor nations in Jordan, the U.S. has important influence and can use that authority to promote and facilitate CBMs. The Center for Strategic and International Studies (CSIS) recognizes the importance of U.S. leadership in global water issues and is encouraging policy changes within Congress and the State Department to foster increased engagement by the United States.<sup>123</sup> CSIS is recommending that water be incorporated in all aspects of international development projects from energy to education, citing this as is in the best interest of developing nations and the United States.

Water is essential for development and democracy building—key priorities of aid agencies and international actors.<sup>124</sup> Recently, the Undersecretary of State for Democracy and Global Affairs, Maria Otero, made a statement recognizing water scarcity as an important issue for the State Department to address in the context of peace and conflict in many regions around the globe.<sup>125</sup> CSIS is encouraging the U.S. to expand its global water campaign efforts by hiring a high level representative to organize aid projects, raise awareness of water as a priority agenda item, manage a core team, and increase water staff at the State Department.<sup>126</sup> The U.S. has made a commitment to development and investment in the Middle East and it is important that water as a means of confidence building be integrated into U.S. foreign policy in both Israel and Jordan.

- **National Legislation** within each country to facilitate, encourage, and incentivize water technology transfer and confidence building

The national governments of Jordan and Israel should pass legislation and policies to enforce the bilateral agreements and facilitate CBMs between businesses, universities, and communities. King Abdullah of Jordan and his legislature have supported both RWH and

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<sup>123</sup> Interview with Rachel Posner, Assistant Director of the CSIS Global Water Futures Project, February 26, 2010.

<sup>124</sup> Peterson, Erik and Rachel Posner. March 2009. "Declaration on U.S. Policy and Global Challenges of Water." CSIS, 1-10.

<sup>125</sup> Otero, Maria. 23 February 2010 "From the Desk of Maria Otero, Under Secretary of State for Democracy and Global Affairs." *U.S. State Department*. <http://www.state.gov/g/137134.htm>

<sup>126</sup> Peterson, Erik and Rachel Posner. March 2009. "Declaration on U.S. Policy and Global Challenges of Water." CSIS, 6.

wastewater reuse technologies and systems as part of their national water agenda.<sup>127</sup> The Jordanian and Israeli governments should take more steps to encourage these practices through incentives such as discounts, tax credits, and rebates for RWH and wastewater reuse technology. Financial incentives will allow more start-up companies and small businesses to enter the water technology sector. Israel has worked to facilitate an atmosphere of investment and start-ups through some government programs. Examples include BIRD, the U.S.-Israel Bi-national Industrial Research and Development Foundation, and YOZMA, an Israeli government investment group in new venture capital funds.<sup>128</sup> These government-sponsored programs give companies start-up funds, access to international markets, and training in business and marketing for new companies.<sup>129</sup> Similar types of programs could be set up to specifically target water technologies and foster cooperation between Israel and Jordan. Israel currently limits rainwater harvesting; legislation should be passed to allow residents to individually manage water through cistern systems. If the governments of Israel and Jordan can remove as many financial costs and bureaucratic restrictions as possible, this will encourage use of these water technologies.

Israeli and Jordanian commitments to the bilateral agreement will be measured by their ability to provide incentives for confidence building projects and water technology products.

***Examples of incentives include:***

- National universities in Israel and Jordan should be given funds to research and further develop rainwater harvesting and wastewater reuse.
- Israel and Jordan should offer rebates and tax credits for purchase and use of rainwater harvesting and wastewater reuse technologies. In the U.S., municipalities have been able to encourage rainwater harvesting through rebate programs and tax credits for individuals and businesses purchasing these technologies. This has encouraged people to take ownership of their water management and implement government supported policies.

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<sup>127</sup> Abdulla, Fayez. A., A.W. Shareef. 4 May 2008. "Roof rainwater harvesting systems for household water supply in Jordan." *Desalination*, 243, 198-199.

<sup>128</sup> Senor, Dan and Saul Singer. November 2009. *Start Up Nation: The Story of Israel's Economic Miracle*. Hachette Book Group, New York, NY, 162, 166-169.

<sup>129</sup> Ibid.

- Companies developing and manufacturing rainwater and wastewater technologies should be given additional government grants and loans to encourage additional advancement in these technologies.

The governments of Israel and Jordan should use their power to maintain high health and water quality standards with these technologies. Israel recently passed a new standard for wastewater treatment effluents to improve water quality. The experiences of Israel in wastewater legislation and regulation can serve to assist the Jordanian government in its management of similar systems and programs. In addition, Jordan can share its RWH experiences with Israel by providing guidance and advice. The cross-cultural connections that can be developed through policymakers writing legislation together are another opportunity for CBMs in the region. Israel and Jordan face many of the same water challenges, and the exchange of ideas, technologies, laws, and practices can only serve to help both countries prepare for long-term water management and establish increased trust.

