Letter No. 2 to AFRICOM

Environmental Degradation and Conflict in Africa

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Environmental degradation is a global challenge. Several studies of the environmental impact of human activities on the planet have identified significant negative, unsustainable, and sometimes potentially irreversible trends.[1] In some regions, the quality of water, land, and air has become significantly degraded. Biodiversity, renewable natural resources, and ecosystem services such as climate regulation, flood control, soil formation, or water purification also have been deleteriously affected around the globe. Additionally, environmental degradation can generate serious repercussions for regional security. The security implications are most obvious on the African continent because a majority of Africans rely very heavily on subsistence farming/fishing, groundwater/precipitation, and hand processing of natural resources. Consequently, they are directly dependent on the natural environment for basic subsistence. The increasing dependency of a rapidly growing African population on a shrinking base of natural resources has created and continues to create conflict. For example, "environmental degradation can exacerbate conflict, which causes further environmental degradation, creating a vicious cycle of environmental decline, tense competition for diminishing resources, increased hostility, inter-communal fighting, and ultimately social and political breakdown."[2] Unfortunately, the linkages between environmental degradation and conflict are complex and underexamined. Nevertheless, the linkages should be a concern for the leaders of US Africa Command (AFRICOM).

AFRICOM's stated primary objective is "building African security capacity so our partners can prevent future conflict and address current or emerging security and stability challenges."[3] This mission will not be obtainable or sustainable unless AFRICOM personnel understand the criticality of natural resources to African security and take a proactive approach to helping

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Africans reduce environmental degradation, protect and sustain natural resources, and mitigate conflict over the environment. In conjunction with other US government agencies, AFRICOM can bring to bear the knowledge, expertise, and resources needed to make Africa more stable and secure by making the African environment more stable and secure.

Environmental Areas of Concern

One can explore environmental degradation in Africa from many different perspectives. The identification and exploration of five major areas of concern—land, water, climate, plants/animals, and people—provide a comprehensive picture of the problem.[4] One can examine each domain from the viewpoint of how degradation is or is not affecting it. Before proceeding, however, some background information about Africa and environmental degradation in Africa should help illuminate the key challenges.

Environmental degradation of land is created by processes that reduce the capacity of the land to produce food or resources.[5] Land degradation can include desertification, deforestation, soil erosion, and salinization, among other natural and anthropogenic processes. A comprehensive review of public information and peer-reviewed reports indicates that Africans in 32 countries consider land degradation a central environmental challenge.[6] Another environmental resource, water is often the focus of intense competition and conflict: "Changes in water quality and quantity—in freshwater environments (lakes and rivers) and in coastal and marine environments—rank among the most challenging environmental and social issues that Africa currently faces."[7] Specifically, several African states identified water pollution and water scarcity as critical environmental issues.[8] Land and water conditions are affected by ongoing changes in Africa's varied and unique climate zones. The recent and rapid increases in global average temperatures are driving a variety of transformations to Africa's climate, increasing environmental degradation. Rainfall patterns and growing seasons are changing, sea levels are rising, water stress is spreading, ecosystems are transforming, and the vector ranges of disease are altering.[9] Climate change and other environmental pressures are also deleteriously affecting Africa's plant and animal life.

At present, the rich African biodiversity is threatened by a confluence of climate change, habitat destruction, poaching, and surging populations.[10] The essential ecosystem services provided by Africa's biodiversity are particularly influenced by expanding African populations extremely dependent on natural capital for subsistence. Rapidly increasing populations are modifying land-use patterns, demanding more clean water, and stressing animal and plant communities throughout Africa. All of these environmental changes are occurring across an ecologically diverse continent populated by equally diverse people.

Second only to Asia in geographical size and population, Africa contains a vast variety of natural resources that includes approximately 30 percent of all of the earth's minerals.[11] Specifically, Africa has 40 percent of the world's gold, 60 percent of the cobalt, and 90 percent of the platinum.[12] The continent is also home to the world's longest river (the Nile), biggest desert (the Sahara), oldest desert (the Namib), and shortest coastline. We now offer more detailed information under the five areas of concern, mentioned above.

