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ACTIVITY 1.3 TRIP REPORT: ASSESSING TRANSBOUDARY AND DOMESTIC AQUIFER OPPORTUNITIES FOR JOINT ACTION IN JORDAN AND SAUDI ARABIA

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PROJECT BACKGROUND AND REPORT PURPOSE

The Advancing the Blue Revolution Initiative (ABRI) is an innovative approach to boldly tackle and address high profile, contentious and politically significant transboundary water issues in the Middle East and Africa that have not previously gained adequate traction or been resolved. Groundwater is often a major share of many countries' water resources in these regions. In many countries groundwater accounts for a large percent of the renewable resource, and when nonrenewable groundwater, which is often heavily mined in some countries, is added to the mix, groundwater has a far greater share.

Initial consultations in the Middle East indicate that resolving transboundary groundwater disputes is among the highest priorities of governments. This report describes an initial consultancy by ABRI's Transboundary Groundwater Team in Jordan to establish links with key stakeholders, discuss with them issues of importance and their priorities, develop a potential implementation agenda for groundwater projects in the region and design a scope of work for a multi-year activity. The objectives of this effort are to:

- Determine the availability and importance of renewable and nonrenewable groundwater in countries in the Middle East;
- Identify and prioritize a set of groundwater management issues – both transboundary and domestic – that will inform the implementation agenda for ABRI;
- Identify constraints and opportunities for addressing transboundary and domestic aquifer conflicts;
- Design a set of interventions in the form of scopes of work for one or more activities, which can serve as models for international and domestic collaboration; and
- Determine best management practices in transboundary and domestic groundwater management, drawn from cases where issues were successfully resolved, as a basis for ABRI interventions.

The approach described here has considered a central Middle Eastern focus area that includes:

- Potential state actors - Jordan, Lebanon, Oman, Palestine, Qatar, Syria, Saudi Arabia, UAE, Yemen, and Israel;

- Potential shared aquifers - Eastern Mediterranean, Hauran and Jabal Al-Arab, Wasia-Biyadh Deep Aquifer, Wajid Deep Aquifer, Disi/Saq and Tabuk Deep Aquifers, and Jordan River Quaternary;

- Other parties in the Middle East where ABRI has contacts and that might benefit from learning about shared aquifer issues and approaches, such as Iraq; and

- Potential non-state actors - Universities and NGOs from each of the above countries and regional water platforms, such as the Arab Water Council

Described below is a limited set of possible interventions related to groundwater issues in the central Middle Eastern region that are of widespread import and could be undertaken by the Advancing the Blue Revolution Initiative. Such initiatives would enable us to extract lessons from groundwater use and management or mismanagement, and highlight good practices that could reasonably be implemented, preferably through regional platforms that involve interested countries.

CENTRAL MIDDLE EAST

The Central Middle East -- Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen -- is an arid, water scarce region with some of the most varied economic conditions in the world. Countries in the area have some of the lowest water availability per capita in the world.

The geologic structure of the region has important impacts on its hydrogeology. Regarding surface water, there are many ephemeral watercourses in many countries called wadis. However, many if not most of they are dry except during the rainy season. Water from wadis is used or captured in many countries in the region through either spate irrigation or in dams of various sizes. Availability and efficient use of surface water is significantly impacted by evaporation and storage, transport and irrigation facilities and technologies.

Groundwater is a second major source of water in the region. The central Middle Eastern region has several transboundary aquifers, including the Disi/Saq aquifer system shared by Jordan and Saudi Arabia; the Mukella aquifer system shared by Yemen, Saudi Arabia, and Oman; and the Jizan aquifer shared by Yemen and Saudi Arabia.

Access to clean water and sanitation are generally high in the area, with the exception of Jordan, Oman and Yemen. Agriculture employs large segments of the population of countries in the area, it is the largest water using sector (over 50% in all countries and over 90% in some), and water use efficiency in the sector is extremely low.

Water availability in the region is decreasing and predicted to continue to fall through this century placing increased stress on the area's aquifers and hydrological systems (World Bank, 2007a). If only renewable water resources are considered, most countries in the region will, in the near future, not be able to meet their domestic water requirements, and will have to implement aggressive water conservation measures and turn to other sources (e.g., nonrenewable sources, water reuse, desalination, and virtual water).