## **IX. Incentives for Technology Transfer & Partnerships**

There are a variety of reasons why Israel, Jordan, and the international community should expand their efforts towards water technology transfer and confidence building. There are opportunities for all parties to gain and support one another in their individual and collective goals and ambitions.

### ***1. Israel***

The government of Israel, Israeli businesses, and the people of Israel will gain from increased cooperation and water technology transfer with Jordan. Israel and Jordan have successfully managed a political peace between their countries but relations between Israelis and Jordanians are tenuous. Increased partnerships with Jordan over water resources can provide Israel with new opportunities for political gains with the Arab world and the international community. Since establishing peace with Jordan in 1994, Israel has been able to build some

important joint agreements and projects. According to the Israeli Ministry of Foreign Affairs, “Jordan is an island of stability in the region and a significant partner in the efforts to achieve peace with its Middle East neighbors.”<sup>130</sup> Israel recognizes the need to further foster peace and cooperation with Jordan for the benefit of both nations and the Middle East. Dr. Franklin Fisher, stated “Israel has a serious political and social interest in staying friendly with Jordan, doing joint things when they can be done.”<sup>131</sup> Israel is an isolated nation in the Middle East and improved relations with the Jordanians have the potential to foster increased economic, environmental, and cultural opportunities for the two countries.

Israel and Jordan have benefited from shared trade and economic relations even before formal peace in 1994. Commerce between the two countries reaches into the hundreds of billions and has the potential to expand with increased technology transfer in the water sector. In 2008, the water technology industry in Israel reported \$1.4 billion in exports.<sup>132</sup> The success of these businesses can be further expanded and facilitated by mutual agreements and government incentives to facilitate confidence building through technology transfer with Jordan. Israel currently supports water technology businesses through Israel NEWTech (Novel Efficient Water Technology Program) a program within the Ministry of Industry, Trade, and Labor.<sup>133</sup> This program encourages R&D, government marketing support, and events to connect companies and businesses.<sup>134</sup> This network could benefit from Israeli partnership with Jordan to further expand

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<sup>130</sup> “A Decade of Peace between Israel and Jordan.” 26 October 2004. Israel Ministry of Foreign Affairs. <http://www.mfa.gov.il/MFA/Peace+Process/Guide+to+the+Peace+Process/A+Decade+of+Peace+between+Israel+and+Jordan+26-Oct-2004.htm>

<sup>131</sup> Interview with Dr. Fisher, Professor of Economics at MIT, March 5, 2010.

<sup>132</sup> Kloosterman, Karin. 4 February 2010. “Israel’s top ten water technology companies.” *Israel21c*. <http://www.israel21c.org/environment/israels-top-ten-water-technology-companies-that-help-keep-the-world-liquid>

<sup>133</sup> Ritch, Emma. 31 March 2009. “Israel to Export \$2.5B in water technologies by 2011.” *Clean Tech Group*. <http://cleantech.com/news/>

<sup>134</sup> “About Israel NEWTech.” Israel NEWTech, National Water and Energy Program. *State of Israel: Ministry of Industry, Trade, and Labor*. <http://www.israelnewtech.gov.il/eng/Pages/IsraelNewTech.aspx>

the market and exchange research and application techniques.

With the assistance of international aid groups and universities, Jordan has successfully implemented some pilot rooftop rainwater harvesting programs throughout the country. Israel's water laws currently restrict this practice, but there have been some small-scale efforts to change this policy and further expand Israel's available water supplies. Israel could benefit from the studies and research conducted by Jordan in rainwater harvesting to offer Israelis access to additional water resources. Israel and Jordan can save time and research funds by coordinating their efforts to implement rainwater harvesting in both countries.

Increased cooperation and trust between Israelis and Jordanians is good for Israel's relations with the Arab world. Cooperation over water issues will increase confidence between the riparians so that they can unite over other shared issues of concern and move forward together. Jordan River Basin Water expert Miriam Lowi describes the U.S. approach to water negotiations in the Middle East during the Johnston mission stating,

The United States Government rejected [the idea of separate Israel and Arab water development]; it saw water-sharing as the gateway to peace and cooperation. The Eisenhower Administration, echoing the functionalist theory of spillover, hoped that 'by regional economic development people in the area will begin to talk with each other and eventually this would lead to better relations for all.'<sup>135</sup>

Fortunately, Israel and Jordan already have peace and, increased cooperation in water technology has the potential to foster more confidence and trust between Israeli and Jordanian businesses, students, and local communities benefiting from the projects.