Land

The land or geography of Africa is quite interesting and diverse. African land is

mostly arid (60 percent), and most of it is degraded either naturally or anthropogenically (65 percent). In particular, 31 percent of African pasture lands and 19 percent of forests are degraded in some form or another. Only 10 percent of all African lands are considered prime farmland while another 25 percent is rated as having low to moderate potential for sustainable agriculture.[13] Overall, 20 percent of Africa's land area is forested, and much of that is threatened by deforestation. Every year, Africans lose an average of 40,000 square kilometers (0.6 percent) to deforestation.[14] In addition, the areas that are vulnerable to desertification—home to over 20 million Africans—are expanding.[15] As a result of these trends and increasing population, pressure on the land and natural resources is increasing. In fact, in 1950, the hypothetical individual share of the land was 13.5 hectares/person, and in 2005 it was 3.2 hectares/person; predictions call for 1.5 hectares/person in 2050.[16] In some areas of Africa, land degradation is obviously increasing, but in a few areas, land restoration efforts have been successful, thanks to thriving reforestation, soil enhancement, and erosion-control programs. The multifaceted pressures on land resources in Africa are also reflected in relation to the pressures on water resources.

Water

A critical resource for all humans, water is especially critical in Africa, the second driest continent after Australia. In fact, 75 percent of all Africans rely upon groundwater as their major source of drinking water.[17] Water resources are unevenly distributed in Africa, some areas having an abundance of water and others very little. Scientists estimate that out of Africa's almost 1 billion people, over 300 million face water scarcity and stress challenges.[18] Overall, Africa has approximately 3,930 cubic kilometers of renewable water resources, which represents less than 9 percent of the global total of renewable water, and per capita consumption of water is 31 cubic meters per year for all of its people.[19] Scientists also estimate that an additional 250 million Africans will face water scarcity challenges as a result of global climate change.[20] The increasing pressures on water are observable in specific areas of Africa. For example, Lake Chad in northern Africa has been shrinking as a result of changing climate and increasing agricultural demand.[21] In other areas, cooperation and water management processes are preserving vital watersheds. The Okavango Delta presents a spectacular case of how coordinated wetland-management institutions are protecting and preserving the world's largest inland delta.[22] African water resources are clearly threatened by a variety of human and environmental pressures, which have also been detected within the distinctive climate zones of Africa.

Climate

Africa is the second driest continent, again after Australia, but Africa is also the world's hottest continent, having six climatic zones: Tropical Wet, Tropical Summer Rainfall, Semiarid, Arid, Highland, and Mediterranean, some of them containing spectacular biodiversity.[23] The Fynbos region in the Cape Province of South Africa, for example, has the highest rate of general endemism in the world.[24] In addition, the seasonal and diurnal variation in some of Africa's climatic zones is amazing. For instance, the temperature variation seasonally in the Democratic Republic of the Congo is only 1.4 degrees Celsius while temperature swings

between the coldest and hottest month in the Sahara Desert can exceed 20 degrees.[25] Interestingly, Africa is the lightning center of the planet, having more flashes per square kilometer than anywhere else.[26] Africa's variation in climate also enables enormous continental biodiversity.

Plants/Animals

Africa's varied animals and plants are plentiful in some regions and endangered in others. The largest bird (ostrich) and largest land mammal (African elephant) in the world both reside in Africa. Large populations of mammals such as wildebeests and zebras migrate across African savannahs by the thousands. Additionally, 98 percent of Madagascar's land mammals, 92 percent of its reptiles, 68 percent of its plants, and 41 percent of its bird species are found only on this island.[27] Also, the forests of the Congo Basin are the world's second-largest area of intact rain forests, after those of the Amazon Basin. The rich African biodiversity is also reflected in the fact that eight of the world's 34 biodiversity hot spots are in Africa. Nevertheless, African biodiversity is declining steadily as over 120 plant species have become extinct and another 1,771 are threatened with extinction.[28] The critical factor in reversing the decline of biodiversity and environmental degradation in general is human activities.

People

Home to 965 million people, Africa is widely considered the birthplace of mankind. As the second most populous continent, it has a population density of 32.6 people per square kilometer. The population is unevenly distributed, with some areas in the Sahara, for example, having very few permanent towns or villages but others, such as those along the Nile River Delta, having extremely dense populations. In 2005 over 60 percent of Africans still lived in rural areas, but the number moving to urban areas is rapidly increasing.[29] Although approximately 57 percent of all Africans are still employed in agricultural activities, urban growth in Africa is the highest in the world.[30] In addition, Africa's growth rate of 2.32 percent annually leads the rest of the world; moreover, 20 of the world's 30 fastest-growing countries are African states. This rate is almost double the 1.24 percent growth rate of population globally.[31] This rapid rate places enormous pressure on agricultural industries to feed the growing populations and places even more pressure on natural habitats and environmental resources. Unfortunately, serious environmental degradation has occurred in some parts of Africa, and many of its other regions remain unprotected from the pressures of rising population.

