Fires set by Iraqi forces prior to their withdrawal during Operation *Desert Storm* blaze out of control outside Kuwait City

DOD

Environmental Planning While Deployed

Mission Hindrance or Enhancement?

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There is abundant doctrine requiring planners and operators to consider environmental protection in deployment operations. Joint Publication (JP) 3-34, *Joint Engineer Operations*, for instance, outlines environmental considerations for both domestic and foreign training and operations.[1] Many commands have also included an annex L in operation plans, which describes the overall environmental mission. However, these plans seldom include specific instruction or goals on the tactical level. In fact, although many lessons from the Balkans and other contingency operations have been documented and studied, lessons are now being relearned in the Iraq and Afghanistan operations.[2] In addition, despite requirements to conduct environmental health site assessments prior to establishing base camps, they were not always completed during Operations *Iraqi Freedom* and *Enduring Freedom* because commanders did not advise preventive medicine personnel where camps were being set up.[3] This may be, at least in part, attributed to field commanders not being aware of the function of their preventive medicine assets.[4] It should be noted that Final Governing Standards (FGS), or the Overseas Environmental Baseline Guidance Document (OEBGD) where FGS are not available, currently do not apply to contingency military operations. However, policy is being drafted to extend the FGS or OEBGD to contingency bases.

There is a difference between an environmental baseline study and an environmental health site assessment, though they are inextricably related. While an environmental baseline study evaluates the status of the environment, an environmental health site assessment evaluates the impact of the environment on the warfighter. In this article, we discuss both studies as they are key to successful military operations.

Troop Health and Safety

History is rife with examples of disease non-battle-related injuries (DNBI) being the dominating causes of casualties in military operations. Diseases associated with unsanitary conditions and close quarters such as dysentery, typhoid fever, pneumonia, and influenza were responsible for DNBI. As early as the Peloponnesian War, Thucydides documented vomiting, convulsions, painful sores, uncontrollable diarrhea, and extreme fever among Athenians jammed together in unsanitary conditions.[5] In fact, World War I marked the first time combat-related deaths outnumbered deaths from DNBI. Even then, a noted bacteriologist observed during preparations for World War I that "war is . . . 75% an engineering and sanitary problem, and less than 25% a military one. The wise general will do what the engineers and sanitary officers let him."[6] Nevertheless, these lessons have not been learned to the necessary extent. During the Soviet-Afghan war in the 1980s, 67 percent of Soviets who served in Afghanistan required hospitalization for a serious illness such as hepatitis, typhoid fever, plague, malaria, or cholera.[7] During Operations *Iraqi Freedom* and *Enduring Freedom* from 2001 to 2006, evacuations for DNBI accounted for 35 percent and 36 percent, respectively, of all medical evacuation cases and were the largest single category of evacuations for both operations.[8]

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In addition to communicable diseases, other environmental conditions can lead to debilitating injuries. At least 25 percent of the 697,000 who served in the 1991 Gulf War are afflicted with an enduring, chronic multisymptom illness commonly known as "Gulf War Syndrome." Suggested causes include exposures to potential neurotoxins (pyridostigmine bromide pills, pesticides, and nerve agents), close proximity to oil well fires, and receipt of multiple vaccines.[9] Even more recently, a jury ordered a military contractor to pay 12 U.S. Soldiers $85 million in damages after failing to protect them from exposure to hexavalent chromium, a known human carcinogen, that contaminated a water treatment facility in Iraq.[10] It is conceivable that had some of these environmental conditions been assessed more carefully, they could have been mitigated.