Israel has made great efforts to contribute to development projects around the globe with their Ministry of Foreign Affairs MASHAV (Israel's Agency for International Development Cooperation) program. MASHAV trains people around the world in agriculture, science, and

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<sup>135</sup> Lowi, Miriam. 1995. *Water and Power*. Cambridge University Press, New York, NY, 113-4.

technology and provides humanitarian aid and assistance.<sup>136</sup> MASHAV works in Jordan through agriculture, dairy farming, medicine, and business development trainings and programs.<sup>137</sup> These programs boost Israel's international image and in the case of Jordan improve relations between neighbors. The MASHAV program and NEWTech program are two Israeli institutions that could be used to foster more CBMs in the water sectors of Israel and Jordan.

## **2. Jordan**

Jordan will benefit in a variety of sectors from increased cooperation and investment in water technologies with Israel. Jordan has been eager to address its water deficits and constraints. According to the Government of Jordan, "The gravest environmental challenge that Jordan faces today is the scarcity of water."<sup>138</sup> Rapid population growth throughout Jordan and limited available water supplies create unsustainable demands on an already stressed water system. Jordan lacks the funds to effectively address this problem and has partnered with international aid groups and private investment corporations to meet many of its water infrastructure needs. According to Dr. Fisher, "The water problem in Amman is sufficiently serious and Jordan is very hot to take action."<sup>139</sup> Jordan's interests can be translated into increased partnerships with Israel, a country who faces the same arid climate constraints. The Israeli government and many businesses have been able to capitalize on their water scarcity through development and investment in the water technology sector. Jordan can benefit from this market to meet the needs of its people and pursue an agenda of Middle East peace.

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<sup>136</sup> "MASHAV- Israel's Agency for International Development Cooperation." 4 March 2010. *Israel Ministry of Foreign Affairs*. <http://www.mfa.gov.il/MFA/Mashav++International+Development/What+is+Mashav/MASHAV+launches+website.htm>

<sup>137</sup> "Middle East Activities: Hashemite Kingdom of Jordan." Israel Diplomatic Network. *Israel Ministry of Foreign Affairs*. <http://mashav.mfa.gov.il/mfm/web/main/document.asp?SubjectID=35242&MissionID=16210&LanguageID=0&StatusID=0&DocumentID=-1>

<sup>138</sup> "Jordan's Water Shortage." The Office of Geography and the Environment. *The Hashemite Kingdom of Jordan*. [http://www.kinghussein.gov.jo/geo\\_env4.html#Jordan%92s%20Water%20Shortage](http://www.kinghussein.gov.jo/geo_env4.html#Jordan%92s%20Water%20Shortage)

<sup>139</sup> Interview with Dr. Fisher, Professor of Economics at MIT, March 5, 2010.

Technology transfer in the water sector and cooperation with Israel has the potential to increase opportunities for international aid. Following the peace agreement between Israel and Jordan, the U.S. increased commitments to infrastructure and aid projects in Jordan. Many countries and international aid agencies are committed to improving Arab-Israeli relations. The policy proposals contained in this paper could provide a framework for increasing donor gifts and opportunities for Jordan. Economic expansion and more reliable water supplies are good for the people of Jordan and will increase support and confidence in King Abdullah's leadership.

The Jordanian and Israeli governments have good relations in some areas, and both countries have been interested in pursuing long-term solutions to the Arab-Israeli conflict. Jordan has absorbed thousands of Palestinian refugees, and the King of Jordan has made a commitment to pursuing opportunities for peace. Establishing more trust and confidence between Israelis and Jordanians could go a long way in increasing opportunities for peace building in the region. Increased connections, partnerships, and dialogue between Israelis and Jordanians can create more confidence and trust, which may influence their perceptions of the Arab-Israeli conflict and facilitate increased understanding and shared identities.

### ***3. International Community***

Countries throughout the world have recognized the need to foster peace in the Middle East and have contributed significant amounts of funds, resources, and political capital to pursue this agenda. Many aid institutions have been created to execute these goals and they have achieved many successes. CBMs like water technology transfer play an important role in establishing increased stability, confidence, and hopefully ultimately peace in the region. This is good for the entire global community and any economic, political, or social interests countries may have in Israel and Jordan.