The ways in which state and regional governmental organizations have reacted to growing environmental degradation vary throughout Africa. Some countries' inability to initiate collaborative processes to reduce conflict arising from environmental degradation has resulted in violence and insecurity. Other states, however, have been able to adapt to and mitigate environmental degradation, thus reducing conflict and insecurity. Below we present two contrasting cases involving the Sudan and Niger, whose state reactions to environmental degradation challenges are dissimilar; consequently, stability and security outcomes are also vastly different. Examination of these two cases can yield potential lessons learned for AFRICOM leaders that may help their efforts to increase the capacity of Africans to enhance their own stability and security in the future.

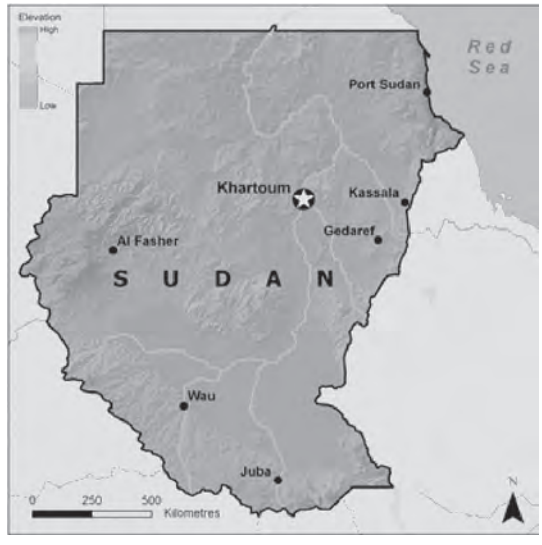
Case Studies: Degradation and Conflict

Conflict augmented by environmental degradation in Africa is often complex and multicausal. However, case studies of environmental degradation in the Sudan and Niger analyzed within the five domains described above reveal some of the specific pressures and challenges in action. The individual pressures and challenges previously discussed can then become focal points for AFRICOM efforts to help Africans help themselves.

Sudan

A case study of the Sudan by the United Nations Environment Programme (UNEP) identifies environmental degradation as a major factor contributing to violent conflict. In addition, the researchers conclude that years of ethnic conflict; population displacement; weak, corrupt, and biased governance; uncontrolled exploitation of natural resources; and little or no investment in sustainable development significantly contribute to instability and insecurity.[32] Particularly, in the Darfur region of Sudan, years of drought exacerbated by desertification and population growth led nomadic pastoralists to move herds of cattle and goats into land occupied primarily by subsistence farmers. Vicious conflict ensued, as many as 450,000 people were killed by fighting and disease, and approximately 2.4 million people were displaced from their homes.[33] According to the *Sudan Post-Conflict Assessment*,

> UNEP's analysis indicates that there is a very strong link between land degradation, desertification and conflict in Darfur. Northern Darfur—where exponential population growth and related environmental stress have created the conditions for conflicts to be triggered and sustained by political, tribal or ethnic differences—can be considered a tragic example of the social breakdown that can result from ecological collapse. Long-term peace in the region will not be possible unless these underlying and closely linked environmental and livelihood issues are resolved.[34]



(From UNEP, Africa: *Atlas of Our Changing Environment* [Nairobi, Kenya: Division of Early Warning and Assessment, UNEP, 2008], 306, http://www.unep.org/dewa/africa/AfricaAtlas/PDF/en/Africa_Atlas_Full_en.pdf.)

This conflict explicitly illuminates the five categories of environmental challenges present in all of Africa:

> Environmental issues have been and continue to be contributing causes of conflict. Competition over oil and gas reserves, Nile waters and timber, as well as land use issues related to agricultural land are important causative factors in the instigation and perpetuation of conflict in Sudan. Confrontations over rangeland and rain-fed agricultural land in the drier parts of the country are a particularly striking manifestation of the connection between natural resource

> scarcity and violent conflict. In all cases, however, environmental factors are intertwined with a range of other social, political and economic issues.[35]

Land degradation, competition for scarce water supplies, changing precipitation patterns contributing to drought and desertification, widespread destruction of forested ecosystems by refugees, and large, uncontrolled population movements all contributed to instability and insecurity in this troubled region. Although Sudan presents a clear example of environmental degradation intertwined in a circular relationship with violent conflict, Niger offers an opposing case study in which environmental degradation initiated innovative, proactive processes that improved ecological conditions and became a major contributor to enhanced security and stability.

