How the Marine Corps Struck Gold in a Trash Heap As Part of the Pentagon's Fight Against Climate Change

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By Sonner Kehrt June 30, 2021

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For years, Marines at Air Station Miramar, a busy Marine Corps installation in Southern California, knew they were sitting on something precious: an enormous pile of trash.

For more than six decades, the Navy had leased land to the city of San Diego for the Miramar Landfill, which collects nearly a million tons of garbage a year.

As organic material in a trash heap breaks down, it produces methane. Methane is a greenhouse gas, and landfills emit substantial amounts of it across the country—the equivalent of tens of millions of cars on the road for a year. But if the Marines could collect and treat that methane, it could be used as a renewable energy source.

"We knew back then that that was a resource that could be used to power the air station in an emergency," says Mick Wasco, the utilities and energy management director at the air station.

So in 2012, Air Station Miramar tapped into the trash pile. Working with an energy partner who helped provide methane gas from the landfill to parts of San Diego, engineers at the air station began to pull in methane to provide energy for the base, as well. Today, the air station gets nearly half of its power from landfill methane gas.

But the methane has also made something else possible: complete energy independence.

The methane gas supply, combined with solar energy, a diesel and natural gas plant, and battery storage, means the air station can remove itself completely from the outside power grid. Its separate microgrid will allow it to operate all mission-critical equipment and even serve as a hub for nonmilitary emergency personnel if wildfires or heat-induced blackouts knock out power to San Diego.

“We’ll be able to operate for 21 days all of our flight line and all of our critical loads without any external fuel supply,” Wasco says of the microgrid. “Everybody and their mother wants one.”

‘Very Deadly Serious’

Projects like this exist all across the Department of Defense—from initiatives as small as replacing thousands of conventional light bulbs with LED bulbs to systematically assessing the threats climate change poses to every major military installation. For years, reports from the Pentagon and from outside agencies have warned that without proper planning, U.S. military bases and personnel will be left exposed to and unprepared for the coming climate crisis. Because of this, projects like Air Station Miramar’s microgrid have proliferated, despite climate-related whiplash between administrations.

In January, President Joe Biden released an executive order positioning climate change at the center of U.S. national security, which means officials will spend even more energy and attention on programs that help prepare the world’s largest military for possibly the greatest threat it has faced.

“It really represents a new chapter in awareness of the climate crisis and its impact on DOD,” says Sherri Goodman, who served as the first U.S. deputy undersecretary of defense, environmental security, and who is a senior fellow at the Wilson Center and a senior strategist at the Center for Climate and Security. “I think they’re very deadly serious.”

‘The Security Implications Are Catastrophic’

In 2018, as Tyndall Air Force Base, in the Florida panhandle, prepared for Hurricane Michael, the Category 2 storm unexpectedly escalated into a Category 5. Sustained winds reached 160 miles per hour, and the eye of the storm passed directly overhead. Michael damaged every structure on the base—nearly 500 of them beyond repair. That same year,

Hurricane Florence hit Camp Lejeune in North Carolina. Record storm surges and over two feet of rain battered buildings, damaging 70% of on-base housing and causing an 84,000-gallon sewage spill.

Military installations frequently lie in what are proving to be Mother Nature's lines of fire: in the path of repeated hurricanes; on coastal lowlands where sea level rise accelerates erosion; in the drought-ravaged West, where record-breaking wildfires have become a yearly event. A 2019 Pentagon report found that nearly every military base it analyzed either currently faces, or will face, climate-driven threats—from recurring flooding to thawing permafrost.

"You go to Norfolk and you can tell that they're dealing with recurrent flooding," says John Conger, director of the Center for Climate and Security, who served as assistant secretary of defense for energy, installations and environment in the Obama administration. "You go to Tyndall Air Force Base and you can see the buildings are still wrecked from the storm two or three years ago. … If you don't do anything, then the security implications are catastrophic in the second half of this century."

Severe weather events like these mean pausing operations, evacuating personnel, and spending time and resources to clean up afterward—the cost to rebuild Tyndall Air Force Base is upward of $5 billion. As these once-rare occurrences become more commonplace, so do interruptions to base readiness.

