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See below Executive Summary

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Executive Summary

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Water, an essential component to human health, is linked closely with national, regional, and global political security. Nearly one-third of the global population lives in regions where water consumption currently exceeds 10 percent of renewable freshwater resources. In 2007, the United Nations estimated a 40 percent increase in water use by 2020. In 2025 1.8 billion people will live where water is scarce (United Nations Environmental Program – (UNEP) 2007) and by the 2030s, the world's clean water supply will be increasingly at risk. Growing populations and increasing pollution, especially in developing nations, are likely to make water shortages more acute, with 40 percent of the world's population experiencing water stress or scarcity. Lack of water is expected to reduce food productivity, thereby increasing tension over water resources and food availability. It is expected that as competition for water resources increases, destabilization, particularly at the local and regional level, will increase. The world's water has been compared to global oil supplies[1] suggesting we are reaching the limits of available and usable freshwater specifically at regional scales. Social, political, and ecological breakdown may occur locally or regionally due to increased competition and conflict over water as usable water supplies face physical scarcity (limited sources of water), as well as economic water scarcity (inadequate financial or political means to obtain adequate sources of water), as we approach the 2030s. The possibility or actuality of a water crisis at any scale brings with it a host of economic, political, environmental, and national security concerns that must be addressed in the international theater prior to escalated competition for water resources. The timeline of useable water renewal on a regional scale is correlated with regional considerations such as ecology, types of consumption, governance over natural resources, available infrastructure and technology, etc.

Because water resources often cross political boundaries on a regional scale, focusing water scarcity initiatives on this level is constructive and worthwhile. The United States Government (USG) is actively participating in this process; one such avenue is the Senator Paul Simon Water for the Poor Act. This Act makes access to safe water and sanitation a specific foreign policy objective. It requires Department of State (DOS) in consultation with the US Agency for Aid and International Development (USAID) and other USG Agencies to develop and implement a strategy to provide affordable and equitable access to safe water and sanitation.

DOD as a USG agency, has the chance to address these water related challenges to further US national and military interests to positively impact theater security and stability. Addressing these water concerns can reduce the emergence of weak or chaotic states that become platforms for asymmetric warfare.[18] At the same time addressing these concerns can provide a principle tool for preventive diplomacy and for building cultures of cooperation, [19] environmental stewardship, trade, agriculture, health improvements, economic development, food security and the reduction of the negative impacts of floods and droughts.

This integration of USG agencies begs the question of how DOD is going to develop and implement a DOD water security program which supports US objectives for water. In particular, how can the Combatant Commands (COCOMs) use their unique skill sets to contribute to the overall USG effort in water? What will be the role of the COCOMs? How will they use military assets and reachback capabilities to put in place a programmatic approach to water security and water resources that are in alignment with USG foreign policy objectives? The following discussion and appendices provide a framework to facilitate this process for DOD.

DOD/COCOM


GEOPHYSICAL SURVEYS


ENGINEER REACHBACK


WATER SAMPLING


WELL DRILLING

CENTERS OF

Water Security Program Strategy

22 April 2010

Preface and Acknowledgements

This document is dedicated to all the personnel who contributed their time, effort or support into making this document a reality. Such folks like Jeff Health, Abigail Goss and Lance Batch from the NAVFAC Engineer Service Center; Joe Vietri, Roselle Henn, Robert Pace, Dave Leach and Lloyd Caldwell from the North Atlantic Division, USACE; Lindy Wolner and Don Kisicki, HQUSACE; Steve Grant, Engineer Research and Development Center, USACE; Maria Placht, Jerome Delli Priscoli, will Logan and Bob Pietrowski from the Institute for Water Resources, USACE; William Martin, Coastal & Hydraulics Laboratory USACE; Steve Hearne and Marc Kodack from the Army Environmental Policy Institute, Aaron Salzberg, DOS Bureau of Oceans and International Environment and Scientific Affairs; Matt Robinson, EPA; James Franckiewicz, USAID Bureau for Economic Growth, Agriculture and Trade, Art Kolodziejski and CAPT Chris Kiwus, AFRICOM; Mike Brown and CAPT Greg Zielinski, EUCOM; Eric Wood, Sherry Durst, Ingrid M Verstraeten and Bret Bruce from the U.S. Geological Survey.

When I started this process in 2008, I set out on a simple mission to help AFRICOM determine what if anything they wanted to do for water security and water resourcing. After determining there was no Department of Defense (DOD) policy, let alone any guidance to the COCOMs, I decided to develop the appendices in the enclosed document; with the end state being a strategy document that could be used by DOD and any COCOM as a starting point for DOD water security cooperation and integrated water resource management in a theater of operation.

What this document provides, is a framework that DOD and the COCOMs can use to develop a range of different measures and capabilities to support US foreign policy objectives for water. This document will have failed if it merely generates conversation. The framework and insights presented here will require some level of COCOM action. It is up to DOD and their execution elements, the COCOMs, to determine the level of relevance and apply the tools in this document to the water challenges within each COCOM's area of focus.

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This integration of USG agencies begs the question of how DOD is going to develop and implement a DOD water security program which supports US objectives for water. In particular, how can the Combatant Commands (COCOMs) use their unique skill sets to contribute to the overall USG effort in water? What will be the role of the COCOMs? How will they use military assets and reachback capabilities to put in place a programmatic approach to water security and water resources that are in alignment with USG foreign policy objectives? The following discussion and appendices provide a framework to facilitate this process for DOD.

Purpose

The purpose of this document is to recommend that Water Security be incorporated as an essential element of DOD strategy, as well as, COCOM Theater Security Programs. This document provides a rationale and justification for a DOD/COCOM Water Security/Water Resources Program and provides specific recommendations as well as a course of action for its implementation. The USAID, DOS, DOD, and other US Government (USG) agencies all play critical roles in making Water Security a successful and sustainable part of USG strategic security interests.

Introduction

Competing demands for water can lead to conflict, but they can also provide the potential to promote regional cooperation and dialog on sustainable sharing of resources and create opportunities for communication and cooperation between nations. Cooperation on water issues offers an important and viable tool for conflict prevention and COCOM engagement strategies. Mechanisms for cooperation such as developing and assisting with watershed, river basin, and coastal watershed programs can promote regional and interstate exchanges needed to relieve pressures leading to conflicts over water. The COCOMs and USG agencies can facilitate this cooperation, particularly when water issues transcend national boundaries and are river basin in scale.

If water is not part of a Theater Security Cooperation (TSC) plan it can be a factor in Theater instability. Periodic droughts plague certain parts of the world, resulting in or potentially resulting in mass migration of people into adjoining areas to look for water and food. Moreover flooding periodically displaces people and causes damage to roads, bridges and other critical infrastructure and effects food security. Associated with these events is poor water quality and sanitation, resulting in large outbreaks of water borne diseases. Climate change also has an impact on water availability. Modeling predicts temperature increases in many areas, desertification and changes to the distribution of rainfall.

As countries seek economic development through increased agriculture, infrastructure and improved quality of life, greater demand will be placed on this already scarce resource. Population growth and climate change will further impact future water availability. The population of the world will add approximately 60 million people each year and reach a total of 8 billion by the 2030s. Ninety-five percent of the increase in population will occur in developing countries. Furthermore, the transboundary nature of water demands coordination and cooperation across boundaries. Inequitable upstream use of water by one nation will reduce available quality and quantity of water for downstream nations, which could result in conflicts and instability. Oregon State University data from several years ago found that for conflicting and cooperative water interactions over the last fifty years; 7 disputes involved violence, 507 created conflicts, 200 involved treaties and 1,228 were solved cooperatively.[2] While this data is generally encouraging, the sheer number of potential conflicts—many of which are in areas of the world that are characterized by violent conflict and resource scarcity—is cause for reflection. Regardless, increasing population pressure, changes in consumption patterns and climate are sure to test the system.

The Millennium Project (ref: http://www.millennium-project.org/millennium/Global_Challenges/chall-02.html) states that water stress could affect half the world by 2025 and 75% of the world's population by 2050. Currently many nations use water in an unsustainable manner; plus integrated water resources management is lacking in many nations. Water tables are falling on every continent; one in ten of the world's major rivers fail to reach the sea for part of each year; agricultural land is becoming brackish; groundwater aquifers are being depleted and or polluted; and urbanization is increasing water demands on aging water infrastructures.[3] The Food and Agriculture Organization of the United Nations (ref: http://www.fao.org/) estimates that water for agriculture needs to increase 60% to feed an additional two billion people by 2030.

Recently, developed nations in the Middle East and Asia have begun exploiting water and agricultural resources in developing nations like Africa for economically profitable but potentially unsustainable food production for their own countries.[4] Unless major political and technological changes occur, conflicts over tradeoffs among agricultural, urban, and ecological uses of water are inevitable, along with mass migrations and conflicts. Further compounding this problem is the lack of surface water and groundwater hydrologic data. For example, Africa has one-third of the world's major international water basins, but can access less than 6% of its renewable water resources. The lack of hydrologic data makes it impossible to determine the location and sustainable yield of water in most regions. For example, northern Uganda has reportedly seen water levels drop in an unconfined groundwater aquifer by approximately 12 m during the past two decades as new wells constructed by Non Governmental Organizations (NGOs) and private industry over-extract the resource. Uganda officials have repeatedly stated they do not know how much water they are contributing to the Nile River, making it difficult for them to argue the case that they are entitled to a set percentage of the resource. In the Ogaden Region, Ethiopian officials have information indicating large groundwater aquifers may exist, but have no information as to the extent of these aquifers, whether the water is potable, and what the safe yield may be. This area is home to approximately 30 million people and experiences frequent drought, requiring USG agencies such as USAID to spend thousands of dollars to truck water into the region on a recurring basis.

A directly linked issue to water security is food security. Indeed water security is essential to food security. According to a 14 Oct 2009 report published by the Food and Agriculture Organization of the United Nations, more than one billion people worldwide are undernourished.[5] USAID further predicts that global food supplies will need to increase by an estimated 50 percent to meet demand increases in the coming 20 years. Demand for water will rise proportionally to demand for food. At the G8 Summit in July 2009, the United States and other nations agreed to commit $20 billion over the next three years to seek long-term solutions to food security.[6]

Without a clear water security and management strategy, these efforts will likely fail. To provide for food security, a country will need to know how much water is available and what the sustainable withdrawal rates are for agriculture and livestock. Knowledge of both quantity and quality of available water are essential for any long term solutions to be viable.

