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Affiliations:

- USF adjunct faculty; College of Public Health Water Conferences Participant 2010 and 2011
- USACE ERDC & NGA- InnoVision StratGEO Water Security
- Trainer, Professional Military Education, I and II MEF Marines
- InterAgency Water Working Group (DOS OES)
- Water Complexities Working Group (IWWG)
- Military Geography Specialty Group (AAG)
Bottom Line Up Front:

• Water’s ties to regional security and stability are complex
  • quantity, quality, accessibility, and availability
• Water-relevant counterinsurgency Stability Operations are challenging
  • many players, many metrics
  • output vs outcome focus
• Monitoring of surface and groundwater is needed
  • “You can’t manage what you can’t measure.”
• Spatial/temporal understanding of watershed is needed.
  • Policy and decision-makers don’t know what they don’t know
  • Awareness of 2\textsuperscript{nd} and 3\textsuperscript{rd} order effects
Kinley Water comes to you from a deep underground source. It has been purified for you using highest safety standards and modern technology (Reverse Osmosis). Kinley Water is bottled untouched under hygienic conditions ensuring constant mineral structure of water, which is a guarantee of its unique taste and high safety.

Keep in a cool and odourless place, away from direct sunlight.
Here's to the crazy ones, the misfits, the rebels, the troublemakers, the round pegs in the square holes... The ones who see things differently -- they're not fond of rules... You can quote them, disagree with them, glorify or vilify them, but the only thing you can't do is ignore them because they change things... They push the human race forward, and while some may see them as the crazy ones, we see genius, because the ones who are crazy enough to think that they can change the world, are the ones who do.

-Steve Jobs

Dr. Evil
Photos by I MEF Combat Camera (Cpl Reeves) and Michael Phillips
The Game has changed....
Helmand River System

Dr. L. J. Palmer-Moloney, RC(SW) C-9 Stability Ops Water Resources Mgt
The Helmand River System—Water as Vital Ground

“Ground of such importance that it must be retained or controlled for the success of the mission”

• Water is the most important natural resource in RC(SW).

• Water’s control and continued provision cuts across all lines of operation.

• Water’s use, management, and availability effect not just Helmand Province but also Nimroz Province and Iran.

• Water cannot be managed if it cannot be measured. We must understand the water budget.

• RC(SW), as part of the Combined Team (SW) with RP and PRT, plays a key role and must consider all sides of “COIN effect”.

Assessment: As “vital ground”, the Helmand is key to the success of the COIN mission.
The Helmand River is both vital ground and a critical resource to the population, GIRQa and RC(SW).

- Water of the system is critical to life and livelihood
- Helmand River water accessibility, availability and supply impacts the LOOs.
- Management of the watershed is necessary to sustain growth in development and governance.

Assessment:
The Helmand River, as the foundation of the population’s life and livelihood, is critical to building security, governance, and development. Building the capability in GIRQa to manage the Helmand River system is essential to ensure that current improvements and development are sustainable and capable of meeting the population’s needs.
Snapshot: Middle & Lower Helmand Discharge (16 OCT 2011)

Kajaki, ~77 M3/sec

Reg-e Khan
Neshin, ~7 M3/sec

Zaranj, 0 M3/sec
Sistan Basin
Sistan Basin
Sistan Basin

Source: Earth Observatory, August 20, 2003, by the Moderate Resolution Imaging Spectroradiometer (MODIS)
Human Needs

Helmand water uses:
- Consumption
- Crop Irrigation
- Electricity Generation
Afghanistan has a substantial rural population, with 80% of its people dependent on the natural resources of the country.
Human Impact

Helmand River System is a renewable water resource impacted by use and development.

- Capture, Diversion, Extraction
- Development
- Water Quality
Hydraulic Conductivity of Selected Rocks

IGNEOUS AND METAMORPHIC ROCKS

Unfractured Fractured
BASALT
Unfractured Fractured Levee flow
SANDSTONE
Fractured Semiconsolidated
SHALE
Unfractured Fractured
CARBONATE ROCKS
Fractured Cavernous
CLAY
SILT, LOESS
SILTY SAND
CLEAN SAND
Fine Coarse
GRAVEL