JP 3-34 stresses the link between the physical health of military members and mission readiness by noting that "failure to recognize environmental threats can result in significant health risks to the JTF [joint task force], adversely impacting readiness." These threats include endemic insect- or rodent-borne disease as well as pollution from soil, water, and air.[11] Over 40 cases from 1991 to 2006 were reported in which contingency-related incidents with negative environmental consequences actually or potentially affected the health of U.S. troops or others. These instances had a profound effect on the military mission. For example, a base camp that was poorly sited had to be dismantled and relocated, which distracted the unit from its primary mission. In another case, a 300-gallon fuel tanker overturned at a U.S. camp, but the spill was not officially reported or properly marked. Base planners had begun to construct sleeping areas at the site until officials learned of the spill. Construction had to be halted and started over at a new location.

Base camps generate large streams of waste. It is critical that this waste is managed properly to prevent contamination. Until recently, military bases in Iraq and Afghanistan routinely used burn pits to dispose of their solid waste. It is unclear exactly how many burn pits were operated and for how long. Notwithstanding the lack of clear epidemiological evidence linking burn pits with respiratory and pulmonary diseases, these operations have been eyed as a potential cause for these types of illnesses. As a result, Department of Defense Instruction 4715.19, "Use of Open-Air Burn Pits in Contingency Operations," now prohibits long-term use of burn pits for certain kinds of waste and authorizes their short-term use only when no alternative disposal method is feasible.

Combat Effectiveness and Mission Success

Besides degradation of troop health and safety, failing to account for environmental factors can have a detrimental effect on meeting mission objectives. Forward operating bases (FOBs) generate hazardous wastes such as fuel, oil, other chemicals, and batteries. The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal prevents the United States from moving hazardous wastes out of a country in a timely manner. As a result, they tend to accumulate at these sites and, if not sited or managed

U.S. Navy

Naval medical personnel examine positive malaria blood smear at Naval Medical Research Unit, Callao, Peru

properly, could hinder mission effectiveness. For example, in Afghanistan, improperly stored lithium batteries resulted in two fires that released hazardous fumes, immediately putting the health of nearby personnel at risk. In Iraq, hazardous waste accumulation points were located near the base perimeter, making an attractive target for attack by insurgents. Also in Iraq, American units used heavy construction equipment that damaged the fragile topsoil (called desert pavement) that created dust storms, leading to visibility, breathing, and vehicle-maintenance problems. An appropriate environmental assessment factoring the local soil and environmental conditions might have prevented these problems.[12]

Although there may be trash in the streets and polluted water in a country where deployed operations take place, locals still care about their environment. In fact, public opinion data in Iraq from 2003 to 2005 indicated that environmental issues should be an important piece of reconstruction efforts.[13] People care deeply whether their water will make their children sick, and they will be more likely to support forces that provide their basic needs. Field Manual 3-24, *Counterinsurgency*, notes that providing essential services such as sewage, water, electricity, and trash is key to gaining support of the population. During Operation *Iraqi Freedom*, attacks on soldiers were reduced in sections of Baghdad where U.S. forces had provided at least some of these services.[14]

Failure to manage waste is counterproductive to meeting both strategic and tactical objectives. U.S. actions that are perceived as harmful to the environment can cause friction between Americans and nationals, which may promote instability and keep the United States from obtaining its political objectives. Therefore, diligent planning minimizing environmental impact must be conducted throughout all operational phases. However, the military is frequently inadequately staffed, trained, and equipped to deal with waste management. The Area of Responsibility Environmental Component Plan discusses the U.S. military's challenges in effectively managing waste streams, often relying on open burning of all forms of solid waste and non-ideal discharge lagoons for wastewater.[15] While contractors may manage the waste generated at larger FOBs, smaller bases may assign the responsibility as an additional duty to military personnel.

In addition, tactical units often lack training in the use of appropriate environmental practices. Due to strict environmental regulations in the United States, units conducting field training exercises are often required to bivouac in areas that have permanent lavatory facilities and water distribution and waste disposal systems. To make appropriate environmental practices part of a unit's culture, training facilities would better serve unit needs if personnel were allowed to construct and manage all aspects of an FOB including waste management. Such predeployment training would prepare military personnel better for deployment operations.

