

WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY
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Environmental Policy Institute

FEBRUARY 2007 REPORT

Note to Readers: Pages 1-12 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 13.

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Item 1. Environmental Crime Could Become a Felony in the EU

The EU Commission has proposed that environmental crimes such as pollution with hazardous substances, illegal dumping of waste, or performing environmentally "dangerous activity" be treated as criminal offenses with minimum levels of punishment that could reach prison sentences or fines for serious cases. By applying the "polluter pays" principle, European courts could also put offenders out of business or order them to clean up the environment. If the proposal is approved by the European Parliament and member governments, it will become law for all 27 member nations. This would be the first criminal law drafted by the Commission after a 2005 EU Court of Justice ruling that the Commission has the power to draft criminal laws and decide what constitutes a crime, notably in the area of the environment. Environmental groups welcomed the plan but said the list of punishable crimes should be expanded.

Military Implications:

At this stage, it seems that the proposal does not contain an exception clause for the military. It is important that the military follow the proposal's progress and its impacts on military operations in Europe in relation to existing SOFAs and other agreements, and as to whether or how it would affect its contractors' activities.

Sources:

Brussels seeks powers to put polluters in jail

<http://euobserver.com/9/23436/?rk=1>

EU may make harming environment a crime

http://www.montereyherald.com/mld/montereyherald/news/breaking_news/16665802.htm

Brussels in push for 'green crime' laws

http://www.ft.com/cms/s/a5f881c0-b622-11db-9eea-0000779e2340,dwp_uuid=70662e7c-3027-11da-ba9f-00000e2511c8.html

Item 2. UNEP Governing Council/Global Ministerial Forum Makes Progress on Global Environmental Governance

The 24th session of the United Nations Environment Programme (UNEP) Governing Council/Global Ministerial Environment Forum (GC-24/GMEF) took place 5-9 February 2007, in Nairobi, Kenya. Delegates from 141 countries discussed issues related to globalization and environment (including developing a range of clear and specific policy options for improving environmental governance at national, regional, and global levels), the state of the world environment, and cooperation at different international levels. The GC/GMEF adopted 15 decisions, including issues related to waste management (adequacy of the Basel Convention and eventual further developments), strengthening international environmental governance (including the draft Environment Watch Strategy Vision 2020, and coordination and synergies among multilateral environmental agreements), chemicals management (heavy metals and hazardous chemicals), the world environmental situation (improved assessment and mitigation actions), water policy and strategy, recommending that the UN General Assembly declare the decade 2010-2020 as the UN Decade for Deserts and the Fight Against Desertification, and Africa's environmental management and protection. Egypt offered to host an international center to build judicial capacity in environmental law. The next GC/GMEF will be held in February 2009.

Military Implications:

Military personnel with environmental security responsibilities should review the GC-24/GMEF decisions for areas of potential cooperation, as well as their potential for triggering future environmental regulations.

Sources:

GC-24/GMEF website [GC-24/GMEF website](#)

Environment Ministers Rise to the Challenge of Globalization and UN Reform

<http://www.unep.org/Documents/Multilingual/Default.asp?DocumentID=499&ArticleID=5526&l=en>

Summary Of the 24th Session of the UNEP Governing Council/Global Ministerial Environment Forum: 5-9 February 2007

<http://www.iisd.ca/vol16/enb1660e.html>

Item 3. China's ASAT Test Created Serious Long-Range Low-Earth Orbital Pollution

The January 11, 2007 Chinese anti-satellite (ASAT) test created tens of thousands of new pieces of space debris in low-earth orbit (LEO) with size greater than 1 cm—large enough to cause significant damage to a satellite they might hit. So far about 900 pieces greater than 5-10 cm have been cataloged as being created by the Chinese test. Even without the Chinese test, a NASA model shows that some heavily used parts of LEO already have such a high density of debris that collisions of objects at these altitudes will increase the number of debris fragments by 200% in two hundred years. The January additions make this situation worse, and multiple future tests or uses of such ASATs—especially against much larger satellites—could greatly increase the threat to satellites, the Space Station, space shuttles and other space craft as they travel through this polluted space. At high altitudes, where the atmosphere is very thin, this debris can stay in orbit for centuries, and so far there is no effective way to remove it. This is likely to steadily increase space insurance costs and without major changes could eventually seriously limit access to space. This shows that one actor can affect future access to space for all. Currently 41 nations own satellites. Since there is no mechanism to address this pollution event, some kind of anti-ASAT debris creating treaty seems inevitable, possibly drafted by the Inter-Agency Space Debris Coordination Committee in Vienna.

Military implications:

Although military-to-military cooperation with China has been damaged by the ASAT test, it does offer an opportunity to explore joint research programs to reduce current space debris. In any case, the military should increase R&D to collect debris and improve modeling software to monitor and predict in greater detail, in addition to programs to harden satellites and space craft.