International engagement by countries like the United States, Canada, England,

Switzerland, and Japan create international good will. Locals view these countries favorably as a result of their contributions and support. In addition, international aid has allowed foreign countries to have influence in donor recipient countries, and could allow countries to engage in and encourage confidence and peace building. It is in the best interests of the world to establish a more secure Middle East through trust enhancing projects serving practical needs; the three-track approach of this policy proposal could provide useful tools for this effort.

## **X. Potential Outcomes and Conclusions**

### ***1. Barriers to Implementation***

Rainwater harvesting is a good technology but it will require individuals and businesses to purchase the infrastructure and then retrofit existing buildings or incorporate it into new construction. Booky Oren, Executive Chairman of the Miya Water Company and Former Chairman of Mekorot, Israel's national water company, states that "initially [RWH] looks attractive based on the good water quality of the rain collected from roof tops, [but] when we try to check the scaling of your idea it is much more complicated."<sup>140</sup> Rainwater harvesting systems are only approximately \$1500-2800, but costs are reduced when added to new construction instead of building retrofits.<sup>141</sup> The payback on these systems is often achieved over a short period of time because of the costs of private water in Jordan. Israel subsidizes their water, but RWH allows individuals to more directly manage their water. Many policymakers are concerned about water quality, with rainwater being stored over long periods of time. Oren stated, "If we will do it on a household basis we need to control the water quality before we can use it again especially after storage of at least 3 months."<sup>142</sup> The U.S. has managed the challenge of water quality by requiring filters and annual maintenance checks by health and water officials.

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<sup>140</sup> Interview and Email Exchange with Booky Oren, Executive Chairman of the Miya Water, April 9, 2010.

<sup>141</sup> Abdulla, Fayez. A., A.W. Shareef. 4 May 2008. "Roof rainwater harvesting systems for household water supply in Jordan." *Desalination*, 243, 205.

<sup>142</sup> Interview and Email Exchange with Booky Oren, Executive Chairman of the Miya Water, April 9, 2010.



Wastewater reuse is a widely accepted and supported technology in both Israel and Jordan, but there are some financial, health, and cultural barriers to its implementation. Wastewater reuse systems are very expensive, requiring significant funds and long-term investment. The model of small-scale decentralized wastewater reuse facilities as shown in the recent USAID examples require lots of funds to implement on a large scale basis. Jordan has been interested in this technology for a while, but is unable to finance it, necessitating the assistance of the international community. High quality effluents dictate high treatment standards, which increases costs, technical training of workers, and regulations. There have been some cultural barriers in Jordan to “unclean” water and high treatment standards are needed to combat these concerns.<sup>143</sup> In addition, the exportation of crops using recycled wastewater involves greater attention to treatment to address concerns of contamination. The issue of treatment requirements is a key opportunity for cooperation, since Israel exports crops irrigated with recycled wastewater and has developed high effluent standards and regulation controls.

## ***2. Spillover to the Palestinians***

The West Bank and Gaza Strip suffer from the same challenges as Israel and Jordan; an arid climate with limited water resources, and could benefit from expanded water resources and CBMs with Israel. The Palestinian territories suffer extreme water scarcity with large population growth and limited availability and access to water resources. Palestinians in Gaza and the West Bank have utilized crude rainwater harvesting techniques with success, but are often limited by the Israeli government.<sup>144</sup> Wastewater management is a significant problem in both the West Bank and Gaza with only about 30% of the population having connections and access to sewer

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<sup>143</sup> De Chatel, Francesca. 22 April 2004 “Recycled Water Turns Jordan’s Deserts Green.” *IslamOnline*. Accessed 29 January 2010. <http://islamonline.net/>

<sup>144</sup> Hass, Amira. 28 January 2010. “Palestinian farmers are being treated like criminals.” *Haaretz*. <http://www.haaretz.com/hasen/spages/1144286.html>

systems.<sup>145</sup> This poor level of management and treatment causes contamination of groundwater aquifers and major health risks for Palestinians. Aid groups including USAID, The World Bank, and GTZ have assisted the Palestinian Authority in building and managing wastewater treatment facilities. In addition, Israel and Jordan have been interested in wastewater treatment in the West Bank especially because of risk of contamination of shared aquifers and other water resources.<sup>146</sup>

Confidence building measures are greatly needed between Israel and the Palestinian territories and water technologies could be an important first step in the path towards cooperation. Both sides of the conflict have the opportunity to gain from better wastewater management and increasing available water supplies. Currently, there is little cooperation in the construction of wastewater treatment facilities and there are continuing Israeli restrictions on RWH. Palestinians are unwilling to work with Israelis on wastewater because it is understood as cooperation with their occupiers.<sup>147</sup> International aid groups have been interested in supporting these projects but Israelis and Palestinians are distrustful and skeptical of cooperation. Allowance and assistance in rainwater harvesting could serve as a first step in confidence building, by giving Palestinians increased control over their personal water supplies. Also, Israel has indicated a preference towards finding new water resources for Palestinians, instead of sharing resources, and rainwater harvesting aligns with this policy preference.<sup>148</sup> Once Palestinians are able to establish more control over their water, they may be more willing to accept wastewater treatment facilities, which could be provided by international agencies that would benefit both Palestinians and Israelis.