Making the Case for Sustainability

Sustainability has become something of a buzzword, but it has real implications for enhancing military mission effectiveness. In this context, *sustainability* may be defined as "using processes that are non-polluting, conserving of energy and natural resources, economically efficient, [and] safe and healthful for workers."[16] FOBs have become an important feature in the U.S. expeditionary warfighting strategy. Contingency bases in deployed environments vary in size, mission, and duration, but all require significant logistics to supply water, fuel, and food, as well as to remove waste. For example, a 600-soldier FOB requires a convoy of 22 trucks per day just to supply fuel and water and haul away wastewater and solid waste.[17] The costs to supply the FOBs are not only dollars and manpower, but also the risk of attack against convoy personnel. There remains an urgent need to improve FOB sustainability to reduce the need to convoy supplies in and the waste out.

Although official military doctrine specifies that bottled drinking water be used as a last resort, it is in reality the primary source of drinking water at many FOBs. There is a perception that bottled water is safer, easier to pack and carry on missions, and more easily distributed during humanitarian missions. However, delivering bottled water is expensive, dangerous, and creates a major source of solid waste. An estimated half of the water bottles are discarded even before they are used because of torn shrink-wrap packaging or expired shelf lives.[18] If not hauled out of the FOB, the waste must be disposed of on-site. Many times, on-site solid waste disposal is accomplished via burn pits. As mentioned, burn pits are not viable long-term alternatives

to waste treatment. However, there are alternatives to relying on bottled drinking water. As long as local water sources meet purity and quantity requirements, military units may use reverse osmosis water purification units, tactical water purification systems, or lightweight purifiers. These technologies are proven to produce safe, potable drinking water and, if used more regularly, would reduce the need for bottled drinking water.

Fuel is another important commodity required at FOBs. In 2006, Major General Richard Zilmer, USMC, requested alternative energy sources such as solar panels and wind turbines for battlefield operations in Iraq. General Zilmer's memo noted that without renewable power, U.S. forces "will remain unnecessarily exposed" and will "continue to accrue preventable . . . serious and grave casualties."[19] Ashton Carter, Under Secretary of Defense for Acquisition, Technology, and Logistics, testified to Congress in 2009 that "protecting large fuel convoys imposes a huge burden on combat forces" and "reducing the fuel demand would move the department more towards an efficient force structure by enabling more combat forces supported by fewer logistics assets, reducing operating costs, and mitigating budget effects caused by fuel price volatility."[20] In 2008, the Army established an energy security strategy to reduce energy consumption and use alternative energy sources. The use of photovoltaic cells (solar power), at least on a small scale, holds promise in offsetting energy production needs.[21] Alternative fuel production (for example, hydrotreated renewable oils) at FOBs has been proposed and pursued, at least in the research stage. However, these require a carbon-based feedstock that could be even more expensive than conventional fuels and do not offer a compelling military benefit.[22] Rather, a more immediate solution may be more efficient generators and equipment to reduce FOB fuel needs. FOB structures, which typically lack insulation, are inefficient and require significant power to heat or cool. Energy audits are also being considered as a way to reduce energy consumption at more permanent facilities in deployed U.S. Central Command locations. Power production at these deployed sites often exceeds demand, wasting a significant amount of fuel. For instance, Camp Leatherneck only required 5 megawatts of power but was generating 19 megawatts with 196 generators running at 30 percent capacity and consuming over 15,000 gallons of fuel per day.[23] More judicious use of generators could reduce the consumption of precious fuel.

Conclusions

Regulations intended to protect the environment have implications beyond just complying with written mandates. Indeed, planning for environmental conditions and protection at the beginning of a deployment benefits troop health and safety. Employing sustainable practices in deployed operations helps reduce waste and costs both in funds and lives. Including environmental factors in planning and operations directly helps to ensure strategic and tactical mission success. Nevertheless, environmental considerations remain absent or delayed in many deployed military operations. There continues to be opportunity to improve environmental practices in these activities. **JFQ**

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NOTES

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