JORDAN

Water is a key issue affecting Jordan's economic prospects, the well-being of the Jordanian people, and regional stability (USAID 2007). Currently, Jordan is exploring ways to expand its limited water supply and use its existing water resources more efficiently, including through regional cooperation. Jordan's net available renewable water resources are 900 million cubic meters per year (MCM/year) or 138 m^3/year per capita. Renewable groundwater in Jordan is estimated at 277 MCM/year (Tutundjian 2001), mostly located in the Yarmouk, Amman-Zarqa and Dead Sea basins. Nonrenewable groundwater (of unknown, but large quantity) is found in the Disi/Saq[1] and Jafr aquifers. Groundwater extraction has reached a level where there is an imbalance of withdrawal over recharge with an annual deficit of about 276 MCM/year.

The Disi/Saq is of great importance because of Jordan's and Saudi Arabia's independent plans for major development of the aquifer in the near future. Other aquifers are not of significant concern at the moment, but will likely be the source of development and international allocation in the future.

In the past several years, Jordan's Ministry of Water and Irrigation (MWI) has initiated talks with counterparts in neighboring countries (Israel, Syria and Saudi Arabia) to establish bilateral committees to discuss joint coordination and management of transboundary aquifers. However, most of these initiatives are in their early stages, and to date have made little measurable progress.

The one transboundary aquifer discussion that has made the most progress so far has been focused on the Disi/Saq aquifer. These talks have led to the establishment of a joint Jordanian-Saudi Arabia aquifer management committee, and a draft agreement on information sharing between the countries was scheduled to be signed in January 2008.

[1] This aquifer, lying beneath both Jordan and Saudi Arabia, is known as the Disi aquifer in Jordan and the Saq aquifer in Saudi Arabia.

SAUDI ARABIA

Saudi Arabia is the largest country in the central Middle Eastern region. Saudi Arabia has a harsh, dry desert climate with large temperature extremes. Most of Saudi Arabia's water resources are from groundwater (with the majority from nonrenewable sources) and desalination. The country's renewable water resources are about 6,900 MCM/year (~281 m^3/year per capita). Estimated nonrenewable groundwater use is about 15,500 MCM/year.

DISI/SAQ AQUIFER

The Disi/Saq aquifer (known as the Disi aquifer in Jordan and the Saq aquifer in Saudi Arabia) is a nonrenewable, transboundary aquifer that extends from south Jordan into Saudi Arabia. The water quality of the aquifer is generally good. The aquifer stores significant quantities of water of very old origin and has a very small recharge. The aquifer is the main nonrenewable groundwater resource in Jordan and currently supplies municipal and industrial water to Aqaba and water for irrigation purposes. In Saudi Arabia, aquifer development began in the 1950s, but increased dramatically in the 1980s. Recently, Jordan has launched a $600 million project to pump water from the aquifer to supply water by pipeline to Amman.

JOINT JORDAN - SAUDI ARABIA TRANSBOUNDARY AQUIFER ACTIVITY

Recent expansion of irrigated area in Saudi Arabia in the Disi/Saq region and Jordanian plans to develop the aquifer for municipal water supply for Amman have created a situation where joint efforts to manage the nonrenewable aquifer are necessary.

Jordan and Saudi Arabia are planning to sign an agreement in January 2008 regarding the exchange of information on the Disi/Saq aquifer. In addition, Jordan is creating a Department of Joint Aquifers within the Ministry of Water and Irrigation to handle shared water issues between Jordan and its neighbors.

The ABRI Transboundary Groundwater Team's consultancy and situation assessment of groundwater issues in Jordan in December of 2007, identified that both Jordan and Saudi Arabia might benefit significantly from ABRI assistance in discussions of joint management of the Disi/Saq Aquifer. (ABRI team members have been involved in numerous successful similar transboundary surface and groundwater management issues both internationally and in the U.S.).

The ABRI Team's interview with Eng. Khaldon H. Khashman, Secretary-General of the Jordanian Ministry of Water and Irrigation, and other water officials in the country indicated that he and others were very interested in exploring how ABRI might help with future talks with the Saudis.