Senator Paul Simon Water for the Poor Act

Under the Paul Simon Water Act for the poor, the Department of State, in consultation with USAID and other USG agencies is required to develop and implement a strategy "to provide affordable and equitable access to safe water and sanitation in developing countries" [7] within the context of sound water resources management.

The United States government is dedicated to improving the lives of people around the world. U.S. water activities directly contribute to the achievement of U.S. foreign assistance goals by:

- Protecting human health,
- Promoting economic development and food security,
- Advancing peace and security, and
- Providing basic needs in response to natural and human-made disasters.

To attain those goals, the USG is working with countries around the world to achieve water security. This is defined as reliable and sustainable access to an acceptable quantity and quality of water to meet human, livelihood, ecosystem, and production needs while reducing the risks from extreme hydrological events to people, the environment, and livelihoods. This focus on water was reiterated on World Water Day 2010 by the Secretary of State, who in her speech pointed out lack of water as a threat not only to social and economic development but to human security and national security.[8] Water issues were also recognized as integral to the success of many of the U.S. major foreign policy initiatives.

The USG approach as outlined in the Senator Paul Simon Water for the Poor act is focused on achieving three objectives: [9]

1. Increasing access to safe drinking water and sanitation and promoting better hygiene;
2. Improving water resources management; and
3. Increasing the productivity of water resources.

Objective 1 is defined as increasing access to water supply and sanitation, and promoting better hygiene. It includes both short-and long-term sustainable access to safe water and adequate sanitation, as well as activities to improve hygiene. Illustrative activities include:

- Strengthening the capacity of small-scale service providers;
- Improving operations and financial sustainability of drinking water and sanitation services utilities;
- Mobilizing capital for expanding and rehabilitating infrastructure; and
- Improving household- and community-level hygiene and sanitation.

Objective 2 is defined as improving water resources management. An initial step to manage a valued resource is to quantify that resource. Water resources cannot be successfully managed if they are not characterized and measured. Management also includes optimizing drinking water usage among competing requirements while ensuring that human needs are met and environmental resources are protected. At the same time resource management must support regional efforts to manage and/or adapt to hydrological variability and the risks of floods and droughts. Illustrative activities include:

- Improving water resources planning;
  - Ensure there is information describing the quantity and quality of sustainable water, both surface and ground water, and

- Develop country specific, regional and transboundary plans describing how to provide sustainable water supplies for public consumption, agriculture, livestock, and geothermal energy production.

- Addressing water quantity and quality challenges;
  - Characterize the quantity and quality of surface and groundwater resources
  - Inventory current water use
  - Ensure there are reliable, clean water supplies in all regions, and
  - Provide necessary wastewater sanitation.
- Strengthening participatory governance;
- Mobilizing financing; and
- Managing hydrologic variability.
  - Develop flood routing data (100 year flood maps), and
  - Use flood data in designing and building infrastructure

Objective 3 is defined as increasing water productivity. It includes maximizing the efficient and productive use of water used in industrial, agricultural, and other consumptive sectors, as well as supporting pollution prevention programs and other programs that reduce water losses. Illustrative activities include:

- Improving water use efficiency in agriculture;
- Understanding water budgets at pertinent spatial and temporal scales;
- Helping countries adapt to hydrologic variability and climate change;
- Reducing water pollution by industry; and
- Improving water use efficiency in towns and cities.

To achieve water security, the USG

- Makes direct investments in infrastructure:
- Works to strengthen the enabling environment in developing countries through capacity building, strengthening local and regional institutions, and promoting policy and regulatory reform;
- Seeks to raise the political will to address water and sanitation issues at the national and global level; and
- Engages in the dissemination of best practices and proven technologies.[9]

In April 2009, the United States Army Corps of Engineers (USACE) and the Naval Facilities Command (NAVFAC) linked 22 water issues back to the 3 dimensions and 16 objectives found in the Senator Paul Simon Water for the Poor Act (See appendix A). This list of DOD "reachback" capabilities can be used as a starting point for COCOM review of water issues within a theater of operation. To complement this list of issues a Water Workshop Worksheet (Appendix B) and Office of Defense Cooperation (ODC)/Embassy Survey/questionnaire (Appendix C) are provided to identify issues of concern and help with the framing and baseline development of a COCOM water security plan/program. Additionally in June 2009, an initial preliminary conversation at the working level among DOD engineers, DOS OES (Bureau of Oceans and International Environment and Scientific Affairs) and USAID EGAT (Bureau for Economic Growth, Agriculture and Trade) revealed that there are areas of mutual concern and that future collaboration under the whole of governance umbrella would be beneficial to all. From this meeting DOS OES in coordination with the USAID EGAT provided their recommended top five priority objectives for water for DOD to focus on world-wide.[10] See

Appendix D. At that time USACE and NAVFAC reviewed the activities from this workshop and came up with their own internal recommendations to further investigate for worldwide water focus. Refer to Appendix D.[10]

Based on these documents and discussions with DOS OES and USAID EGAT DOD can best support DOS and USAID water security objectives by cooperating and coordinating with USG agencies on mil to mil programs, disaster and humanitarian response, and technical and analytical support. A few examples include:

- Train host country military, or civilian equivalent, on various technologies, including water related resource assessments and monitoring, infrastructure design, construction, maintenance, and protection,
- Train host militaries, or civilian equivalent, on early warning systems, emergency preparedness and disaster response,
- Assist host countries military and/or civilian entities with water data management and surface and groundwater modeling and mapping functions to quantify water resources availability,
- Immediately respond to humanitarian disasters in support of the Office of Foreign Disaster Assistance (OFDA).

A more extensive DOS OES and USAID EGAT recommended list of examples of COCOM activities to support water security concerns are included in Appendix E. Appropriate actions need to be determined on a country by country basis and by the capabilities/requirements of the relevant COCOM.

United States Joint Forces Command (USJFCOM) Concerns

USJFCOM's "2010 Joint Operating Environment" (JOE) includes a discussion of water security issues and how that can affect stability throughout the world. The JOE states that as we approach the 2030s, the world's clean water supply will be increasingly at risk. Growing populations and increasing pollution, especially in developing nations are likely to make water shortages more acute with 40% of the world's population experiencing water stress or scarcity. There is a growing awareness at DOD that the changes in climatic conditions could lead to destabilization of regions around the world and potentially millions of environmental refuges. Agriculture will likely remain the source of greatest demand for water worldwide, accounting for 70% of total water usage.[11] In comparison, industry will account for only 20%, while domestic usage will likely remain steady at 10%. Developed nations are more efficient (yield per unit harvested) than developing nations in using available water supplies for agricultural irrigation and use far less than the 70% average. Increased agricultural efficiency could free limited water supplies for human consumption and sanitation needs. However, there is first an essential need to understand the quantity of surface and groundwater available before USAID, DOS, DOD, or the range of international NGOs and relief organizations sponsor and support agricultural expansion.

Currently the Near East and North Africa use far more than the global average of 70% of available water dedicated to irrigation. By the 2030s, at least 30 developing nations are likely to use even more of their water for irrigation.[12] In recent times; the increasing unreliability of an assured supply of rainwater has forced farmers to turn more to groundwater in many areas. As a

result, aquifer levels are declining at rates between one and three meters per year. The impact of such declines on agricultural production and the associated human populations could be profound especially since aquifers, once drained, may not refill for centuries.[13]

One should not minimize the prospect of conflict over water. In 1967, Jordanian and Syrian efforts to dam the Jordan River were a contributing cause of the Six-Day War between Israel and its neighbors. Today, Turkish dams on the upper Euphrates and Tigris Rivers, the source of water for the Mesopotamian basin, pose similar problems for Syria and Iraq. Turkish diversion of water to irrigate mountain valleys in eastern Turkey already reduces water downstream.[14] Localized; water scarcity could easily destabilize whole regions. The continuing crisis in Sudan's Darfur region, now spreading to Chad, is an example of what could happen on a wider scale between now and the 2030s. Indeed, it is precisely along other potential conflict fault lines that potential crises involving water scarcity are most likely.[15] Similar potential conflict is brewing between the neighboring countries of Ethiopia and Kenya as several large-scale hydropower dams are constructed or planned along major streamcourses downstream from their headwaters. In addition, the government of Uganda is concerned about having little to no understanding about the volume of water originating from transboundary sources flowing in to Lake Victoria or out into the Nile River, a potential source of strife.

The JOE further states "Whether the United States would find itself drawn into such conflict is uncertain, but what is certain is that future joint force commanders will find conflict over water endemic to their world, whether as the spark or the underlying cause of disputes between various racial, tribal, or political groups. If they are called on to intervene in a catastrophic water crisis, they might well confront collapsing or impotent social networks and governmental services. Beyond the problems of water scarcity, will be those associated with water pollution, whether from uncontrolled industrialization, as in China, or from the human sewage expelled by the mega-cities of the world. The dumping of vast amounts of waste into the world's rivers and oceans threatens the health and welfare of large portions of the human race, to say nothing of the affected ecosystems. While joint forces will rarely have to address pollution problems directly, any operations in polluted urban areas will carry considerable exposure risk. Hence, commanders may be unable to avoid dealing with the consequences of chronic water pollution."[16]

Water Security Impacts on COCOM's Mission

A COCOM's Theater Security Cooperation (TSC) mission is to work in concert with other USG agencies to enhance security, regional stability and support global initiatives. COCOMs are tasked to assist partners so that they can provide for their own security in ways that permit realization of partner nation capacity and potential. Depending on circumstances water security may be an essential component of the COCOM's Theater Security Cooperation Program from Country Campaign plans to Regional and Theater Campaign Plans. At the same time these TSC programs should be coordinated and complement DOS Mission Strategic Plans and USAID Country Assistance Strategy.