Niger

During the 1970s, Niger was in the grip of an enormous drought. The Sahel, already characterized as an arid region of variable rainfall and low- fertility soils, is home to most of Niger's people. Threats of desertification and land degradation forced the rural farmers in this enormous dryland to change their relationships with the land and with each other. Systematic ecosystem-management processes, such as planting specific tree species, designed to restore environmental conditions and agricultural productivity, were adopted throughout the region. Specifically, famers used simple, low-cost environmental-management techniques that enabled natural regeneration of trees and shrubs. The techniques, collectively known as farmer-managed natural regeneration, also involved uncomplicated forest-, soil-, and water-conservation programs.[36] The results have been spectacular. US Geological Survey scientists compared aerial photographs from the 1970s to photos taken in 2005 and were astonished by the widespread environmental transformations. Over 5 million hectares of land in Niger now show regeneration of vegetation:

> Today, agricultural parklands replace the wind-swept fields of the 1970s. On-farm tree densities have increased ten to twenty-fold. Village sizes have also dramatically increased in the area, generally by a factor of three, a direct indicator of rural population growth. The changes were equally surprising on the rocky slopes and plateaus east of Tahoua. Almost totally denuded in 1975, a patchwork of terraces and rock bunds now extends throughout the regions that were constructed to stem soil erosion, trap precious rainfall, and create micro-catchments for planting and nurturing trees. As a result, trees now occur on most plateaus, and farmers have taken advantage of the new environment to plant fields of millet and sorghum between the ribbons of trees. Windbreaks of mature trees crisscross the wide Maggia Valley and its tributaries. Many of the valleys now have dikes and low dams to create ephemeral lakes. As their waters recede in the dry season, farmers plant vegetables. A vibrant dry season market gardening economy has developed. Large tracts of valley lands are now green with produce—including onions, lettuce, tomatoes, sweet potatoes, and peppers.
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> . . . Many interviews with village informants at all sites confirm that there has been notable environmental improvement since the 1970s. Farmers point to the increase in woody cover, to the diversity of high-value trees, and to the rehabilitation of the productive capacity of tens of thousands of hectares of degraded land. The projects of the 1970s and 1980s demonstrated what could be done, giving villagers options. Since then, there has been a huge spread effect, particularly in farmer-managed natural regeneration—a significant change in

the way farmers maintain their fields, allowing high value trees to grow in their fields.[37]

(From UNEP, *Africa: Atlas of Our Changing Environment* [Nairobi, Kenya: Division of Early Warning and Assessment, UNEP, 2008], 262, http://www.unep.org/dewa/africa/AfricaAtlas/PDF/en/Africa_Atlas_Full_en.pdf.)

Changes in ecosystem management have improved the environment across all five domains in Niger. Degradation of the land has been markedly reduced, erosion has decreased, fertility has been enhanced, and agricultural productivity has dramatically improved. Even though rainfall levels are still below historical levels before the 1970s drought, farmers have learned to capture scarce rainfall, and groundwater levels have risen in some areas. Niger has been experiencing many of the climatic changes that affect the Sudan, yet Niger's farmers are adapting to the changing conditions without the violence and instability seen in the Sudan. In addition, the biodiversity of the area has been greatly increased by expansive terracing and planting of trees. Scientists assert that "farmers have reacted proactively to the large-scale land degradation that occurred during the droughts of the 1970s and 1980s, and have begun protecting their resources on a massive scale, encouraging natural regeneration, rebuilding their soils, and harvesting scarce rainfall."[38] Finally, even though the population of Niger has doubled since the 1970s, the country's rural farmers have decentralized control over natural resources, increased land/food security, and empowered local people to care for their own resources.[39] Importantly, "for other Sahelian countries facing the triple challenges of population growth, desertification, and climate change, [farmer-managed natural regeneration] also offers a cheap and effective model to improve farm productivity and reclaim precious land from the dunes."[40] Conflict still occurs over property rights and access to natural resources, but large-scale violence and population displacements have not been a consequence of environmental degradation and change in Niger.[41]

The dramatic differences in how people in the Sudan and Niger reacted to environmental degradation and change illustrate the need for more study into the intricate relationships between environmental degradation and conflict. The lessons learned from these two disparate outcomes also offer opportunities for AFRICOM to learn from the processes and measures applied, both successfully and unsuccessfully, and to provide focused, proactive, constructive assistance to Africans as they learn to help themselves.