Because of the Disi/Saq Aquifer's importance for both countries, it is the ABRI Transboundary Groundwater Team's considered assessment that it is important to explore potential future ABRI involvement with the Jordanians, Saudis, USAID and the U.S. State Department. The ABRI Team recognizes the challenge and political sensitivity of engaging the Saudis and Jordanians in a dialogue of this type, and ABRI's potential involvement. Now that the possibility of US government support for discussions on the joint management of the Disi/Saq aquifer has been suggested to the Jordanians, if they raise this to their Saudi Arabian counterparts, there may be a joint request by the countries to the US Department of State for support in this area. In that event, as a possible follow-up to the joint request for US support, we see several possible options for how to proceed, which are dependent on the will and interests of the parties.

In general, our approach would be to build a technical and institutional platform for cooperation and sharing information on and management of transboundary aquifers. This platform could involve:

1. Separate activities in Saudi Arabia and Jordan in support of Disi/Saq discussions;
2. Indirect Support to Disi/Saq discussions between Saudi Arabia and Jordan (Free standing consultations and meetings independent of joint discussions); or

3. Direct support to Disi/Saq discussions between Saudi Arabia and Jordan

A determination of which of the above strategies will be most acceptable to the parties and feasible for ABRI can only be determined through additional discussions and possibly an additional situation assessment visit to the region.

Forms of assistance that might be provided by ABRI include:

- Relationship and confidence building;
- Creation of effective information exchange, dialogue, and problem solving forums and procedures;
- Individual and joint information gathering and exchange processes;
- Approaches for identification and articulation of individual and joint interests;
- Clarification and agreement on next steps to address common aquifer management issues;
- Provision of information on organizational structures and technical data relevant for transboundary water management initiatives;
- Capacity building training in collaborative problem solving and interest-based negotiation procedures;
- Consultation on meeting planning and agenda development of technical working groups;
- Facilitation of technical working groups;
- Consultation on meeting planning and agenda development of plenary sessions; and
- Facilitation of plenary groups.

Intended forums and activities that ABRI could offer or provide to involved parties include:

- Assuming that there is a request from the countries for U.S. government support of joint aquifer activities between the countries, the ABRI Team would conduct a planning trip to Jordan and Saudi Arabia (3-4 days in each country) to plan initial activities.

- ABRI could provide various kinds of support identified in the options above for at least three meetings/workshops (3 days each) in conjunction with the Jordan-Saudi Arabia Joint Aquifer Committee. Early activities might include and encourage:

    - Relationship and confidence building;
    - Training to build capacity in transboundary aquifer problem solving and negotiation;
    - Provision of state-of-the-art information on institutional arrangements for transboundary water resources management (especially groundwater management);
    - Provision of state-of-the-art information on aquifer information management;
    - Exchange of information on Jordan-Saudi Arabia shared aquifers; and
    - Training or exchange of information on other topics identified by Jordan and Saudi participants

- ABRI could conduct at least two Individual working meetings in Jordan and Saudi Arabia (3 to 4 days in each country) to follow up on joint meeting outcomes and to plan for next meeting. Exact agenda items for these meetings will not be known until after the first joint meeting.

- ABRI would conclude the initiative with an Activity Summary and Closure Report closure including reporting lessons learned and next steps

Anticipated outcomes of the activity:

- Improved working relationships and confidence building between parties;
- Establishment of more institutionalized and effective dialogue/problem solving forums and procedures;
- Effective technical information exchange;
- Identification of possible joint activities such as monitoring, future information exchange, common management approaches; and
- First steps toward development of joint management plans.

Next steps to implement the activity:

The Government of Saudi Arabia has not yet been consulted on this activity. Next steps in the design of this activity include decisions by USAID and the U.S. State Department on how to proceed. These decisions include how and when to re-connect with the Jordanians to inform them about U.S. interests to proceed (or not proceed) with any further exploratory talks about future ABRI assistance, and, if a decision is made to move forward, what entity will contact the Saudis to explore the option of assistance from the U.S.