In Secretary Clinton's 2010 World Water Day speech, she states "For the U.S., water represents one of the great diplomatic and development opportunities of our time. Water is Key to U.S. Diplomatic Relations - Successful engagement on water can also affect how our country is perceived in the world." Currently, DOS and USAID lead the water resources programs in

Theater. A COCOM's primary concern with regard to water security should be that COCOM stability objectives are being addressed by these DOS and USAID led programs. Where COCOM objectives are not fully addressed, a COCOM needs to identify and implement the best method to address those concerns, in concert with DOS and USAID existing programs. This can be facilitated through a Whole of Governance Water Working Group (See Appendix F). This tool allows USAID, the Department of State (DOS) and the Department of Defense (DOD) hereafter called the "3D" (representing Development, Diplomacy and Defense) to evaluate and reconcile U S agencies' and departments' support for water and sanitation within the Joint Operational Area of a COCOM.

Proposed Course of Action

The following water security program methodology will help ensure that water issues are addressed throughout the execution of the COCOM mission. The overall goal of this methodology is to determine how water resources issues should be addressed during execution of the COCOM mission to promote a stable and secure environment. This program should leverage existing DOD OES, USAID EGAT, as well as other USG agencies, non-governmental and international community efforts to identify and promote a single, coordinated USG approach to water issues. Where unique DOD capabilities exist, DOD should offer to make those capabilities available so they may be incorporated into the existing DOS and USAID approach. DOD strengths typically include technical and engineering resources and knowledge.

The integration of water security into the COCOM strategy should include the following steps:

1. Identify Water Security Scope

This identifies water related areas of concern to the COCOM mission. Areas of concern should include:

- Coalition/partner military organizations provide sustainable clean drinking water at their installations and to deployed troops,
- Coalition/partner military organizations are equipped with basic water treatment and sanitation knowledge to set up outposts or encampments in support of operations while minimizing risk of contamination and sickness,
- Coalition/partner military organizations can respond to violent acts and disasters by providing clean water to affected residents,
- Coalition/partner military organizations with a Civil Affairs (CA) or engineering capability have the training and knowledge necessary to construct successful, sustainable, stability-promoting water projects for local residents,
- Coalition/partner military organizations can protect their residents from attack during the search for water,
- Foster host nation/partner military organizations awareness of existing water infrastructure such that water supply systems, dams, well systems, and bridges are protected/ secured to mitigate violent acts and natural disasters,
- Foster host nation/partner military organizations awareness for review of new water infrastructure facilities under construction so that they are protected/secured to mitigate violent acts and sited to minimize exposure to natural disasters,
- Ensure U.S. funded water infrastructure/facilities under DOD construction are protected/secured and sustainable relative to projected population growth and centralization,

- Working with DOS to ensure neighboring countries and their militaries abide by treaty conditions with regard to the water resources,
- Addressing water issues as required in COCOM plans and projects,
- A review of DOD technical and analytical support that can be provided to partners and stakeholders to further leverage COCOM capabilities to support integrated water resource management,
- A deliberate examination (Military Decision Making Process (MDMP) and Knowledge Development Division (IKD) analysis) on how the COCOM can leverage organic and reachback capabilities to address water security, to include how DOD reachback agencies can be applied beyond but still complement DOS and USAID lead programs. The opportunity exists to amplify on this approach by addressing:
  - ✓ Climate change impacts on water security,
  - ✓ Transnational/regional (river basin wide) water resource assessments (groundwater/surface water),
  - ✓ Integrated Water Resources Management,
  - ✓ Multi-objective river basin planning,
  - ✓ Relationship of water availability to food security,
  - ✓ Water-Energy development,
  - ✓ Water infrastructure in rapidly urbanizing areas and
  - ✓ Relationship of Water to Socio Cultural impacts.

As the water security program is developed within a COCOM, other areas of concern will be added to the list above.

2. Identify COCOM Stakeholders
   Stakeholders would include the J2, J3, J4, J5, J9 and equivalents for non J code COCOMs. The water security program must be socialized and refined with these stakeholders prior to finalizing the program scope.

3. Identify Potential Partners and Programs
   USAID and other USG agencies and organizations have existing water programs and are usually the COCOM's primary partners. In addition, other national governments and international organizations also have programs that address water. As part of the development of a COCOM's water security program, the COCOM needs to determine who are the appropriate partners and if they are willing to partner with the COCOM. Once the partners are identified, details of their water programs will need to be obtained and used to help formulate the COCOM's water security program. In some instances there is a substantial in-continent community of water expertise and players. It would be presumptuous and improper for COCOMs to introduce and embark on initiatives (particularly those regional in nature) without collaborating with these entities. COCOMs will need to reach out to country teams and interagency representatives to identify these stakeholders and to understand whether existing organizations are balanced and fully representative of all stakeholders.

4. Identify and Prioritize Gaps
   After gathering a list of relevant existing programs, an evaluation will be made to determine how these programs can contribute to satisfying all or part of a COCOM's areas of concern.

This includes identifying programmatic gaps, including scope and funding shortfalls, in existing programs to determine where the COCOM's water security concerns are not being addressed. The gaps will be prioritized to determine which are most important with regard to promoting a secure and stable environment. In addition, once this evaluation is complete, the list of potential partners identified in step 3 can be finalized.

5. Examine Potential Actions to Close Gaps
   Potential actions to close gaps include modifying the existing COCOM work processes, requesting that other agencies modify their existing programs, or develop new program efforts. In some cases, DOD has unique technical expertise in-house that can be used to close gaps. As part of this step, the potential actions to close gaps will need to be prioritized and potential actions further defined to include estimated total costs for budgeting purposes. It is expected that it will take a number of years to achieve water security. The timelines to close gaps will need to be balanced with projected annual funding availability as discussed in step 6 below.

6. Identify Potential Funding Sources and Develop Funding Proposals
   For existing programs, funding potential may be collected in Step 3 above. For gap areas, new funding sources may need to be identified or existing programs may require additional funding. If we consider leveraging NGOs, USG agencies and country level players and think beyond the traditional funding sources associated with the COCOM funding streams, there might exist an array of additional funding sources to address water security related issues that go beyond what is currently being contemplated. The preferred approach is to fund water security program actions from a variety of fund sources to avoid negatively impacting on existing efforts. For example, instead of trying to fund all efforts using Humanitarian Assistance (HA) funds; funding may come from:
   - O&M funding,
   - DoD Section 1207/1210 Funds - In Section 1207 of the FY 2006 National Defense Authorization Act, Congress authorized the Department of Defense (DoD) to transfer up to $100 million per year to the Secretary of State for "reconstruction, security, or stabilization assistance to a foreign country." This assistance can be in the form of either services or funds. Congress then reauthorized this authority in Section 1210 of the FY 2008 Defense Authorization Act. These funds have hence been informally referred to as "1207" or "1210" funds,
   - Capacity building of foreign military forces authority (NDAA 1206 in FY10),
   - Appropriated funds for State Partnership Program authority (NDAA 1210 in FY10),
   - Foreign Military Sales funds (NDAA 1207 authority),
   - International Military Education and Training (IMET) funds for Mil to Mil Training,
   - Overseas Humanitarian Disaster Assistance and Civic Aid (OHDACA),
   - DOS and USAID funds earmarked for the Senator Paul Simon Water for the Poor Act,
   - Economic Support Funds (ESF) – Congress established the ESF to promote economic and political stability in strategically important regions where the United States has special security interests,
   - Millennium Challenge Corporation - Provides large grants for economic improvement to countries with good governance but poverty conditions,

- Section 234 of the Water Resources Development Act of 1996, as amended – This allows USACE to support other federal agencies, international organizations and foreign governments on matters of national significance to the U.S. related to water resources, infrastructure development or environmental protection. COCOM support is not direct but can be requested to support US Embassy interests. Appropriations are approximately $400,000 annually.

Once the funding strategy is agreed to the appropriate POM issue papers, budget requests, and other documents and justifications will need to be developed and socialized with the financial and execution community. Certain programs may need additional funding to ensure all priority items are fully funded. Based on the availability of funds, execution plans can be developed showing funding phasing and execution goals.

7. Develop Processes to Implement Program
   Once the water security program is defined, develop work processes to address the gaps to ensure the program is fully executable.

8. Develop Performance Metrics
   Develop performance metrics and reporting mechanisms to evaluate effectiveness and progress toward desired goals and water security program measures of success.

9. Begin Execution and Continue Coordination Within DOD and With USG Partners
   Continuing open and constructive collaboration with partners will be essential for effective program execution and to ensure efforts are continuously focused on the desired goals of the COCOM's water security program. As this is envisioned to be a multi- agency effort with a variety of partners (refer to Whole of Governance Water Board, Appendix F), ongoing collaboration will require periodic meetings, workshops, and other knowledge sharing to ensure all COCOM concerns are addressed, refined and/or modified based on lessons learned and changing conditions. In addition, efforts and issues must be coordinated with DOS, USAID, the Joint Forces Command and other DOD organizations to leverage assets and avoid duplication of effort.

USG Agencies

The Senator Paul Simon Water for the Poor Act states that the Secretary of State (DOS), in consultation with USAID and other USG agencies, is required to develop and implement a USG strategy supporting water security. The COCOM strategy should support the Water for the Poor Act but at the same time should not be confined by this framework. The COCOM should use this Act as a baseline from which to start and develop the process as it makes sense from a whole of governance and an integrated water security management standpoint. Many USG agencies have technical expertise that can be used to support USG water security activities, including DOD, US Department of Interior's United States Geological Survey (USGS) and Bureau of Reclamation, US Environmental Protection Agency and US Department of Agriculture (USDA) and Department of Energy. The relevancy of these agencies' programs should be considered during the formulation of the COCOM water security program strategy to ensure efforts are not duplicated and resources are leveraged where possible. Capabilities of the most likely USG agencies related to water security that a COCOM could come in contact with are described in

Appendix G. For a full list of USG agency capabilities in the water sector refer to the Global Water Futures: A Road Map for Future U.S. Policy. [17]

US Government and Contractor Capabilities

Private industry has many of the same capabilities as USG agencies and can be used to provide water security services. Depending on the activity and the desired product, contractors may be the best choice for completing a specific task. Some pros and cons to consider include the following:

- Contractors can often provide a niche or specialty area expertise related to a specific issue;
- Contractors are useful to supplant USG resources to meet high volume or peak workload demands;
- Computer models and databases developed and used by the USG are free, while private sector models and database software often require initial fees and or annual license fees that a partner country cannot afford;
- In some regions, the USG will receive more public relations benefit if the work is performed by the US military or government personnel, whether in whole or in part with a partner country military or government agency;
- For Mil to Mil and Gov to Gov activities, a contractor usually cannot commit the military or USG to a course of action;
- In remote areas, contractors may not be able to operate due to security considerations;
- Depending on the service, a contractor may be more expensive; they also can be less experienced;
- Contractors need USG oversight, which entails an additional administrative cost, to ensure value to the USG and quality control;
- Where a high level of control is needed or the course of action is uncertain, a USG employee is favored as it is difficult to impose a high level of control on a contractor; and
- A contractor is typically motivated to make the highest profit for their company, which if the contract is not precisely written, can result in higher long term cost to the USG.