Overall Recommendations

The case studies illustrate many specific issues that are continental challenges to peace and development. Many of the positive responses to the challenges apply

across most of Africa and have enhanced stability and security. AFRICOM has the potential to contribute significantly to stability and security in Africa by learning from these and other cases. By building positive relationships with African militaries and governments, AFRICOM personnel can boost African capacity to adapt to and mitigate environmental change. Recognizing that US and African militaries can be an exemplar, that the environment is a critical lifeline for Africans, that the environment is a complex source of meaning and relationships, and that stabilizing agreements may emerge from points of dialogue, we offer the following recommendations for AFRICOM's consideration:

1. "Help Africans operationalize their knowledge of the relationships between the environment and security. . . . Prepare and provide training/education material on environmental security."

Exemplified by the Sudan and Niger, environmental degradation is a threat to the environmental and national security of all African states. Degradation contributes to conflict, both violent and nonviolent, across Africa. With focused curricula on environmental security, AFRICOM can help individual African states and selected regions increase their awareness of the impending challenges that continued environmental degradation pose to stability and security.

AFRICOM should work toward establishing centers of excellence that address environmental security issues. These centers could prepare training in environmental security and educational curricula that investigate and provide responses to local, state, and regional linkages between environmental degradation and conflict.[42]

2. "Share environmental information/data with African states in a manner that is easily accessible."

African states on the whole lack access to up-to-date, advanced, and comprehensive environmental information/data. In Niger when simple, scientifically based ecosystem-management processes were implemented, stability and security increased. In the Sudan, where these processes and other good governance procedures were not applied, violence and instability erupted. Without accurate and current environmental information, African states cannot make informed security decisions for the future.

AFRICOM can either provide environmental information directly to selected states or assist them in the creation of environmental-information databases that are transparent, easily used, and accessible to as many citizens as possible. Additional environmental information can be obtained from "after action reports" from other agencies (the Department of State, United States Agency for International Development, World Food Program, Peace Corps, etc.) to see how they support environmental activities in Africa.[43] For example, reports from the US Geological Survey have been essential in determining what went right in Niger. Also, information can be acquired from allies who provide environmental support in Africa, such as Italy, the United Kingdom, and France.[44] Environmental information can also be garnered from commercial contractors who provide environmental support to customers in African countries.[45]

3. "Assist African militaries to facilitate, inculcate and disseminate an African environmental ethic (focus on mission, community, and environment). . . . They should understand [the importance of] ecosystem services and causal relationships [between those services and environmental security]."

US military forces are currently struggling to develop a comprehensive environmental ethic that extends to contingency and peacekeeping operations.[46] Progress is being made, and the US Army's environmental sustainability ethic of "mission, community, and environment" could provide a template upon which African states and AFRICOM can begin a dialogue with military professionals on the relationships among ecosystem services, environmental security, and conflict.[47] An African environmental ethic can prevent environmental degradation and augment environmental security. Perhaps funds from African Contingency Operations Training and Assistance could be used to help initiate the process of instilling an environmental ethic in interested African militaries.[48]

4. "Expand the use of US National Guard [personnel and State Partnership Programs (SPP)] to train African militaries for natural disaster and environmental mitigation responses."

Many SPP personnel and US National Guard units are experts at responding to natural and environmental disasters. African militaries can benefit from SPP and National Guard expertise and training on how to respond to such disasters as floods, droughts, and pandemic disease. With AFRICOM's assistance, SPP personnel and US guardsmen, who also understand the importance of environmental mitigation procedures, could share their extensive knowledge with African military professionals.

5. "Help African militaries purchase and utilize available environmental monitoring and early warning devices."

Many African states lack a proactive solution to the natural and environmental disasters that often weaken and disable state security. AFRICOM professionals can assist with the acquisition of early warning and natural-disaster monitoring devices by selected African militaries. If those militaries can increase their monitoring and response capabilities to natural and environmental disasters, they will enhance their security competencies, public image, and professionalism.