Marines with Marine Corps Base Camp Lejeune help push a car out of a flooded area during Hurricane Florence, on Marine Corps Base Camp Lejeune, Sept. 15, 2018. Hurricane Florence impacted MCB Camp Lejeune and Marine Corps Air Station New River with periods of strong winds, heavy rains, flooding of urban and low lying areas, flash floods and coastal storm surges. Credit: U.S. Marine Corps/Lance Cpl. Isaiah Gomez

But the risk climate change poses isn't just to physical infrastructure. Shifting weather and climate patterns affect training and operational missions. Aircraft performance, for instance, can suffer in extreme heat. So can human performance. Last year, the Union of Concerned Scientists released a memo detailing the threat that heat-related illnesses poses to soldiers. In 2018, there were nearly 2,800 cases among military members, a number expected to increase. The analysis found that by the middle of the century, if nothing changes, more than 100 military installations around the country will average more than 30 additional days a year with a heat index of over 100 degrees Fahrenheit.

"A lot of DOD basic training bases are in the South," Conger says. At some of these installations, black flag days—days where the temperature reaches above 90 degrees Fahrenheit, bringing physical training to a halt—can already number 20 or 30 a year, which impacts recruit readiness. "What do you do in 10 or 20 years when it's 90? Or 120?"

'Climate on the Map for DOD'

That sort of thinking—"Rather than talking about how to protect the environment, but how to protect yourself from the environment," as Conger puts it—helped to shift the military's approach to climate change. "When you start talking about … 'How can I ensure I can do my mission?' the enthusiasm level is significant," Conger says.

In 2007, Goodman introduced a new term to the Pentagon: "threat multiplier."

The phrase played on the familiar "force multiplier," or a factor that amplifies effort, giving you more bang for your buck—sometimes quite literally. A threat multiplier, on the other hand, works in the other direction: It amplifies a threat, making a bad thing worse. Climate change, Goodman argues, is a threat multiplier.

Climate change isn't only about the environment: Climate change makes everything the military already worries about worse. A shrinking polar ice cap doesn't just mean thinking about polar bears. It means thinking about geopolitical dynamics and national security, as China and Russia build up their icebreaker fleet. It means thinking about humanitarian and environmental emergencies, as people move away from northern villages sinking into the permafrost and oil tankers start to transit through the Northwest Passage. Melting ice north of Alaska means higher sea levels in Miami.

"It really put climate on the map for DOD," Goodman says.

In 2008, the National Defense Authorization Act included, for the first time, direction to the Department of Defense to consider the effect of climate change on military missions and facilities. In its 2010 Quadrennial Defense Review Report, the department identified climate change as a key factor shaping the national security environment.

During the Obama administration, clean energy initiatives popped up everywhere. In particular, projects that focused on energy resilience at bases—like the microgrid project at Air Station Miramar, which started in 2012—nearly tripled between 2011 and 2015. At Fort Drum, in upstate New York, work began to convert its coal-burning power plant to one fueled primarily through leftover logging branches and wood from demolition projects. Los Angeles Air Force Base became the first federal facility to completely replace its general purpose vehicle fleet with electric cars.

The services also debuted bigger-picture programs. In 2009, the Navy announced the "Great Green Fleet," an initiative to reduce fossil fuel dependence and expand biofuel use. Two years later, the Army began its "Army Net Zero" initiative, choosing 17 pilot sites around the country for programs aimed at minimizing energy, water and refuse waste—everything from keeping old mattresses from Fort Carson out of landfills through a recycling initiative to studying the possibility of harnessing ocean-wave energy with the Oregon National Guard. In a 2015 commencement address at the Coast Guard Academy, President Obama focused his remarks on the threat of climate change, which he told cadets would "shape your entire careers."

Then, under the Trump administration, the enthusiasm level shifted back in the other direction. The Navy stood down its task force on climate change, which had been in place since 2009. The Defense Department's official comments on a Government Accountability Office report urging better preparation for climate change overseas stated that associating extreme weather events with climate change wasn't worth the time or money to track.

But Conger says that even without the support of the administration, many climate-related Defense Department initiatives kept moving. At Los Angeles Air Force Base, a pilot study continued into the Trump presidency to demonstrate the capacity of its electric vehicle fleet to return energy to the grid while plugged in. Today, Fort Drum is completely powered through biomass, and the plant generates enough electricity for the Army to sell some back to the grid.

"It was less like they put their foot on the brake and more like they took it off the accelerator," Conger says. "When the Trump guys came in and said, 'You don't have to worry about climate change anymore,' they said, 'Well, we're going to anyway. Because it affects our mission.'"

'Green Infrastructure Is Fair Game'

Last September, in the final months of the Trump administration, the Defense Department released a new tool to analyze climate-related risks at military installations. The Climate Assessment Tool builds on a similar effort designed by the Army Corps of Engineers, using historical extreme weather data to project possible future scenarios. In April, the department announced it would assess all major U.S. installations within a year.