Conclusion

Water, an essential component to human health is also closely linked with national, regional, and global political security. Water related challenges, if left unchecked, will create a global water crisis. DOD has the chance to address these challenges to further US national and military interests to positively impact theater security and stability. Addressing water concerns can reduce the emergence of weak or chaotic states that become platforms for asymmetric warfare.[18] At the same time addressing these concerns can provide a principal tool for preventive diplomacy and for building cultures of cooperation, [19] environmental stewardship, trade, agriculture, health improvements, economic development, food security and the reduction of the negative impacts of flood and drought occurrences. In order to accomplish these objectives, DOD needs to develop and implement a DOD specific water security program which caters to its strengths and supports US objectives for water. The COCOMs need to develop their role in water security and water resources. The tools and the overall strategy have been proposed. It is now up to DOD and the COCOMs to determine the way ahead to put in place a programmatic approach to water security and water resources that are in alignment with USG foreign policy objectives.

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10. 16 June 2009 Water Workshop, Washington D.C. is the source for the 5 broad overarching "Priority Objectives" for DOD to focus on as well as USACE and NAVFAC internal recommendations for focus. The objectives stem from a coordinated consensus in Washington D.C. from the Special Coordinator for Water Resources, Bureau of Oceans and International Environment and Scientific Affairs who runs the DOS Water Program and from the head of the Water Team, Natural Resource Management, USAID Bureau for Economic Growth, Agriculture and Trade (EGAT). Both DOS OES and USAID EGAT were specifically asked at the 30 person workshop to provide 5 overarching priority objectives for DOD to focus on worldwide.
11. The Joint Operating Environment (JOE) 2010, www.jfcom.mil/newslink/storyarchive/**2010**/JOE_**2010**_o.pdf.
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Appendix A DOD Identified Water Issues Ranked By USACE/NAVFAC

USACE and NAVFAC identified a total of 22 Water Issues that they could assist the COCOMs with. These issues were developed using the COCOM water issue worksheets. The worksheets follow the 3 dimensions of the Senator Paul Simon water for the Poor Act. This list of DOD identified water issues ranked by USACE/NAVFAC is not inclusive of everything water related but is a starting point to help COCOMs identity water security/water resource issues. USACE and NAVFAC rank ordered these issues based on internal relative importance in order. COCOM rankings of these issues as well as new issues will be based on Area of focus requirements and guidance from country teams, DOS and USAID. It would be up to the COCOM assisted by USACE and NAVFAC to find funding for issues deemed important to the COCOM.

1.	Water Planner	Supply a water planner to help develop water resource planning at the COCOM. Planner will employ watershed and river basin planning models to develop regional strategies, aid in the development of strategies for improving water quality and access to water resources, combine regional planning initiatives, predictive models and scenario planning techniques to develop strategies for responding to water issues. The planner will be available to reach back to scientific and engineering resources to aid in developing an integrated coastal management strategy.
2.	Trained Water Professionals	Conduct train the trainer courses and support technical water competency development to enhance the pool of trained and experienced water professionals.
3.	Transboundary Ground Water Supplies	Mapping of transboundary aquifers and watersheds to help determine the extent of groundwater aquifers, recharge zones, recharge rates and safe yields.
4.	Hydraulic Management	The Hydrologic Engineering Center would assist in hydrologic planning, modeling and management capacity in Country X. This would include exchange of personnel and joint training programs on water resources planning, analysis and modeling.
5.	Hydrogeology	Map surface geology and hydrogeology for country X to help identify new water resources as well as mineral resources within the country. This process could be expanded to other countries or regions involving multicounty river basins.
6.	Surface Water Modeling	Provide surface water modeling in the areas of water availability and flooding to countries. Teach countries how to use USG software.
7.	Natural Disaster	Train and equip military to react to natural or manmade disasters to include linkage to and the conduct of Table Top Exercises with CIVMIL governmental organizations. Provide the military training on how to set up temporary water supplies and sanitation facilities as well as field expedient/rapid repair of Lines of Communication (Road, Rail, Aerial and Sea).

8.	Early Warning System	Conduct an assessment of the available Geographic Information System (GIS) and hydrometeorological data from surrounding regions or countries, followed by an evaluation of this data to develop a single hydraulic model of River and, in time, the major tributaries. The hydraulic model will be shared between the member nations and will be used by them to prepare flood mapping, support the flood warning and forecasting system, and for analysis of future flood protection projects.
9.	River Priority Assessments	Funded via Development Banks, World Banks and USG resources; the USACE Institute for Water Resources would create a special set of training courses on tools and techniques for multipurpose development on rivers to manage flood and drought cycles. Respective agencies within countries (USAID, DOS) in coordination with regulatory bodies would pick rivers within countries for initial surveys to determine multipurpose development on those rivers.
10.	Water Security Plans	Provide technical experts to assist with the development of National Plans for achieving water security.
11.	Agriculture	Assist USG agencies and countries as applicable in agricultural water use sector review, strategy and technical capability development.
12.	Flooding	Help to establish hydrologic data and train country engineers and planners to identify flood problem areas, as well as solutions to situate roads and villages in non flood zones. For those areas which cannot be moved the development of early warning systems to improve evacuation lead-time.
13.	Water Supply and Sanitation	Integration of coastal storm disaster response actions with ongoing regional strategies to reduce risk and adaptation to climate change. To include training for appropriate siting /relocation of infrastructure as well as instruction on flood plain management.
14.	Transboundary River Basin Organization Development	Assist DOS and USAID to facilitate formation and development of River Basin Organizations to balance water resource needs and to develop sustainable strategies for water resource management.
15.	National and Regional Water Policies	Assist DOS and USAID and countries to develop capability for assessing and/or help to establish national and regional water policies in concert with water resource management strategies and river basin plans. Additionally provide modeling drawn from River Basin organizations, coastal zone management and watershed authorities to illustrate the benefits of establishing policies.
16.	Well Sanitation	Use reachback capacity to redesign well points to prevent fecal contamination.
17.	Sanitation	Look at ways to improve sanitary and wastewater infrastructure as it relates to collection, transport, treatment and disposal.

18.	Toxic Minerals	In regions where there are naturally occurring unsafe levels of minerals such as arsenic and fluoride in the ground water, look at providing simple and sustainable treatment technologies to reduce their levels to acceptable health levels for drinking water.
19.	Monitor/Evaluate Water Supply and Sanitation	Assist with the development of appropriate monitoring and evaluation mechanisms for water supply and sanitation at local, basin, national and regional levels.
20.	Pumps	Look into developing or working with a firm to develop non mechanical pumps (Solar or Wind) that are simple to maintain and repair.
21.	Water Way Illegal Activities	Drug trafficking organizations are moving significant amounts of cocaine from South America to Europe through West Africa. The Counter Narco Terrorism group would like a study of the littoral and inland waterways to address potential and likely areas of use for illegal activities.
22.	Climate Change Adaptation	Provide research, modeling, planning, engineering, design and construction management to support nations as they prepare for and adapt to climate variability and change.
23.	Data Management	Assist partner nations with assembly and archiving of existing water resources and technical data as well as collection of new data to form the foundation for future water development and management efforts. A wide variety of valuable data already exists within the host country, various international organization databases and the USACE Water Detection Response Team database. Unless this data is consolidated and shared, senseless duplication and replication of previous efforts will occur.

Appendix B Water Workshop Worksheets

COCOM WATER ISSUES

COUNTRY PRIORITY #:

REGION (Circle One): Europe Eurasia

REGIONAL ISSUE (Circle One): YES NO

ISSUE:

USG Dimension (Circle One): YES NO. If yes, which one(s)? Specify the number and letter (i.e. 2b).

BRIEF EXPLANATION (Keep it to one Page):

POC:

EMAIL:

PHONE NUMBER:

USG Dimensions of Water Management with Objectives

Please respond to this RFI within the context of the Senator Paul Simon Water for the Poor Act. The USG dimensions and objectives articulated below are from this Act. The Water for the Poor Act was developed by DOS in concert with USAID and makes access to safe water and sanitation a specific foreign policy objective. It requires DOS in consultation with USAID and other US Gov Agencies (DOD included) to develop and implement a strategy. (http://www.state.gov/r/pa/prs/ps/2009/06a/125449.htm). These objectives, organized in three interrelated dimensions, are:

Dimension 1. Improving access to water supply and sanitation and promoting better hygiene.

USG Objectives:

A. Strengthening the capacity and sustainability of small-scale service providers (that operate in rural and peri-urban areas.)

B. Improving the operations and financial sustainability of utilities that serve cities and towns that are undergoing the most rapid population growth.
C. Mobilizing capital from domestic markets for infrastructure development on a permanent and sustainable basis.
D. Improving household and community-level hygiene and sanitation.
E. Integrating water supply and sanitation with humanitarian assistance/disaster programs in water supply and sanitation.