One concept to consider is "fractional ownership," whereby African states or regional organizations can partially own expensive environmental-monitoring equipment. "'Fractional ownership' . . . could be a concept explored by US Foreign Military Sales (FMS)" and/or international corporations, and the overall process "could foster growth of real African regional capability to respond to [environmental] cris[e]s and [disasters] even if [the process] started bilaterally [or unilaterally]."[49]

6. "Assist African environmental security specialists to train other Africans."

Establishing a core cadre of African environmental security specialists will have multiple benefits. These specialists can create targeted programs that address challenges and responses to African environmental security and help professionalize African militaries. AFRICOM can provide training, expertise, and curricula that will make this effort possible.

7. "Assist Africans [in efforts] to mitigate environmental degradation by migrants and refugees."

Environmental refugees and migrants fleeing environmental degradation and conflict challenge every African state's limited

security and economic resources. Mass movements of displaced individuals and families place a huge burden on the refugee camps and on the local environment. AFRICOM can help African militaries locate refugee camps in sustainable locations, construct camps that reduce environmental and security challenges, and proactively prevent environmental degradation from happening in the first place.

8. "Inform African militaries of US environmental security [expertise and] capabilities."

A specialized segment of US military and governmental professionals has extensive expertise in issues pertaining to environmental security, degradation, and mitigation. The in-depth and practical knowledge of these professionals can be used to reduce environmental degradation and conflict in Africa. AFRICOM should provide African military leaders with information on these capabilities and on the opportunities for US environmental security professionals to share their proficiencies with African military and environmental security professionals.

One method for such sharing could involve building "social networks" among AFRICOM staff members, African environmentalists, African environmental security experts, and other agencies, components, and even nongovernmental environmental agencies. An environmental-security social network could be used to enhance sustainable environmental practices and processes, as well as augment stability and security operations.[50] In addition, personal handheld communication devices, cell and satellite phones, or two-way radios could be used to improve the reliability of, speed of, and access to communications in all of Africa without an expensive supporting land infrastructure. As a tool for strategic environmental security communications, social networks and personal handheld devices would prove invaluable.[51] Nevertheless, we should not discount local environmental knowledge: simple "word-of-mouth" low-tech communication can be very effective, and inclusion of often marginalized groups (women and young men) should be a focal point of all strategies involving communication and environmental security.[52]

9. "AFRICOM should concentrate on those [environmental security] projects that provide visible results, measured against realistic milestones."

AFRICOM must hold engagement partners accountable and continually move those partners toward becoming self-sufficient contributors.[53] Various studies have shown that when individuals and groups become accountable and responsible for managing environmental assets and have the capacity to manage ecosystems effectively, then cooperation, ownership, and stewardship values and sustainability of the resources increase visibly.[54]

Conclusions

AFRICOM can become a positive, proactive force on the African continent, helping Africans help themselves. US military forces, environmental organizations, and government agencies have enormous expertise in and knowledge of environmental change and the challenges and opportunities it can create. AFRICOM must help Africans build environmental, economic, and social capital in order to assure stability and security.[55] The processes that AFRICOM supports should ensure that Africans are provided with expert, current, and relevant information about environmental management; gain secure and equitable control over their natural resources; and are empowered to make community-based deci-

sions concerning these resources. The frameworks and institutions that enable the supporting processes all have working antecedents in the United States and other developed states; AFRICOM can assist process adaption by Africans for Africans.[56] Information, expertise, secure resource ownership, frameworks, and institutions can give Africans the tools to protect the land, water, climate, biodiversity, and themselves from further environmental degradation and the added devastation of linked violent conflict. Consequently, the goals of these efforts are to help Africans reduce environmental degradation, protect and sustain natural resources, and mitigate conflict over the environment. AFRICOM's charge is to become a strategic, operational, and tactical enabler. ❑