SELECTED VALUES OF POROSITY, SPECIFIC YIELD, AND SPECIFIC RETENTION

<table>
<thead>
<tr>
<th>Material</th>
<th>Porosity</th>
<th>Specific yield</th>
<th>Specific retention</th>
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<tbody>
<tr>
<td>Soil</td>
<td>55</td>
<td>40</td>
<td>15</td>
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<tr>
<td>Clay</td>
<td>50</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td>Sand</td>
<td>25</td>
<td>22</td>
<td>3</td>
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<tr>
<td>Gravel</td>
<td>20</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>Limestone</td>
<td>20</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Sandstone (semiconsolidated)</td>
<td>11</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Granite</td>
<td>.1</td>
<td>.09</td>
<td>.01</td>
</tr>
<tr>
<td>Basalt (young)</td>
<td>11</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>
Kajaki HydroPower Plant (HPP)
Central Helmand Province Irrigation Infrastructure Repair
Irrigated agriculture, Helmand Province. Source: SSG Shawn Hibbard
Central Helmand Province Development & Water
Nimruz: Water Capture, Diversion, and withdrawal Projects
Population depends on water from surface and groundwater sources. For people of western Nimruz, Iran provides water.
Nimruz: Additional Considerations

Canals need constant upkeep and maintenance. Water flow in canals is not a sure bet.

Quality of water—for consumption and for irrigation must be acknowledged and addressed.
• Paucity of current information on in-stream flow
  • USGS Data for most of Afghanistan is 30 years old
  • Needs to be updated to gain accurate info on current water budget
    • New gauging stations planned with World Bank/Asian Development Bank Assistance
• Sparse data collection of groundwater levels
  • Groundwater levels drawn down as a result of the drought and overdraft.
  • Recharge rate of the aquifers needs to be understood and monitored.
• Finally, data about water quality are even more difficult to come by.
  • Little information in the literature; most reports observational.
  • Comprehensive assessment of watershed water quality missing
ISAF’s key objectives to formulate metrics:
• GIRoA is effective in key terrain
• Control of licit commerce at borders
• Negative influencers marginalized
• People have access to fair justice
• Increased availability of essential services
• Socio-economic development is improving
• Agricultural development and productivity improved
• ANSF provides security to enable governance and development
• Improve freedom of movement to increase commercial activity
• GIRoA leads district level security efforts
• Effective COIN (Counterinsurgency)
Is the government providing the enabling environment / public services/goods that allow Afghans to go about their daily lives? 
- If not, why not? 
- If not, who?

Is the population receiving and using essential services? (schools, healthcare, water, roads, & electricity)

What are the services that are essential to you?

District Delivery Program --?
Water Monitoring in Helmand Watershed
Helmand Water Volume and Outlook

- SSMI satellite data indicate the total SWE volume through 9 May 2010 for the Helmand Watershed is below normal on this date compared to historical data (1987-2009).
- Minimal snowpack exists only in the upper reaches of this watershed.
Human-Water Environmental Complexities in COIN

Water Challenges in Zaranj City, Nimruz Province

Surface and groundwater brackish with microbial contamination

Sewage treatment Lacking

Substandard quality for water taste and smell

Population vulnerable to water-born disease


Public Health Challenges directly related to poor water quality: skin conditions, mouth infections, diarrhea.

60% patients in one local clinic made ill by drinking local water.

**Problem:** Need data to understand “water complexities” (supply, quality, availability, and accessibility)

- Poor quality, limited quantity, inaccessibility
- Disease, food shortages, economic adversity, population displacement
- Dissatisfaction with government
- Insurgent opportunity

“People pursue essential needs until they are met, at any cost and from any source.”

FM 3-24
Part of the Solution: Community-based data collection

Data Collection:
- Basic tech
- Low cost
- Minimal training

Lends itself to COIN Stability Ops – Civilian Transition Process

Better Decisions:
- Well location, condition
- Agricultural projects
- Irrigation infrastructure
- Public health
- Condition of Local Water (quality/quantity, accessibility/availability)
POINTS TO CONSIDER
Spatial-Temporal Scale

Water Quantity, Quality, Availability, and Accessibility

- District level
- Village level
- Watershed level
- National level: MRRD, IDLG, MAIL, MoEW, MoPW, MoPH, MoEC, MoCIT, MINES, MoED
POUNTS TO CONSIDER
Atmospherics (Social Environment)

Number and Detail of Water Observations/Questions

Water Quantity, Quality, Availability, and Accessibility

Few, Critical Observations

Multiple Probing, In-depth Observations and Questions

Critical Observations and Questions
# ISAF Commander’s Perspective of COIN

## Population-centric Plan

**Protect Population**  
ANSF (Afghan National Security Force), Local Government, Local economic opportunities

**Connect**

**Strengthen** (Prepare for transition)

## LOO (Lines of Operation)

1. Protection  
2. Support/Develop ANSF  
3. Neutralize Insurgency  
4. Support GIRoA

## End State:  
AF self governance/self defense; deny sanctuary; establish credible government
GI RoA Water Management

Ministry of Energy and Water (MEW)
- Responsible for surface water management at the national level
- Manages Dam construction