Dimension 2. Improving Water Resources Management, (including allocation among competing needs)

USG Objectives:

A. (Policy, regulatory and institutional frameworks that address) effective water resources management at the appropriate scale and across all sectors.
B. Supply optimization (including assessments of surface and groundwater supplies, water balance, wastewater reuse and environmental impacts).
C. Demand management (including cost recovery policies, water use efficiency technologies, and decentralized water resource management authorities).
D. Addressing water quantity and quality challenges.
E. Equitable access to water resources through participatory and transparent governance.
F. Mobilization of financing (to sustain investments in water resources management/protection).
G. Managing hydrologic variability and adapting to climate change (including actions to mitigate and minimize impacts of droughts and floods).

Dimension 3. Improving water productivity (in agriculture and industry).

USG Objectives:

A. Improve water use efficiency in agriculture.
B. Help countries adapt to climate variability and climate change.
C. Reduce water pollution by industry.
D. Improve water use efficiencies in cities.

Appendix C Office of Defense Cooperation/Embassy Survey & Questionnaire

The Senator Paul Simon Water for the Poor Act of 2009 makes access to safe water and sanitation a specific foreign policy objective. It requires DOS in consultation with USAID and other US Gov Agencies (including DOD) to develop and implement a strategy to "Provide affordable and equitable access to safe water and sanitation in developing countries."

We can support this requirement by determining (COCOM's NAME) role in water security and water resourcing. This will allow the Command to put in place a programmatic approach to water security and water resources that is in alignment with USAID and DOS objectives.

I would ask each of you to please fill out and return the attached questionnaire Tab 1. by XX XXX 2010. As you fill out the questionnaire please pay particular attention to question 3. At a minimum we would like to see your two top issues / proposed projects. This will require each of you to get with Host Nation counterparts, as well as your folks on the ground for an accurate representation of the water security and water capacity building needs in your countries. The questions on the PDF document were derived from DOS OES and USAID EGAT recommended Engineer activities and from internal reviews at our end.

On Xxx XX 2010 we will bring in folks from the United States Army Corps of Engineers, the Naval Facilities Engineering Command, Civil Affairs, J-5 Strategy, J4 Engineers (HA and Environmental), USAID and DOS to review the results of the surveys as the first part of developing a COCOM plan in support of DOS and USAID objectives for water. The end product will be a Baseline of issues by country/region that (COCOM Name) can prioritize and use to help shape the COCOM's support for USG water security and water resourcing objectives.

Please contact Xxxxx (Phone #) or Xxxxx (Phone #) regarding any questions you have on this process.

Note: The Tab 1 PDF formatted Water Engagement Concept Questionnaire is also available in Microsoft Excel format for editing. Contact Erik Fleischner (Fleischj@eucom.mil) or Mike Brown (Brownmic@eucom.mil).

Tab 1 to Appendix C Water Engagement Concept Questionnaire

HEADQUARTERS
UNITED STATES EUROPEAN COMMAND
Directorate of Logistics
Engineer Division
Unit 30400
APO AE 09131

Submit by Email

Reviewer Name

Current Date

Country

*Custom Entries Allowed

Senator Paul Simon Water for the Poor Survey

Thank you for taking this Survey. The survey should take less than five minutes of your time to complete.
Click the "Submit by Email" button to submit the survey.

1. Prior to this survey had you heard of the Senator Paul Simon Water for the Poor Act? ◯ Yes ◯ No

2. Are you interested in assisting EUCOM with developing a strategy to support USG objectives the Water for the Poor Act? ◯ Yes ◯ No

3. Please provide a short synopsis on any current or future water related projects that you would like to execute.

4. Would it be beneficial to have a traveling contact team visit with defense and civilian authorities to assist with the development of a country specific strategy for water related issues.

◯ Yes ◯ No Comments?

5. Should the Combatant Commands, e.g., EUCOM, provide a Water Resource Specialist to help develop DOD water programs that are in alignment with and support Dept. of State and USAID objectives based on the Senator Paul Simon Water for the Poor Act?

◯ Yes ◯ No Comments?

For the next set of questions please rank the following water related topics:

Please score each of the following environmental engagement concepts:

Green = This concept would be very beneficial
Yellow = This concept would be moderately beneficial
Red = This concept would not be beneficial

	Beneficial	Neutral	Futile
6. Train host country military, or civilian equivalent, on various technologies, including water related infrastructure design, construction, maintenance, and protection.	●	●	●
7. Promote best practices to reduce environmental footprint of host country militaries and raise awareness of potential environmental impacts associated with water related projects.	●	●	●
8. Promote capacity-building workshops for host country mil or relevant civilian entities on various topics to include water resource management techniques and best practices; water quality assessment; surface water modeling; ground water modeling; remote sensing and GIS; and geophysics.	●	●	●

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Tab 1 to Appendix C Water Engagement Concept Questionnaire

9. Share data on factors that impact water availability and quality or other environmental stressors that may impact livelihoods, especially to inform strategic planning processes.

10. Promote, develop, and evaluate proactive strategies for water resource planning to minimize/avoid disasters. In addition, train host nation military and/or civil authorities on early warning systems, emergency preparedness and disaster response.

11. Promote Integrated Coastal Zone Management Strategies to reduce coastal damage from natural or man made disasters, e.g., such as an oil spill at sea or in port.

12. Look at ways to assist USAID with strengthening a sustainable approach to existing water supplies.

13. Provide technical experts to assist with trans-boundary water resource management.

14. Develop Regional and Country Campaign plans that are aligned with and support USAID and DOS objectives for water as reflected in the annually updated Senator Paul Simon Water for the Poor Act Report to Congress.

15. Conduct ground and surface water hydrology studies, including modeling and remote sensing to better manage water resources.

16. Exchange information and conduct study tours for host nation for development of water and environmental technology

17. Look into creating a set of training courses on tools and techniques for developing sustainable approaches to water system management allowing water systems to manage water quality/quantity during flood and drought cycles.

18. Develop Train the Trainer Courses to enhance technical water competency through the development of the worlds' pool of trained and experienced water professionals.

19. Develop a capability to provide access to basic services in critical regions where it is unsafe for traditional development and assistance providors to operate.

20. Provide support on proactive infrastructure considerations to minimize the effects from water related disasters. Includes exchanging information on modeling tools that can be used to predict flood path in order to mitigate flood disaster and improve disaster preparedness.

21. Exchange information on water-borne pathogens, modes of transmission, symptoms of exposure, methods of treatment, and preventative measures.

22. Provide specific technologies and designs to improve water resource management, quality, and access. This could include reviews of host nation water systems based on assessments and recommendations, e.g., water distribution systems, water treatment plants, desalinization plants, rainwater collection, wells, storage tanks.

23. Please provide any comments in the space provided below.

Submit by Email

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Appendix D Top Five Priority Objectives and USACE/NAVFAC Internal Recommendations for Review

DOS OES in consultation with USAID EGAT identified 5 priority water objectives for DOD to focus on world wide. [9]

USAID EGAT AND DOS OES TOP FIVE PRIORITY OBJECTIVES FOR WATER FOR DOD TO FOCUS ON WORLD-WIDE
Water-related disaster assistance.
Strengthening host country military capacity to better support civilian authority efforts to address water related disasters.
Developing regional mil-to-mil activities around both 1 and 2 above.
Providing needs information to USAID and DOS that would help provide a better understanding of conditions on-the-ground. Data from DOD could help DOS and USAID better target development assistance to meet broader development, diplomatic and/or security needs.
Providing for basic water and sanitation needs in regions where a) there is a need to strengthen relationships or b) where traditional development assistance implementers cannot engage because of security concerns. Projects would be small scale infrastructure to meet basic water and sanitation needs in places where it might not be safe for traditional implementers to work.

USACE and NAVFAC additionally looked at internal recommendations for further water initiatives development. USACE/NAVFAC will research these internal recommendations for possible further development.[9]

USACE and NAVFAC INTERNAL RECOMMENDATIONS FOR WORLD-WIDE WATER FOCUS
Proactive Strategies for Water Resources Planning to Minimize/Avoid Disasters.
Assistance in Flood Risk Management and Infrastructure Investment.
Strengthening Sustainable Approach to Existing Water Supply.
Integrated Coastal Zone Management Strategies to Reduce Coastal Damage.
Further develop geospatial data collection and hydrogeologic analysis.
Work with interested COCOMs and if possible provide a Water Resource Specialist to Combatant Commands (e.g. CENTCOM, SOUTHCOM, PACOM, AFRICOM) to help develop DOD water programs that are in alignment with USG objectives for water.
Look into possibly creating a special set of training courses on tools and techniques for multipurpose development of water systems to manage flood and drought cycles.
Develop Train the Trainer Courses to enhance technical water competency development of the third worlds' pool of trained and experienced water professionals.

Appendix E COCOM Water Activities

DOD can support DOS and USAID water security objectives by cooperating and coordinating with USG agencies on mil to mil programs, disaster and humanitarian response, and technical and analytical support.

***** The below activities are examples. Appropriate actions would be determined on a country by country basis and by the capabilities/qualifications of the relevant COCOM*****

1. Mil to Mil Programs
   - Train host country military, or civilian equivalent, on various technologies, including water related infrastructure design, construction, maintenance, and protection.
   - Promote best practices to reduce environmental footprint of host country militaries and raise awareness of potential environmental impacts associated with water related projects.
   - Promote capacity-building workshops for host country military or relevant civilian entities on various topics to include water resource management techniques and best practices; water quality assessment; surface water modeling; ground water modeling; remote sensing and GIS; and geophysics.
   - Train host nation military in implementation of international and domestic environmental laws and agreements.
   - Train host country military on cradle-to-grave considerations associated with water related projects to include basis and applicability of project proposal; socio-economic and environmental impacts; community mobilization strategies; maintenance concerns; effects assessment; and availability of assistance from national and international organizations.
   - Train host militaries, or civilian equivalent, on early warning systems, emergency preparedness and disaster response.

2. Disaster and Humanitarian Response
   - Immediately respond to humanitarian disasters through OFDA.
   - Closely coordinate with USAID mission staff on relief efforts.
   - Provide access to basic services in critical regions where it is unsafe for traditional development and assistance implementers to work.
   - Complete construction projects based on USAID assessment recommendations.
   - Evaluate national and regional emergency management mechanisms.

3. Technical and Analytical Support
   - Share data on factors that impact water availability and quality or other environmental stressors that may impact livelihoods, especially to inform strategic planning processes.