Approximate Budget for Activities:

Preparation of accurate and detailed budgets and schedules is not possible at this time since additional consultations to develop detailed priorities and obtain approval of the various governments have not taken place yet. Priorities and details for work may change as a result of these anticipated consultations. However, tentative budgets and schedules are provided here. These budgets include costs for expatriate and local ABRI contractors and consultants but do not include costs of ABRI local staff and meeting costs. For the most part, the level of activity and the budget is and will be driven by available funds.

For this activity, it is assumed that two expatriate consultants and one local consultant will participate in each of six trips to the region and that an additional expatriate consultant (as resource person) will participate in each joint of three Jordanian-Saudi meetings. Of course, these trips and the level of effort are subject to the mode in which the activity proceeds (see options 1 – 5 above). The cost of this activity is estimated to be $380,000.

1. INTRODUCTION

1.1 PROJECT BACKGROUND AND REPORT PURPOSE

The Advancing the Blue Revolution Initiative's (ABRI) approach is to boldly tackle high profile, contentious and politically significant transboundary water issues in the Middle East and Africa, which have not previously seen adequate traction or resolution. Groundwater is commonly a major share of a country's water resources in the Middle East. In many countries in the region, groundwater accounts for large percent of the renewable resource, and when nonrenewable groundwater–heavily mined in some countries–is added to the mix, groundwater has a far greater share.

Initial consultations in the Middle East indicate that resolving transboundary groundwater disputes is among the highest priorities of governments. In Jordan, for example, government officials repeatedly stated that managing aquifers with neighboring countries is critical.

This report describes initial consultancies by DAI's Transboundary Groundwater Team in Jordan to establish links with key stakeholders, discuss with them issues of importance and their priorities, develop a potential implementation agenda for groundwater projects in the region and design a scope of work for a multi-year activity. The objectives of this effort are to:

- Determine the availability and importance of renewable and nonrenewable groundwater in countries in the Middle East;
- Identify and prioritize a set of groundwater management issues – both transboundary and domestic – that will inform the implementation agenda for ABRI;
- Identify constraints and opportunities for addressing transboundary and domestic aquifer conflicts;
- Design a set of interventions in the form of scopes of work for one or more activities, which can serve as models for international and domestic collaboration; and
- Determine best management practices in transboundary and domestic groundwater management, drawn from cases where issues were successfully resolved, as a basis for ABRI interventions.

The approach described here has considered a central Middle Eastern focus area that includes:

- Potential state actors - Jordan, Lebanon, Oman, Palestine, Qatar, Syria, Saudi Arabia, UAE, Yemen, and Israel;

- Potential shared aquifers - Eastern Mediterranean, Hauran and Jabal Al-Arab, Wasia-Biyadh Deep Aquifer, Wajid Deep Aquifer, Disi/Saq and Tabuk Deep Aquifers, and Jordan River Quaternary;

- Other parties in the Middle East where ABRI has contacts and that might benefit from learning about shared aquifer issues and approaches, such as Iraq; and

- Potential non-state actors - Universities and NGOs from each of the above countries and regional water platforms, such as the Arab Water Council

Described below is a limited set of possible interventions related to groundwater issues in the central Middle Eastern region that are of widespread import and could be undertaken by the Advancing the Blue Revolution Initiative. Our emphasis is on extracting lessons from groundwater use and management or mismanagement, and highlighting good practices that can be reasonably implemented, preferably through regional platforms that involve interested countries.

1.2 CENTRAL MIDDLE EAST REGION

1.2.1 INTRODUCTION

The central Middle Eastern region -- Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen -- is an arid, water scarce region with some of the most varied economic conditions in the world. Countries in the area have some of the lowest water availability per capita in the world. Access to clean water and sanitation are generally high in the area, with the exception of Jordan, Oman and Yemen. Agriculture employs large segments of the population of countries in the area, it is the largest water using sector (over 50% in all countries and over 90% in some), and water use efficiency in the sector is extremely low.

Water availability in the region is decreasing and predicted to continue to fall through this century placing increased stress on the area's aquifers and hydrological systems (World Bank, 2007a). If only renewable water resources are considered, most countries in the region will, in the near future, not be able to meet their domestic water requirements, and will have to implement aggressive water conservation measures and turn to other sources (e.g., nonrenewable sources, water reuse, desalination, and virtual water).