Notes

1. See, for example, World Wildlife Fund International et al., *Living Planet Report 2008* (Switzerland: World Wildlife Fund International, 2008); and Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington, DC: Island Press, 2005).
2. United Nations Environment Programme (UNEP), *Africa: Atlas of Our Changing Environment* (Nairobi, Kenya: Division of Early Warning and Assessment, United Nations Environment Programme, 2008), 57, http://www.unep.org/dewa/africa/AfricaAtlas/PDF/en/Africa_Atlas_Full_en.pdf.
3. Senate, *Statement of General William E. Ward, USA, Commander, United States Africa Command, before the Senate Armed Services Committee*, 111th Cong., 1st sess., 17 March 2009, http://www.africom.mil/getArticle.asp?art=2816&lang=0.
4. UNEP, *Africa: Atlas of Our Changing Environment*, chap. 1, PowerPoint presentation, slide 5.
5. Ibid., 19.
6. Ibid., xii.
7. Ibid., 20.
8. Ibid., xii.
9. Ibid., 14; and Michel Boko et al., "Africa," in *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. Martin Parry et al. (Cambridge, UK: Cambridge University Press, 2007), 435, http://www.ipcc.ch/ipccreports/ar4-wg2.htm.
10. UNEP, *Africa: Atlas of Our Changing Environment*, xi.
11. Ibid., chap. 1, PowerPoint slide 4.
12. Ibid., x.
13. Ibid., xi.
14. Ibid.
15. Ibid., 19.
16. Ibid., 13.
17. Ibid., xi.
18. Ibid.
19. Ibid., 6.
20. Boko et al., "Africa," 435.
21. UNEP, *Africa: Atlas of Our Changing Environment*, 52–55.
22. Dan Henk, *The Botswana Defense Force in the Struggle for an African Environment* (New York: Palgrave Macmillan, 2007).
23. UNEP, *Africa: Atlas of Our Changing Environment*, 9.
24. Ibid., 11.
25. Ibid., 8.
26. Ibid., 29.
27. Ibid., 220.
28. Ibid., 23.
29. Ibid., 14.
30. Ibid., x.
31. Ibid., 13.
32. UNEP, *Sudan: Post-Conflict Environmental Assessment—Synthesis Report* (Nairobi, Kenya: UNEP, June 2007), 6, http://postconflict.unep.ch/publications/UNEP_Sudan_synthesis_E.pdf.
33. UNEP, *Africa: Atlas of Our Changing Environment*, 60.
34. UNEP, *Sudan: Post-Conflict Environmental Assessment—Synthesis Report*, 7.
35. Ibid., 6.
36. World Resources Institute (WRI), "Routes to Resilience: Case Studies," in *World Resources 2008: Roots of Resilience—Growing the Wealth of the Poor* (Washington, DC: WRI, 2008), 143–45, http://pdf.wri.org/world_resources_2008_roots_of_resilience.pdf.
37. UNEP, *Africa: Atlas of Our Changing Environment*, 16, 17; and Gray Tappan, "RE: Extent of Natural Regeneration in Niger," 12 July 2007, FRAME Web site post, FRAME Community, United States Agency for International Development, http://www .frameweb.org/CommunityBrowser.aspx.
38. UNEP, *Africa: Atlas of Our Changing Environment*, 17.
39. Ibid.
40. WRI, "Routes to Resilience," 155.
41. Ibid., 157.
42. Dr. Stephen F. Burgess, *Air Force Symposium 2009: US Africa Command (AFRICOM), 31 March–2 April 2009, Final Report* (Maxwell AFB, AL: Air University, Air War College,

2009), 6, http://www.au.af.mil/au/research/documents/AF%20AFRICOM%20Symposium%20Report%2030%20June%202009.pdf. For the nine recommendations offered here, see ibid., 8 (nos. 1–7), 9 (no. 8), and 5 (no. 9).

43. Ibid., 4.
44. Ibid.
45. Ibid.
46. David E. Mosher et al., *Green Warriors: Army Environmental Considerations for Contingency Operations from Planning through Post-Conflict* (Santa Monica, CA: RAND Corporation, 2008), http://www.rand.org/pubs/monographs/2008/RAND_MG632.pdf.
47. Peter J. Schoomaker and R. L. Brownlee, *Sustain the Mission, Secure the Future: The Army Strategy for the Environment* (Arlington, VA: Army Environmental Policy Institute, 1 October 2004), 2, http://www.asaie.army.mil/Public/ESOH/doc/ArmyEnvStrategy.pdf.
48. Burgess, *Air Force Symposium 2009*, 5.
49. Ibid., 32.
50. Ibid., 28–29.
51. Ibid., 29.
52. WRI, "Routes to Resilience," 156.
53. Burgess, *Air Force Symposium 2009*, 5.
54. WRI, *World Resources 2008*.
55. WRI, "Routes to Resilience," 114.
56. Ibid., 111–57.