- Exchange information and conduct study tours for host nation for development of water and environmental technology.
- Utilize USACE, NAVFAC and U.S. based UNESCO Category II centers/ institutes for assessments and best practices.

4. COCOM Internal
    - Develop Regional and Country Campaign plans that are aligned with and support USAID and DOS objectives for water as reflected in the annually updated Senator Paul Simon Water for the Poor Act Report to Congress.

****The following activities would be appropriate after coordination with DOS/AID or where USAID or other traditional development assistance actors cannot operate:****

2. Disaster and humanitarian response
    - Introduce host country to modeling tools that can be used to predict flood path in order to mitigate flood disaster and improve disaster preparedness.
    - Provide support to host nation on proactive infrastructure considerations such as minimizing construction in flood areas, reinforcement of buildings and bridges within flood zones, and optimization of drainage or surface water channels.
    - Train host country on common water-borne pathogens, modes of transmission, symptoms of exposure, methods of treatment, and preventative measures.

3. Technical and analytical support
    - Conduct ground and surface water hydrology studies, including modeling and remote sensing.
    - Provide technical experts to assist with transboundary water resource management.
    - Upgrade host country water systems, i.e. water distribution systems, water treatment plants, desalinization plants, rainwater collection, wells, storage tanks.
    - Provide specific technologies and designs, i.e. micro-hydro turbine energy technology, solar and wind powered reverse osmosis for potable water, constructed wetlands system to reduce dissolved organic contaminants.

Appendix F Whole of Governance Water Working Group

1. General.

a. The Senator Paul Simon Water for the Poor Act of 2005 (the WfP Act) was signed into law on December 1, 2005. The Act emphasizes the provision of affordable and equitable access to safe drinking water and sanitation in developing countries as a key component of U.S. foreign assistance programs. It requires the Secretary of State, in consultation with the U.S. Agency for International Development (USAID) and other U.S. Government agencies, to develop and implement a strategy "to provide affordable and equitable access to safe water and sanitation in developing countries" within the context of sound water resources management. It also requires the Secretary of State, in consultation with the USAID Administrator, to submit an annual report "Framework for Action" to Congress describing changes in the U.S. strategy and progress in achieving the objectives of the WfP Act.

b. USAID, Department of State (DOS) and Department of Defense (DOD) hereafter called the "3D" organizes and conducts the Whole of Governance Water Working Group (WGWWG) to evaluate and reconcile U S agencies and departments support for water and sanitation within the Joint Operational Area of a Combatant Command (COCOM).

c. A WGWWG is an ad hoc group formed at the discretion of anyone of the 3D, when operations within the Joint Operations Area (JOA) warrant creation of a management organization to evaluate and reconcile water resourcing and water security issues. Most WGWWG work and issues will be handled as routine staff actions by the COCOM Engineer staff with assistance by WGWWG members. Routine issues will be resolved without convening a formal WGWWG meeting. The WGWWG should however at a minimum meet annually preferable prior to a COCOMs annual theater security conference.

d. When a WGWWG is required, consider:
    1) COCOM Mission, COCOM Campaign Plans, Service Component Engineer capability, Engineer reachback capabilities COCOM budget constraints, Millennium Challenge goals, World Water Forum guidance, DOS Mission Strategic Plans, USAID Country Assistance Strategy and USAID/DOS WfP Act guidance.
    2) Host nation, PVO, NGO water security and water resourcing initiatives.
    3) U. S. agency water security and water resourcing initiatives. Such as USAID a regional water and sanitation strategies.

e. When identifying the primary issues of the WGWWG. Consider:
    1) Established policies, procedures, priorities and oversight for water security and water resourcing.
    2) Evaluate and reconcile competing requirements.
    3) USAID and DOS guidance.
    4) Developing and coordinating support agreements.

f. Specific responsibilities of the 3D are as follows:
   1) Partner with Combatant Commands to support humanitarian assistance construction of water and sanitation infrastructure. Projects are initiated and implemented in collaboration with national ministries.
   2) Incorporate Water Security objectives into COCOM activities. Help the COCOMs to develop and implement a DOD strategy in alignment with the Framework for Action to provide/enhance affordable and equitable access to safe water and sanitation in developing countries" within the context of sound water resources management.
   3) Mentor the COCOMs IOT develop a strategic framework to advance U S efforts to achieve water security in developing countries. This would include integrating the goals of the WfP Act where applicable into DOD and COCOM functions.
   4) Provide guidance for COCOM plan development to achieve U.S. goals and objectives along with measurable indicators to track progress and report results back to DOS and USAID. This COCOM plan would support and be in alignment with USAID/DOS WfP Act documentation; giving special consideration to three key emerging challenges: increasing access to safe drinking water and sanitation, and promoting hygiene; responding to climate change; and improving water management to meet increasing food production needs.
   5) Build partnerships with U S agencies and departments to improve science and technology collaboration and capacity. In addition promote investments at the country and regional level to support partnerships and scientific and diplomatic initiatives that provide support, catalyze action, and/or increase political will to address water and sanitation challenges at the global level.
   6) Evaluates and reconcile DOD water related activities to ensure compliance with WfP Act guidance.
   7) Provide support for regional conferences, symposia, and seminars between water resource specialists and defense officials.
   8) Support Water Security visits to the U.S. by influential civilian and military leaders from the region.
   9) In coordination with the COCOMs facilitate regional sponsorship of Water Security issues.
   10) Develop and institute Water Security courses at COCOM schools.
   11) Use existing COCOM conferences to educate influential leaders on the concept of Water Security.
   12) Initiate senior officer visits to the (IWR) Institute of Water Resources and the (ERDC) Engineer Research Development Center.
   13) Work with the COCOMs to encourage senior officer participation in environmental related courses.
   14) Assist regional organizations develop Water Security courses.
   15) Support standardization of regional water security programs.
   16) Help International Organizations develop Water Security courses in the AOR.
   17) Support standardization of international water security programs.
   18) Co-sponsor internationally and regionally focused water security conferences.
   19) Provide Subject Matter Experts (SME) to interface with host nation water professionals.
   20) Facilitate visits of selected host nation water professionals to observe U.S. water security and water resource training.

21) Provide or facilitate SMEs to evaluate national and regional emergency management mechanisms.
22) Work with COCOMs to support State Partnership for Peace Program (PfP) visits to provide selected individuals with opportunity to observe U.S. emergency management procedures.
23) Co-sponsor with the COCOMs regional emergency management conferences to discuss environmental terrorism response capabilities.
24) Co-sponsor with the COCOMs "train the trainer" events for host nation security forces in water resourcing.
25) Utilize the (CMEP) Civil Military Emergency Preparedness program to develop capabilities and identify natural disaster vulnerabilities.
26) Use CMEP to train Host Nations to conduct Disaster preparedness assessments.
27) Work with the COCOMs to Institute engineer training exercises to create capability to provide potable drinking water.
28) Conduct classes on the implications of resource development schemes for host nation security forces.
29) Facilitate HN visits to USACE/NAVFAC to observe water and environmental procedures and practices.
30) Facilitate visits and exchanges with Army Corps of Engineers and National Park Service on coastal management.
31) Facilitate visits and exchanges on fisheries protection and management.
32) Facilitate and co-sponsor visits, exchanges and SMEs with the Army Corps of Engineers on the development of waterways and system management.
33) Facilitate visits, exchanges, and SMEs with Army Corps of Engineers, USDA, and/or EPA on ecosystem management, biodiversity, and sustainable development based management techniques.

2. Organization.

a. The composition of WGWWG in addition to the 3D members will vary depending on requirements, the COCOM organization/function and other organizations and agencies involved. When integrating representation in the WGWWG do the following:

1) Identify the nature of current and future operations and primary users/operators, Service components, commands, activities and agencies supporting Water Security/Water Resource operations.
2) Select the appropriate balance of service and U.S. Agency representation – At the level COCOM consider strategic planner, legal, civil affairs, humanitarian assistance, engineer, engineer reachback and surgeon representation.

b. Request the COCOM designate the COCOM Engineer to represent the command as the DOD 3D WGWWG Member to execute the following duties/responsibilities:

1) Advise COCOM on Water Resources and Water Security Issues.
2) Manage the program with Guidance from the WGWWG.
3) Maintain thorough knowledge and understanding of COCOM Operational Plans (OPLANS), Operations Orders (OPORDS), and component and supporting forces concepts of operations/support.

4) Convene and Conduct the COCOM WGWWG meetings in association with the 3D.

c. WGWWG members duties/responsibilities:

1) Maintain a thorough knowledge and understanding of U.S. government plans, orders and component and supporting forces concepts of operations/support as it related to water and the environment.
2) Ensure accuracy and clarity of status reports, information, and statistical data.
3) Prepare, coordinate, and present briefings, as required.
4) Assist with country and regional plans development as required.
5) Coordinate activities. Relay requests for information and resources; provide status of resources and organizations.
6) Advise COCOM and other WGWWG members on water related issues.

d. Members (Non COCOM):

1) Department of State (DOS): Specifically the Bureau of Oceans, Environment, and Science (OES): Promotes transformational diplomacy through advancing environmental stewardship, encouraging economic growth, and promoting social development around the globe to foster a safer, more secure and hopeful world. Goals for water are executed through programs and activities promulgated under the Senator Paul Simon Water for the Poor Act.
2) US Agency for International Development (USAID): Specifically the Bureau for Economic Growth, Agriculture and Trade (EGAT). USAID's water mission strives to improve the management of critical watersheds and areas with high biodiversity to preserve the health of the ecosystems and ensure access to clean water for human populations. USAID objectives on Water and Sanitation are reflected in Senator Paul Simon Water for the Poor Act.
3) U.S. Army Corps of Engineers (USACE): USACE is a major water resources government agency that leads in the area of flood protection, inland waterways maintenance and navigation, hydroelectric energy projects and environmental issues related to waterways. USACE has extensive expertise in the areas of Research and Development related to water resources, to include micro- and macro- models, numerical methods modeling and areas related to environmental research (such as dredging) in its various laboratories. ACE also possesses a well drilling assessment capability and conducts military-to-military engagements, full service engineering, construction, and research and development.
4) Naval Facilities Engineering Command (NAVFAC): NAVFAC via the Engineering Service Center (ESC) provides specialized facilities engineering, technology and facilities expertise to include environmental and water expertise. Focus areas include Shore, Ocean, and Waterfront Facilities, Energy and Utilities, Environmental, Amphibious and Expeditionary Systems.
5) The Air Force Center for Engineering and the Environment (AFCEE): AFCEE is a field operating agency of the Air Force Civil Engineer. The center provides comprehensive expertise to protect, preserve, restore, develop and sustain our nation's environmental and installation resources.