The geologic structure of the area is very important to the hydrogeology of the region. There are many ephemeral watercourses called wadis in the region, which are dry except during the rainy season; there and plentiful ancient aquifers of nonrenewable groundwater beneath much of the area.

The central Middle Eastern region has several transboundary aquifers, including the Disi/Saq aquifer system shared by Jordan and Saudi Arabia; the Mukella aquifer system shared by Yemen, Saudi Arabia, and Oman; and the Jizan aquifer shared by Yemen and Saudi Arabia. Of these the Disi/Saq is of great importance because of Jordan's and Saudi Arabia's independent plans for major development of the aquifer in the near future. Other aquifers are not of such great concern at the moment, but will likely be the source of development and international allocation in the future.

Jordan and Saudi Arabia are considered in some detail below. During a recent trip (December 2007), Jordan was visited to gain further first-hand knowledge of the groundwater situation there.

1.2.2. JORDAN

In 1988, the Ministry of Water and Irrigation (MWI) was created bringing the Water Authority of Jordan (WAJ) and the Jordan Valley Authority (JVA) under one umbrella. The organizations have the following abbreviated responsibilities (Tutundjian, 2001):

- Ministry of Water and Irrigation (MWI – the "Little Ministry") – responsible for developing and implementing water and wastewater development programs;
- Water Authority of Jordan (WAJ) – Responsible for municipal water use; and
- Jordan Valley Authority (JVA) - charged with the social and economic development in the Jordan Rift Valley from the Yarmouk River in the north to Aqaba in the south, as well as the responsibility for the touristic development of the Jordan Rift Valley.

MWI, WAJ and JVA each has an independent secretary-general who reports directly to the Minister of Water and Irrigation. MWI does not have authorizing parliamentary legislation, but operates under a set of bylaws approved by the executive branch. The main tasks of the MWI are: analyzing and formulating water policy, undertaking strategic planning and resource development programs, formulating water allocation options, establishing a water resource data bank and analyzing data, monitoring and controlling water quality.

During the past several years, Jordan's Ministry of Water and Irrigation (MWI) has made contacts with its counterparts in Israel, Syria and Saudi Arabia to discuss joint coordination and management of

transboundary aquifers. As a result of Jordan's interest in this area, the government plans to set up a unit in MWI to coordinate all transboundary aquifer initiatives. To date, discussions with Syria focused on conducting joint studies have not resulted in much progress or coordination. Talks with Israel are ongoing.

The discussions that have made the most progress concerning coordination of activities related to transboundary aquifers have been with Saudi Arabia focused on the Disi/Saq aquifer in the south of the country. In a meeting in December among the secretary general of the Ministry of Water and Irrigation, the secretary general of the Jordan Valley Authority and USAID/DAI consultants, they indicated that an agreement to form a joint committee between Jordan and Saudi Arabia for the purpose of exchanging information on the Disi/Saq aquifer would be signed within the next month. This agreement opens a significant opportunity for ABRI to provide both technical and process assistance to the involved parties.

1.2.3. SAUDI ARABIA

In 2002 all water agencies and authorities of Saudi Arabia were placed under the Ministry of Water (MW). In September 2003, responsibility for the electricity sector was added to the mission of the ministry and its name was changed to the Ministry of Water and Electricity (MWE). The government adopted several regulations for management of groundwater resources, including:

- Licensing of well drilling including submitting site, aquifer, depth, design, development and production information;
- Supervising well drilling and development;
- Controlling the use of produced groundwater;
- Banning well drilling in depleted areas or in aquifers with water level declines and quality change; and
- Designating water protection zones for domestic use.

Specific groundwater management objectives (stated in Royal Decree No 125 on 25/4/1422, 16 July 2001) are:

- Supervise the water sector and its facilities, and the management, monitoring and organization;
- Carry out all related studies of water in order to assess its resources, storage and available volumes; and
- Prepare a comprehensive water plan defining the policies related to water, development of its resources, and water resources protection and conservation.