Helmand Arghandab Valley Association (HAVA)
- Part of MEW
- Responsible for management of the Helmand and Arghandab Rivers, canal construction and maintenance, and Kajaki and Dahla Dam
- PRT embed present for mentoring

Ministry of Agriculture, Irrigation, and Livestock (MAIL)
- Responsible for canal water distribution and irrigation
- Authorities for irrigation are similar to HAVA

Ministry of Mines (MoM)
- Confined Aquifer Groundwater Resources

Ministry of Rural Rehabilitation and Development (MRRD)

Informal Structures
- Mirabs: Non-GI RoA officials who manage water at the local level by controlling canal gates and water distribution
- Exist in parallel to GI RoA structure and not managed.
**SITUATIONAL AWARENESS**

**Point 1:** Water has a determinative impact on: 1) agriculture and livestock, 2) population management, 3) energy, 4) public works and, 5) the drug trade in the targeted geographic area.

**Point 2:** Humanitarian assistance projects supported by NGOs and USAID in association with ISAF to improve economic activity and employment—likely through agriculture—will require increased water use and must be supported by investment and improvements in water infrastructure and watershed management.

**Point 3:** Though many players (NGOs, USAID, US military with CERP funds, the international community) are involved in water projects, there is no coordinated watershed management plan to monitor and assess water quantity and quality in the region of interest.

**Point 4:** ISAF’s efforts to stabilize Afghanistan must balance near-term gains in agricultural production with (a) the potential of increased transboundary conflicts over water and (b) the potential to exhaust Afghanistan’s water resources. To mitigate these negative effects, actions must focus on improving Resource Policy/Water Resource Management capacity and effectiveness, with special focus on increasing efficiency of waterquantity and quality monitoring and assessment.

**GROUNDWATER**

*Groundwater is a renewable resource. It is recharged in the Helmand River Basin primarily through snowmelt in the Hindu Kush Mountains. It is also recharged through seepage from the Helmand River, various wadis and other tributaries to the Helmand River.*

*Groundwater is a limited resource. The amount of groundwater available can be reduced due to contamination, population growth and climate change.

Knowledge and monitoring of the groundwater system is important in order to avoid undiscovered degradation of the groundwater due to over-abstraction or contamination.

**BE AWARE!** Across the AO, groundwater is being withdrawn faster than it recharges causing a drop in the water level.

**WATERSHED OVERVIEW**

Water capture, diversion, and extraction projects upstream affect people downstream and can cause grievances.

Unequal distribution of water leads to:
- Regional Water Scarcity
- Regional loss of Livelihood
- Environmental Refugees
- Internally Displaced People

Control of water in canals and in wells is directly related to social power structure within communities.

**SURFACE WATER**

A significant amount of irrigated fields in the battlespace rely on water from the Helmand River that is diverted through canals.

Flood irrigation of fields leads to soil salinization. Saline soil is harmful to plant health. If salt content is high enough, crops like corn will die. (FYI, Poppy is relatively salt tolerant.)

**BE AWARE!** Even though check dams and diversion canals offer quick impact solutions, they capture and divert water from the system and can negatively impact those downstream.

**GROUNDWATER**

*The Cause/Effect of Wells*

Local nationals often ask for wells to get water for drinking and for crop irrigation.

**BE AWARE!** Wells in RC(SW) offer quick impact but short-term solutions.

Across the AO, groundwater is being withdrawn faster than it recharges. This causes drop in water levels. In order to reach water, wells have to be drilled deeper and water withdraw requires energy.

Wells with diesel or electric pumps compete for the same water as wells with hand pumps and with karezes in area.

**BE AWARE!** Usually drilling an initial well or adding an additional well in a community is not a good or sustainable solution and may cause long-term problems.
Summary

The Helmand River system is both vital ground and critical infrastructure within the RC(SW) AO.

• Popular support for GIRoA is based on the availability of essential services; water is primary concern of the population.

Risks to the Helmand River System can be mitigated through watershed management plan.

• Local and Provincial level development projects must be executed within the plan
• Water management planning must include GIRoA agencies and develop sustainable GIRoA management capabilities.
• Good river system management can increase licit crops and increase economic growth while ensuring adequate water availability downstream.

Helmand River System management plans within CF and GI RoA are developing to ensure sustainable growth and provision of services in the future.
Thanks to Rasia, my interpreter.

In loving memory of MSgt Scott Pruitt, I MEF (FWD), KIA 28 Apr 2012, Zaranj, Afghanistan
Questions?

Overall Classification: UNCLASSIFIED