6) The National Aeronautics and Space Administration (NASA): Utilizing visualization and monitoring systems, NASA uses the resultant Earth science data routinely in an integrated approach for U.S. and international concerns. NASA seeks to further develop and optimize this data for water sensitive parts of the world.
7) U.S. Geological Survey (USGS): USGS is a science agency of focused on natural resources and a source of mapping.
8) Millennium Challenge Corporation (MCC): MCC focuses on promoting sustainable economic growth to reduce global poverty through investments in areas such as infrastructure (including water/sanitation), agriculture, education and private sector development. MCC assistance only goes to MCC-eligible countries that have developed, with input from their public, well-designed projects that address the greatest impediments to the country's development and promote sustainable economic growth and poverty reduction.
9) National Geospatial-Intelligence Agency (NGA): The Environmental Security Branch of NGA provides geospatial intelligence based on imagery and geospatial data for policy- makers and DoD customers regarding water issues that potentially affect the political or economic stability of a region or states, potentially impact human health and welfare, or where U.S. national security interests intersect environmental issues. The Environment and Economic Security Division, organized by regions with expertise in water issues, presents this information in the form of maps, annotated graphics, and geographic information system (GIS) based products.
10) U.S. Department of Agriculture (USDA): USDA works on water through its Forest Service and Foreign Agricultural Service. Areas of expertise include research, technical expertise, and tools for land and water management. USDA provides technical assistance and builds partnerships for watershed assessments and watershed planning. It also trains and provides technical expertise to partners overseas in emergency preparedness, response, and disaster mitigation, including drought and floods.
11) U.S. Environmental Protection Agency (EPA): EPA is one of the primary government organizations responsible for the protection of human health and natural ecosystems in the U.S. The Agency plays a major role in the regulation, protection and improvement of water resources and supplies. EPA works through partnerships to conserve water and energy, minimize greenhouse gases, re-use solid waste, and get a handle on pesticide risks.
12) U.S. Department of Energy (DOE): DOE's mission is to advance the national, economic, and energy security of the United States; to promote scientific and technological innovation in support of that mission; and to ensure the environmental cleanup of the national nuclear weapons complex. DOE focuses on energy and nuclear security, scientific discovery and innovation, and environmental responsibility.

e. WGWWG Board Members:

1) Co Chairmen:
-DOS - Regional Rep in consultation with the DOS/OES
-USAID - Regional Rep in consultation with USAID/EGAT

-COCOM Division Engineer

2) Members:
-COCOM Water Specialist
-COCOM Environmental Engineer
-COCOM J-5 Plans
-COCOM HA Representation
-USACE LNO
-NAVFAC LNO when assigned

3) Special Members as required when available/assigned:
-USACE IWR Representative
-USACE Civil Works Representation
-NAVFAC Engineer Service Center Representation
-AFCEE Representation
-The National Aeronautics and Space Administration (NASA)
-U.S. Geological Survey (USGS)
-Millennium Challenge Corporation (MCC)
-National Geospatial-Intelligence Agency (NGA)
- U.S. Department of Agriculture (USDA)
- U.S. Environmental Protection Agency (EPA)
-Department of Energy (DOE)
-Surgeon representation
-Staff Judge Advocate (SJA)

-J9 Representative
-Host Nation Representative (by invitation only after American Embassy coordination)
-Non-Governmental/Private Volunteer Organization(s) (by invitation only after American Embassy coordination)
-Service Component(s) Representatives
-Other (by invitation)

3. Procedures.

a. The COCOM Engineer or DOS or USAID will activate the WGWWG.

b. The WGWWG meeting locations and physical arrangements will be coordinated and executed by the COCOM Engineer Division. The COCOM Engineer Division will announce the WGWWG meeting locations and times.

c. USAID, DOS and the COCOM Engineer (Deputy JTF Engineer if absent) will co-chair all formal WGWWG meetings.

d. WGWWG members are as shown above.

e. Formal WGWWG meeting decisions will strive for consensus. In the absence of consensus, a majority of voting members will determine the issue. Only members and co-chairs vote (not special members) on WGWWG issues. Issues that cannot be resolved

will go to the Ambassador for county issues and the Combatant Commander for regional issues.

f. Disposition of WGWWG actions.

1. Routine decisions will be forwarded to the COCOM staff and other organizations via appropriate communications.
2. Formal WGWWG meeting minutes and decisions will be forwarded to Co Chairs, members and special members for information.

g. The COCOM Engineer Division is responsible for preparing meeting agenda and read-ahead materials (if applicable); maintaining minutes of all WGWWG meetings; preparing appropriate documentation of all WGWWG (routine or formal meeting) actions (messages, memorandums, CESP); and disseminating WGWWG actions.

Appendix G USG Agency Capabilities in the Water Sector

1. Department of State (DOS)

Specifically the Bureau of Oceans, Environment, and Science (OES) promotes transformational diplomacy through advancing environmental stewardship, encouraging economic growth, and promoting social development around the globe to foster a safer, more secure and hopeful world. DOS goals for water are executed through programs and activities promulgated under the Senator Paul Simon Water for the Poor Act.

2. US Agency for International Development (USAID)

Specifically the Bureau for Economic Growth, Agriculture and Trade (EGAT) leads the way for water. USAID's water mission strives to improve the management of critical watersheds and areas with high biodiversity to preserve the health of the ecosystems and ensure access to clean water for human populations. USAID objectives on Water and Sanitation are reflected in Senator Paul Simon Water for the Poor Act. The United States Army Corps of Engineers has a Participating Agency Service Agreement (PASA) with USAID to provide water technical services and support.

3. DOD

DOD is the single largest employer of environmental and water resources professionals in the world. Unlike most other federal agencies, DOD must operate large military bases and provide water supply and sanitation systems. DOD also executes a civil works water resources mission in the US and applies its expertise and services to address water resources issues nationally and overseas. This results in DOD having the USG's core capacity and body of knowledge and experience in water resources planning and implementation and operation of water systems.

Public Works: DOD operates numerous bases and public works infrastructure worldwide requiring them to provide the same type of utilities as cities provide. DOD plans, designs, builds and operates water supply, wastewater treatment, and storm sewer systems and provides protection of these facilities from flooding, storm surge, sea level rise, erosion and other natural disasters. DOD, through the Army Corps of Engineers (USACE), Naval Facilities Engineering Command (NAVFACENGCOM), and Air Force Center for Engineering and the Environment (AFCEE), has the majority of USG technical expertise in public works operations which can be used to help with urban water supply issues that many developing countries are facing as their populations rapidly grow.

DOD recognizes the importance of the environment in maintaining a healthy, diverse and sustainable condition needed to support life. DOD incorporates environmental sustainability principles by integrating economic and environmental sustainability principles in developing water resources programs, activities, and infrastructure. These principles are extremely important in addressing water security issues where the relationship between safe and dependable water supplies is inextricably related to sustaining healthy environmental conditions. Lastly, an understanding of and integration of the effects of climate change and sea level rise on water availability, on the incidences and patterns of extreme hydrologic events such as flooding and drought and more subtle effects of shifting climatic change on human populations will be integral to successful sustainability planning in the coming decades.

Water Resources Planning and Management: Primarily through the USACE, DOD retains over 2,500 inter-disciplinary water resources specialists to support it's civil works mission which includes planning, engineering, construction, operations and maintenance and emergency response efforts to address a variety of water resources issues. These issues include water supply, water quality, ecosystem restoration, flood risk reduction, coastal and storm damage reduction, navigation, and other related purposes. Effective water resource planning requires an intimate understanding of the water resources problems and needs of the customers and stakeholders. It also requires a holistic systems approach to water resources management at the watershed and sub-watershed levels; to include innovative, cost-effective and sustainable solutions properly scaled to the water resource issues at hand.

Remote Area Water Supply and Treatment: As part of overseas military operations, DOD enters areas and establishes temporary bases to house soldiers and provide them with water, power, and sanitation. Often, this requires the drilling of water wells and the use of advanced water treatment systems, including reverse osmosis, to treat and provide safe drinking water. The US Navy, Army and Air Force employ well drillers and water system operators to provide for safe and sanitary water for their troops. This ability is unique to DOD and is important to providing Mil-to-Mil training to partner nations.

Natural Resources Management: DOD owns and operates large military training ranges as well as recreational and wildlife areas as part of its civil works projects. At these ranges and areas, DOD is required to ensure endangered species in those areas are thoroughly protected and public areas are environmentally enhanced. DOD assesses natural resources and develops and implements natural resource management plans to protect the habitat from degradation. DOD has a large and diverse natural resource management staff that is skilled in resource management in a broad range of climate and geographic conditions. This staff can help ensure that water security operations do not have unintended consequences to critical habitats. In addition, they can assist countries during the design and implementation of new water resources development programs to address existing degraded habitats.

Geographic Information Systems (GIS), Databases and Mapping: DOD has a core capability to assimilate and process large amounts of data and use GIS and other database platforms to organize and analyze data, produce maps, and prepare reports. The ability of most developing countries to develop comprehensive and executable water strategy plans is severely limited as they do not have central databases containing water information. They do not know how much sustainable water they have nor where it is located. Computer models to determine sustainable water resources need data input from GIS databases. Without these databases, developing countries are limited in their ability to conduct computer modeling to assess water resources and develop executable strategic plans to provide water for consumption and agriculture.