1.2.4. DISI/SAQ AQUIFER

The Disi/Saq aquifer (known as the Disi aquifer in Jordan and the Saq aquifer in Saudi Arabia) is a nonrenewable, transboundary aquifer that extends from south Jordan into Saudi Arabia. Generally, groundwater in the aquifer flows from Saudi Arabia in the south towards north-east Jordan turning northwest in central Jordan and finally discharging in the wadis draining the eastern highlands of the Rift Valley (World Bank 2004[2]). The water quality of the aquifer is generally good with TDS values typically under 1000 ppm. The aquifer stores significant quantities (~280 km^3) of water of very old origin (~30,000 years) and has a very small recharge (~0.3 km^3/year) (Sharaf and Hussein 1997).

The Disi/Saq aquifer in is the main nonrenewable groundwater resource in Jordan. On the Jordanian side, the aquifer supplies the Aqaba with water for municipal and industrial uses and for irrigation purposes (Tutundjian 2001). In Saudi Arabia, Saq/Disi aquifer pumping began in the 1950s, but increased dramatically in the 1980s after a government decision to subsidize wheat production (Lloyd and

[2] One of the principle conclusions of WB report: Measures should be undertaken to enhance regional cooperation and coordination with Saudi Arabia that shares the Disi aquifer.

Pimm 1990). Recently, Jordan has launched a $600 million project to pump water from the aquifer to supply water by pipeline to Amman. In 1985/86 the total area irrigated by water from the aquifer was 404,000 ha (6,920 ha in Jordan and 336,900 ha in Saudi Arabia). Total withdrawal from the aquifer was 3,193 MCM/year (36 MCM/year in Jordan and 3,157 MCM/year in Saudi Arabia) (Lloyd and Pimm 1990).

Figure 1
Map of the Disi Aquifer

2. POSSIBLE JOINT JORDAN - SAUDI ARABIA TRANSBOUNDARY AQUIFER ACTIVITY

2.1. BACKGROUND

This report describes initial consultancies by DAI's Transboundary Groundwater Team in Jordan to establish links with key stakeholders, discuss with them issues of importance and their priorities, develop a potential implementation agenda for groundwater projects in the region and design a scope of work for ABRI multi-year activities. The objectives of this effort are to:

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- Other parties in the Middle East where ABRI has contacts and that might benefit from learning about shared aquifer issues and approaches, such as Iraq; and
- Potential non-state actors - Universities and NGOs from each of the above countries and regional water platforms, such as the Arab Water Council

A limited set of possible interventions is described in the following sections, concluding with the team's recommendations for activities to implement.

Transboundary aquifers are very important to Jordan since they share significant aquifers with their neighbors, especially Saudi Arabia and Syria. Recently, there has been some exchange of information and opinions through Jordan-Saudi Arabia and Jordan-Syria Joint Committees.

As noted previously, both Saudi Arabia and Jordan want to exploit large quantities of nonrenewable groundwater from the Disi/Saq aquifer which underlies both countries. A previous agreement between Jordan and Saudi Arabia resulted in an exchange of land in the border area of eastern Jordan overlying the Disi aquifer for Saudi Arabian land on the Red Sea near Aqaba. One of the provisions of the agreement was that the natural resources, including water, of the exchanged lands would be jointly managed (Haddadin 2006). It has been noted by several authors, that as long as the Disi/Saq well fields in Saudi Arabia are sufficiently far from the Jordan border, there should be no negative affects in Jordan

from Saudi pumping of the aquifer for several decades, but this is subject to dispute since concrete information on this issue is difficult to obtain.

Recent expansion of irrigated area in Saudi Arabia in the Disi/Saq region and Jordanian plans to develop the aquifer for municipal water supply for Amman have created a situation where joint efforts to manage the nonrenewable aquifer are necessary. Jordan and Saudi Arabia have drafted and are prepared to sign an agreement regarding the exchange of information on the Disi/Saq aquifer[3]. In addition, Jordan is creating a Department of Joint Aquifers within the Ministry of Water and Irrigation (MWI) to handle shared water issues between Jordan and its neighbors. The Secretary-General of MWI has noted that the ministry would welcome any USAID attempts to support them in their efforts to manage transboundary aquifers, especially with Saudi Arabia. There is an existing Jordan–Saudi Arabia joint committee on transboundary aquifers that has met several times. Both Jordan and Saudi Arabia have sent delegations of 6-7 people to the meetings which were very productive[4].