Similar efforts are already underway. In 2017, the Naval Facilities Engineering Command released a handbook to help base planners better understand how to think about and plan for climate change. One of the first installations to go through the process was Parris Island, a Marine Corps base in South Carolina.

"We got involvement from everyone from recruit training, to sea-level-rise experts, to people who can bring topographical data," says Cmdr. Andrew Litteral, a public works officer there.

The main concern at Parris Island is sea level rise, but the assessment looked at everything from improving stormwater systems to the effect of the sun beating down on concrete structures, which results in a "heat island effect," creating high-temperature zones that can persist even after the sun has set.

"We've been demolishing pavement, tearing up parking lots," Litteral says. Less concrete also means better drainage, which helps when the base floods. Where they do repave roads, it's higher up, farther away from the threats posed by flooding and erosion. They're building new buildings higher above sea level, as well.

Since 2017, the Unified Facilities Criteria, the military's building code standard, has directed planners to consider the impact of climate change. At Naval Station Norfolk, where projections put sea level rise as high as nearly seven feet by the end of the century, engineers have been replacing old piers with higher ones, which keep utilities out of reach of storm surges. At Cape Lisburne, a long-range radar site on the northwest coast of Alaska, the Army Corps of Engineers completed a new seawall last year to prevent erosion by the Chukchi Sea.

Environmental resiliency is also growing. The Defense Department's Readiness and Environmental Protection Integration Program has historically helped the military work with communities to avoid land-use and other resource conflicts that could impede military training. In 2019, the government adjusted its mission to include "installation resilience"—specifically projects that mimic or bring back natural systems to mitigate the risk of things like wildfires or erosion.

"Now green infrastructure is fair game," Conger says.

At Fort Huachuca in Arizona's Sonoran Desert, the program has helped the base buy nearby water conservation easements, protecting local watersheds from groundwater pumping while simultaneously keeping new housing developments away from the base's Unmanned Aircraft Systems training. This year, Eglin Air Force Base in Florida received a Secretary of Defense Environmental Award in part for helping rescue thousands of gopher tortoises displaced by development. Keeping the tortoise from landing on the endangered species list means other bases where gopher tortoises live won't need to curtail operations down the line.

At another Marine Corps air station, on the opposite side of the country from Air Station Miramar, a different sort of project takes shape: Several years ago, Jessica Guilianelli, a natural resources manager at Air Station Cherry Point, noticed that trees along the base's shoreline, which fronts North Carolina's Neuse River, kept ending up in the water. Soil was washing out from under their roots. Then Hurricane Florence came through. The shoreline, already eroding, suddenly became much worse.

As part of the hurricane recovery efforts, and to protect against further erosion, the air station is creating a "living shoreline" along parts of its waterfront, using natural materials and native flora and fauna to construct an ecosystem that will protect the shoreline. A sill of granite rocks will form a breakwater to protect the beach and the bulkheads along it from the waves and strong tides on the Neuse River.

"Over time, we will actually be accumulating sediment behind that sill instead of losing it, like we had been," Guilianelli says. Marsh grasses will help keep that sediment stabilized. In partnership with Duke University, the air station is also reintroducing eastern oysters, a species that once flourished in the area. The protected marsh creates a home for oysters, and in turn, the oysters help filter the water and promote the growth of even more healthy grasses.

Last month, in remarks at an Earth Day summit, Secretary of Defense Lloyd Austin highlighted the magnitude of the danger climate change poses.

“We face all kinds of threats in our line of work, but few of them truly deserve to be called existential,” he said. “The climate crisis does.”

How the new administration’s priorities will be borne out remains to be seen. The Defense Department’s new Climate Action Team, which stood up in March, is developing a plan. And many of the specific details about what programs and initiatives will be prioritized won’t be made clear until the new defense budget is released.

For the military, mission comes first. But it’s increasingly clear that operating in the midst of an existential crisis can’t mean business as usual. To do the work, the military needs the cooperation of the earth and air and sea. Ensuring the mission for the coming years means buying into that idea at every level—from the chiefs of service to Air Station Cherry Point.

“I’m here to make sure that our natural resources are sustainable for us,” Guilianelli says. “We need to train Marines for the foreseeable future.”

This War Horse feature was reported by Sonner Kehrt, edited by Kelly Kennedy, fact-checked by Ben Kalin, and copy-edited by Mitchell Hansen-Dewar.