Hydrologic Models: As part of their civil works programs, DOD has developed public domain models for surface water to assess the hydrology of surface water and to predict water balances, reservoir operations, flows in streams and rivers, storm water runoff, flood plains delineation maps and coastal erosion. They also have models for measuring groundwater flow, supply and recharge. DOD is a recognized leader in hydrologic and hydraulic modeling and makes these models available at no cost in the public domain. Many

of these models can be coupled with economic models to evaluate financial considerations prior to making water resource investments.

Hydrologic investigations and contaminated water treatment: DOD has many past waste (Superfund) sites and pursuant to the clean-up of those areas, uses geologists and hydrologists to investigate and model the movement of groundwater at these sites. In addition, they use scientists and engineers to evaluate potential health and environmental risks to determine what course of action is needed to clean-up contamination based on the desired use of the water. Once the appropriate clean-up levels are determined, they design, build and operate systems to treat contaminated water to protect human health and the environment.

Project Management: Many DOD efforts require complex coordination among individuals, customers, stakeholder groups and agencies. DOD has many program managers who are trained to develop budgets, schedules and plans of action to manage a broad variety of operations from start to completion, including: joint operations, conducting studies, constructing buildings and facilities, and troop mobilization and logistics support throughout their mission. DOD has project management processes, procedures, and quality management systems in place to ensure that water programs and projects are on-time, within budget, produce high quality results, and meet customer expectations.

4. USGS

The USGS is the world's largest natural science organization and has local offices in almost 200 locations both within the United States and in foreign countries (http://www.usgs.gov/). Worldwide, the USGS has a long history of providing timely national and international earth, water, and biological sciences information and the construction and maintenance of water-resource databases. The USGS has a broad range of expertise and can provide technical support on several water-related issues, including definition of the hydrogeologic framework conditions critical to groundwater exploration; characterization and assessment of aquifer systems using conventional hydrologic and geophysical methods as well as state of the art remote sensing techniques; evaluation of surface and ground water interactions and the wise use of resources through optimization and conjunctive use management strategies: assessment and modeling of the effects of water development projects on resource sustainability and biological communities; implications of water resources development for sustainable economic growth and development; understanding water-quality conditions including the potential for natural contaminants and indications of the movement, impacts and sustainability of water development; and surface and groundwater monitoring.
The expertise and infrastructure of these USGS programs supports the economic and social goals of the DOS and USAID and compliments the infrastructure and water management missions of the DOD. Specific USGS programs that can assist or be adapted to the DOD Water Security Strategy include:

The Groundwater Resources Program (http://water.usgs.gov/ogw/gwrp/): Provides objective scientific information and develops the interdisciplinary understanding necessary to assess and quantify the availability of groundwater resources for the United States. The USGS conducts multi-scale assessments of groundwater systems, studies critical groundwater issues, develops new investigative methodologies and techniques, and provides reliable, objective groundwater data and information. The Program has extensive experience in the

design and implementation of groundwater monitoring networks and development of conceptual and digital models of stream-aquifer dynamics, recharge, discharge, and flow and contaminant transport. These USGS models are used throughout the world to predict responses of aquifer systems to changing stresses.

The Watershed and River Systems Management Program: Offers a comprehensive "systems approach" to computer modeling by coupling watershed models (simulating upland physical hydrology), routing and reservoir management models (simulating downstream water use), and hydraulic and chemical models (identifying reach-specific problems in the riverine environment). This linkage yields a powerful tool to support critical water-resource – decisions.

The National Water Use Program: Examines the withdrawal, use, and return flow of water on local, state, and national levels.

The National Water Information Coordination Program: Helps to ensure the cost-effective availability of the water information that is required for effective decision making for natural resources management and environmental protection.

The Drinking Water Program: Uses a wide range of monitoring, assessment, and research activities to develop strategies that protect the quality of the Nation's drinking-water.

The National Geophysics Program: Provides technical expertise to support ground water investigations and to advance the understanding of hydrogeologic framework conditions through development of new methods of geophysical characterization of subsurface waters and monitoring methods through applied research. http://water.usgs.gov/ogw/bgas/

The National Water Quality Assessment Program: Collects and analyzes data and information in more than 50 major river basins and aquifers across USA. The goal is to develop long-term consistent and comparable information on streams, ground water, and aquatic ecosystems to support sound management and policy decisions at the basin level. The Program strives to understand the processes that control the observed water-quality conditions and to apply this knowledge toward a safe and sustainable water supply.

The National Streamflow Information Program: The USGS operates and maintains approximately 7,500 streamgages which provide long-term, accurate, and unbiased information on streamflow to meet the needs of many diverse users. The USGS streamgaging network is currently funded in partnership with over 800 Federal, State, and local agencies. The mission of NSIP is to provide the streamflow information and understanding required to meet local, State, regional, and national needs. The data are collected and provided in real time to meet critical operational needs.

The Water Resources Discipline of the USGS has provided hydrologic and hydrogeologic expertise to more than 50 countries since 1940. This work has specialized in data collection, evaluation, and storage, and technology transfer and capacity building for in-country scientists and officials. Expertise and experience in international hydrologic activities includes: institutional capacity building; water use, availability, vulnerability, and sustainability investigations; transboundary issues; hydrogeologic and sedimentological

models and investigations; construction, operation, and maintenance of hydrologic data-collection networks; geophysics; hydrologic database development; water-quality assessments; remote sensing; geographic information system and computer model development to display and analyze hydrologic and hydrogeologic systems; and hazards assessments. The USGS also is the designated lead agency for investigating the impacts of global climate variability and change for the USG.

5. US Department of Interior - Bureau of Reclamation

The Bureau of Reclamation is best known for the dams, power plants, and canals it constructed in the 17 western states. Their mission is to assist in meeting the increasing water demands of the West while protecting the environment and the public's investment in these structures. They have constructed more than 600 dams and are the largest wholesaler of water in the US. They supply water to more than 31 million people, and provide one out of five Western farmers (140,000) with irrigation water for 10 million acres of farmland that produce 60% of the nation's vegetables and 25% of its fruits and nuts.

The Bureau of Reclamation is also the second largest producer of hydroelectric power in the western United States. Their 58 power plants annually provide more than 41 billion kilowatt hours and produce enough electricity to serve 3.5 million homes.

The Bureau of Reclamation has strong expertise in dam, power plant and canal design and operation, hydroelectric power generation and distribution, and water resource management.

6. The National Aeronautics and Space Administration (NASA)

Utilizing visualization and monitoring systems, NASA uses the resultant Earth science data routinely in an integrated approach for U.S. and international concerns. NASA seeks to further develop and optimize this data for water sensitive parts of the world. Water capabilities include the use of NASA satellite and modeling products to support international water resources activities. NASA research
on water includes programs such as the Terrestrial Hydrology Program, NASA's Energy and Water Cycle Study (NEWS), and the Modeling, Analysis, and Prediction (MAP) Program. NASA satellites are also able to provide land surface hydrologic observations using remote sensing to provide data on precipitation, radiation, temperature, soil moisture, groundwater, snowcover, evapotranspiration, streamflow & lake level, and vegetation. These observations are able to provide the scientific basis for policy decisions, and NASA is eager to collaborate with USG and others to identify areas where more research is needed so the agency can continue to move forward internationally.

7. Millennium Challenge Corporation (MCC)

MCC focuses on promoting sustainable economic growth to reduce global poverty through investments in areas such as infrastructure (including water/sanitation), agriculture, education and private sector development. MCC assistance only goes to MCC-eligible countries that have developed, with input from their public, well-designed projects that address the greatest impediments to the country's development and promote sustainable economic growth and poverty reduction.

8. National Geospatial-Intelligence Agency (NGA)

The Environmental Security Branch of NGA provides geospatial intelligence based on imagery and geospatial data for policy- makers and DoD customers regarding water issues that potentially affect the political or economic stability of a region or states, potentially

impact human health and welfare, or where U.S. national security interests intersect environmental issues. The Environment and Economic Security Division, organized by regions with expertise in water issues, presents this information in the form of maps, annotated graphics, and geographic information system (GIS) based products.

9. U.S. Environmental Protection Agency (EPA)

EPA is one of the primary government organizations responsible for the protection of human health and natural ecosystems in the U.S. The Agency plays a major role in the regulation, protection and improvement of water resources and supplies. EPA works through partnerships to conserve water and energy, minimize greenhouse gases, re-use solid waste, and get a handle on pesticide risks.

10. USDA

The production of food is highly dependent of the availability of water. The USDA is already working with the Millennium Challenge Corporation (an innovative and independent U.S. foreign aid agency whose board is chaired by DOS) and has a Memorandum of Agreement (MOA) with USACE. USDA provides leadership on food, agriculture, natural resources, and related issues based on sound public policy, the best available science, and efficient management. Their Natural Resource Conservation Service has particular expertise with respect to environmentally sustainable agricultural practices including prudent land management to control environmental damaging agricultural run-off.

11. DOE

The agency looks at national security and it's relationship to science, technology, energy security and environmental quality. From a water standpoint the agency focuses on water and energy as the two major elements in sustainable development. Capabilities include technical assistance in groundwater contamination, water monitoring, wastewater treatment and pollution prevention, water and energy conservation technologies, renewable energy technologies for water pumping, hydro geological and contaminant transport modeling and atmospheric and global impact research.

12. National Oceanic and Atmospheric Administration (NOAA)

Most of the agencies work is directed to understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet economic, social and environmental needs. Some of their capabilities include Weather and climate forecasts, river and flood forecasting, remote sensing (identifies land cover, water presence. Snowpack and connection to runoff and reservoir level modeling, drought and desertification and coastal and marine events), coastal and estuarine management, land based sources of marine degradation, habitat alteration and aquaculture.

13. Centers for Disease Control (CDC)

Works with partners throughout the nation and the world to monitor health, detect and investigate health problems, conduct research to enhance prevention and develop and advocate sound public health policies. Water aspect capabilities include measuring and monitoring public health effects from contaminated drinking water and recreational water, waterborne disease outbreak surveillance and investigations/disease prevention programs, support for health departments delivering water related programs, water security, bioterrorism and emergency response support to federal agencies, epidemiologic

investigations related to contaminants in drinking water, development and evaluation of water treatment and monitoring technology, Water safety plans IAW the World Health Organization.