The USAID/Jordan mission has not focused on transboundary issues to date, but representatives there mentioned that that this would be a useful task that would complement the Mission's current work[5]. MWI is moving to start the Disi/Saq aquifer project before next summer and the USAID/Jordan mission believes that Jordan–Saudi Arabia collaboration is very important at this time.

Secretary General Khaldon of the Jordanian Ministry of Water and Irrigation has said that Jordan would welcome USAID support to explore transboundary aquifer issues with Saudi Arabia[6]. However, it is not clear whether Saudi Arabia has the same level of interest or commitment to either the process or ABRI's possible involvement.

The Saudi's have shown a clear interest in collaborating with Jordan, to some extent, on this issue by drafting and preparing to sign an agreement on information exchange over transboundary aquifers. Thus, they are interested in being at some kind of "table" for a dialogue on cooperation. In addition, the Saudi government seems to respect international water law to the extent that they are preparing to agree to exchange information (and perhaps more, e.g., consultation about future development plans, joint monitoring, etc.) on the transboundary Saq/Disi aquifer. However, their long term goals and aspirations are not clear.

One possible reason for the Saudi's desire to address Saq/Disi aquifer use could be the impact of government food security policies of the 1980s which had a major impact on water use and availability. This program was stopped in the 1990s and many of the policies that encouraged inefficient water usage in agriculture are being reversed in favor of an integrated approach to water management.[7]

The country now seems to be committed to addressing their water scarcity and that this will be a major problem for them in the future. They continue to seek innovative ways to deal with this problem, including increased water use efficiency, incentives to conserve water and ensure efficient water use decisions (especially in agriculture) and regional cooperation with their neighbors to ensure the sustainability of transboundary aquifers.

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[3] Personal communication, Eng. Khaldon H. Khashman, Secretary General, Ministry of Water and Irrigation, December 2007

[4] Personal communication, Khair Al Hadidi, Director, Groundwater Basins Directorate, Water Authority of Jordan, December 2007

[5] Personal communication, John Smith-Sreen, Director, Office of Water and Environment, USAID-Jordan, December, 2007

[6] Personal communication, December, 2007

[7] In 1993, the government reduced the area of wheat cultivation eligible for price support to 25 per cent of its previous size (Abderrahman 2001).

2.2. OPTIONS FOR ABRI JOINT JORDANIAN - SAUDI AQUIFER ACTIVITY

The ABRI groundwater team recognizes the challenge of bringing the Saudi's into a dialogue with Jordan through the mechanism proposed here and our possible involvement. Now that the possibility of US government support for discussions on the joint management of the Disi/Saq aquifer has been suggested to the Jordanians, if they raise this to their Saudi Arabian counterparts, there may be a joint request by the countries to the US Department of State for support in this area. In that event, as a possible follow-up to the joint request for US support, we see several possible options for how to proceed, which are dependent on the will and interests of the parties. These are outlined below with increasing levels of engagement by ABRI:

1. **Separate Support Activities to Saudi Arabia and/or Jordan in Support of Disi/Saq Discussions**
   If joint activities, for whatever reason, are not possible, we can offer to conduct separate, parallel activities that would support the discussions in each country, which might be similar or different depending on the individual party's interests or needs.

2. **Indirect Support to Disi/Saq Discussions between Saudi Arabia and Jordan**
   If the parties do not want direct ABRI's involvement in their deliberations, we can offer to conduct a number of joint, complementary and supportive activities that would encourage their process.

3. **Direct Support of Disi/Saq Discussions between Saudi Arabia and Jordan**
   If the parties are amenable to ABRI's direct support of their discussions, we would develop a mutually acceptable agreement on a scope of work for ABRI and respective activities.

Innovative and revolutionary aspects of all of the activities identified above, assistance to Jordan and Saudi Arabia on their joint aquifer, include: (1) addressing an issue that has never or only minimally been addressed in the past; (2) working with parties who have had no or minimal interaction or successful problem solving/negotiations; and (3) implementing new approaches addressing above issues and parties that are likely to produce unique and innovative outcomes.