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<sup>145</sup> "Wastewater (Domestic and Industrial)." Palestinian Water Programme. GTZ.  
<http://www.waterprogramme.ps/wastewater.php>

<sup>146</sup> Shmueli, Assaf. 24 September 2008. "Report: Palestinian effluent endangers underground water reservoirs."  
*Ynet News.com*. <http://www.ynetnews.com/articles/0,7340,L-3601315,00.html>

<sup>147</sup> Ibid.

<sup>148</sup> Interview with Dr. Fisher, Professor of Economics at MIT, March 5, 2010.

USAID and FOEME have worked to extend confidence building water projects to the Palestinians and these projects serve as examples of the potential of CBMs between Israel and the Palestinians. The Peace and Reconciliation Program at USAID works to foster cooperation between Israelis and Palestinians. Funds are awarded to NGOs that facilitate projects, which “address issues of common interest and mitigate the effect of the Israeli-Palestinian conflict on program beneficiaries.”<sup>149</sup> Recipients of funds include Seeds of Peace, Friends of the Earth Middle East, and Parents Circle.<sup>150</sup> USAID achieves confidence building through water projects, education programs, dialogue groups, and physical fitness. The program works to target tensions between religious and ethnic groups and build partnerships through shared experiences.

FOEME organizes shared wastewater treatment projects between Israelis and Palestinians that can be used as a model for the future. The Baka Sharkia community of the West Bank and the Baka Gharbia community of Israel both had difficulty managing their wastewater and decided to partner together to meet their communities’ needs, save costs, protect the local water source, and build connections with their neighbors. The communities share a spring and want to reduce the flow of untreated waste into their freshwater stream. The Baka Gharbia community is planning the construction of a new wastewater treatment plant and recognized the additional benefits of connecting the plant to Baka Sharkia. The communities use the same stream and underground aquifer for potable water needs and saw that through cooperation they could achieve more for their communities and the environment.<sup>151</sup>

### **3. Conclusions**

Israeli and Jordanian partnership in technology transfer and confidence building measures

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<sup>149</sup> Ibid.

<sup>150</sup> “History of Past Conflict Management and Mitigation Programs Summaries for Fiscal Years 2004-2006 Award Cycles.” Democracy and Governance. *West Bank/Gaza USAID*.  
[http://www.usaid.gov/wbg/misc/cmmresources/dgo\\_appres\\_SummaryofPastCMMprograms.pdf](http://www.usaid.gov/wbg/misc/cmmresources/dgo_appres_SummaryofPastCMMprograms.pdf)

<sup>151</sup> Interview and Email Exchange with Mira Edelstein, FOEME Resource Development, March 31, 2010, 2.

can serve as an important model for the Palestinians and Israelis. If this policy proposal is successfully implemented, Israelis may be more willing to ramp up efforts in Gaza and the West Bank and encourage Palestinian management of their water resources. Increased Jordanian confidence and trust in Israelis may also increase positive Arab perceptions of Israel and open opportunities for peace building between Israel and the Palestinians. International aid can play an important role in funding and executing these initiatives. Aid groups can encourage confidence building by including cooperation as inherent components of their infrastructure projects in the region.

The three-track policy proposal (bi-lateral agreements, multilateral support, and national legislation) to implement projects, policies, and programs of joint rainwater harvesting and wastewater reuse projects in Israel and Jordan will serve as important confidence building measures in the region. By targeting non-elites through local community-based projects, Israelis and Jordanians will have an opportunity to build partnerships through business, education, and community efforts to sustainably expand water resources. Ultimately, grassroots support for trust and confidence is necessary for long lasting peace between nations. Israel has a strategic interest in engaging in these types of opportunities with Jordanians to improve regional Arab relations. In addition, Israel and Jordan suffer from significant water challenges, which are expected to increase in the coming years. This policy proposal can begin a history of environmental cooperation to give all citizens of the region access to water resources. Rainwater harvesting and wastewater reuse will expand available water supplies, sustainably managing water resources for the future. Water technology cooperation is a path towards increased partnership and confidence building that will nourish the future of the Middle East with resources sustainably shared between Israel and its Arab neighbors.