2.3. RECOMMENDATION FOR ABRI JOINT JORDANIAN - SAUDI AQUIFER ACTIVITY

The approach will build a technical and institutional platform for cooperation in sharing information on transboundary aquifers and their management. This will be achieved by creating viable and productive relationships and forums for dialogue, information exchange and needs/interests identification and assessment related to transboundary aquifers shared between Jordan and Saudi Arabia. The overarching objective of the activity is increased viability and enhancement of ongoing operations of the Jordan-Saudi Arabia Joint Aquifer Committee.

Goals of the activity include:

- Relationship and confidence building;
- Creating effective information exchange, dialogue, and problem solving forums;
- Individual and joint information gathering and exchange;
- identifying and articulating individual and joint interests; and
- Clarifying and agreeing on next steps to address common aquifer management issues.

Intended forums and activities that ABRI could offer or provide involved parties include:

- Assuming that there is a request from the countries for US government support of joint aquifer activities between the countries, conduct a planning trip to Jordan and Saudi Arabia (3-4 days in each country) to plan initial activities;

- Support for and possible facilitation of at least three meetings/workshops (3 days each) in conjunction with the Jordan-Saudi Arabia Joint Aquifer Committee to encourage:

    - Relationship and confidence building;
    - Training to build capacity in transboundary aquifer problem solving and negotiation;
    - Provision of state-of-the-art information on institutional arrangements for transboundary water resources management (especially groundwater management);
    - Provision of state-of-the-art information on aquifer information management;
    - Exchange of information on Jordan-Saudi Arabia shared aquifers; and
    - Training or exchange of information on other topics identified by Jordan and Saudi participants

- Conduct at least two Individual working meetings in Jordan and Saudi Arabia (3 to 4 days in each country) to follow up on joint meeting outcomes and to plan for next meeting. Exact agenda items for these meetings will not be known until after the first joint meeting.

- Activity summary/closure including reporting lessons learned and next steps.

Anticipated outcomes of the activity:

- Improved working relationships and confidence between parties;
- Establishment of more institutionalized and effective dialogue/problem solving forums;
- Effective technical information exchange;
- Identification of possible joint activities such as monitoring, future information exchange, common management approaches;
- First steps on development of joint management plans; and
- Increased viability and enhancement of ongoing operations of the Jordan-Saudi Arabia Joint Aquifer Committee

Next steps to implement the activity:

The Government of Saudi Arabia has not yet been consulted on this activity. Based on recent discussions between ABRI and Government of Jordan water officials, it is expected that the Jordanian officials may raise the question of ABRI support with their Saudi Arabian counterparts in their next joint committee meeting. At that time a request may be made to the US Government for US assistance in this area. Then the next steps in this activity would include a trip to Saudi Arabia and Jordan for talks to determine which of the above strategies, or others, may be most acceptable to the parties and feasible for ABRI, and to plan the activity. Key issues to be decided include:

- Technical resources needed and available to participate in the initiative;
- Focus and content of agendas for joint meetings and recruit appropriate resource people;
- Sites and venues for meetings;
- ABRI staffing needs (as opposed to resource people);
- Who to invite and how invitations should be made;
- Budgets for whole project and various components; and
- Other logistical issues.

The key points of contact in the two countries are:

- Secretary General Khaldon H. Khashman of the Ministry of Water and irrigation, Government of Jordan; and
- Vice Minister Ali Al-Tukais of Water and Electricity, Government of Saudi Arabia.

Approximate Budget for Activity

Preparation of accurate and detailed budgets and schedules is not possible at this time since additional consultations to develop detailed priorities and obtain approval of the various governments have not taken place yet. Priorities and details for work may change as a result of these anticipated consultations. However, tentative budgets and schedules are provided here. These budgets include costs for expatriate and local ABRI contractors and consultants but do not include costs of ABRI local staff and meeting costs. For the most part, the level of activity and the budget is and will be driven by available funds. It is assumed that two expatriate consultants and one local consultant will participate in each trip to the region and that an additional expatriate consultant (as resource person) will participate in each joint Jordanian-Saudi meeting. The approximate budget for this activity is $380,000.

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ANNEX A

PEOPLE CONTACTED

JORDAN

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