Sources:

Debris from China's Kinetic Energy ASAT Test

http://www.ucsusa.org/global_security/space_weapons/debris-from-chinas-asat-test.html

China's Anti-Satellite Test: Worrisome Debris Cloud Circles Earth

http://www.space.com/news/070202_china_spacedebris.html

NASA Orbital Debris Program Office

<http://orbitaldebris.jsc.nasa.gov>

Space debris spotlight

http://www.esa.int/esaCP/SEMHDJXJD1E_FeatureWeek_0.html

United Nations Office for Outer Space Affairs (UNOOSA) <http://www.unoosa.org>
Inter-Agency Space Debris Coordination Committee <http://www.iadc-online.org>

Item 4. EU and US to Cooperate on Environmental Research

The US Environmental Protection Agency and the EU Commission's Directorate of Research have signed an agreement, *Implementing Arrangement on Environmental Research and Ecoinformatics*, setting up a bilateral research framework to more strategically address common environmental challenges. Among the collaborative research topics are: uses and impacts of nanotechnology; environmental information systems; development of environmental and sustainability indicators; environmental modeling; decision support tools; environment and health; sustainable chemistry and materials; environmental technologies; and air quality management.

Military Implications:

This is an opportunity to review military-environmental issues between the US and the EU to identify what could be areas for military participation in the collaborative research envisioned by this new agreement. Additionally, a review of the 7th EU Research Framework Programme at <http://www.cordis.europa.eu/fp7> would provide background on some EU interests.

Sources:

EU and US agree to cooperate on environmental research and ecoinformatics
<http://www.ec.europa.eu/research/press/2007/pr0902-2en.cfm>

EU and US agree to cooperate on environmental research of nanotechnology impacts
<http://www.nanowerk.com/news/newsid=1427.php>

Item 5. The Institute for Environmental Security in The Hague to Hold Annual Peace and Sustainability Sessions

The Institute for Environmental Security will convene annual Peace and Sustainability sessions to address the challenges related to conflict prevention and post-conflict issues. The first session, entitled Forces for Sustainability, will be held on 14-15 March 2007 at the Peace Palace in The Hague. It intends to promote cooperation between different actors (such as the security and development sectors) involved in conflict prevention and/or transition to sustainable development in post-conflict situations. "Challenges to be addressed include—how to: formulate scenarios for change towards transparent governance structures; give priority to supervision of the phasing out of illegal economic activities; retrain and employ militias in professions for the restoration and management of ecosystems and natural resources; create new models of empowerment for local communities" says the announcement.

Military Implications:

Copies of the Army Strategy for the Environment should be sent to the conference organizers. If not already doing so, relevant military personnel should consider attending the annual Peace and Sustainability Sessions. The recommendations of these sessions should be widely publicized among military forces involved in conflict prevention, mitigation, and post-conflict rebuilding.

Source:

Forces for Sustainability Launch of the Peace and Sustainability Sessions

<http://www.envirosecurity.org/sustainability/>

Item 6. French President Jacques Chirac issues *Paris Call for Action* for Global Ecological Governance

An international conference on global ecological governance, “Citizens of the Earth,” was held in Paris at the instigation of President Jacques Chirac, who issued the Paris Call for Action for Global Ecological Governance and invited all nations to come to Paris to make progress on the call to action. The resulting conference, held in February, addressed new approaches to climate change, biodiversity, pollution, environmental health, water, environmental governance, and changing patterns of production and consumption. Within the nine points of the *Paris Call for Action* that inspired the meeting was the proposal for a Universal Declaration of Environmental Rights and Duties (the right to a sound environment) and the transformation of UNEP into a WHO-like organization to be called the United Nations Environment Organization. Green Cross International renewed its call for the adoption of an international legal instrument that would assure the right to water. Environmental degradation “could even come to jeopardize international peace and security” said UN Secretary-General Ban Ki-moon’s message to the conference, and the UN General Assembly President Sheikha Haya Rashed Al Khalifa, addressing the Conference, called for “clear objectives and strong ecological governance at the global level, a concept that continues to elude us.”

Military Implications:

Considering the high level of the participants and President Chirac’s commitment, it is likely that some of the elements in the call for action may shape new international agreements; and hence the Call for Action and how it is used by the French President and other leaders is a useful indicator of changes in environmental politics.

Sources:

“Citizens of the Earth” Conference <http://www.citoyensdelaterre.fr/conference/?-English->

“Citizens of the Earth” Conference for Global Ecological Governance

<http://www.citoyensdelaterre.fr/conference/?PARIS-CALL-FOR-ACTION>

Green Cross International defends the right to water at the Paris Conference for Global Ecological Governance

<http://www.greencrossinternational.net/en/comm/news/2007/5.html>

UN officials urge global push to reverse environmental damage

<http://www.un.org/apps/news/story.asp?NewsID=21440&Cr=climate&Cr1=change>

Item 7. Technological Breakthroughs with Environmental Security Implications**7.1 Sensitive Uranium Detector Using DNA**

Researchers at the University of Illinois and elsewhere, led by chemistry Professor Yi Lu, have developed a uranium sensor which they say “combines the high metal ion selectivity of catalytic DNA with the high sensitivity of fluorescence detection [and] provides a fast, on-site test for

assessing uranium contamination in the environment and the effectiveness of remediation strategies". The sensor has a sensitivity of 11 parts per trillion.

Military Implications:

The military should investigate this new technique for its applicability to systems for environmental surveillance and post-conflict cleanup in situations in which uranium is a factor.

Sources:

Disposable uranium ion detector developed

<http://www.physorg.com/news90609076.html>

A catalytic beacon sensor for uranium with parts-per-trillion sensitivity and millionfold selectivity

http://www.pnas.org/cgi/content/abstract/104/7/2056?maxtoshow=&HITS=10&hits=10&RESU_LTFORMAT=&fulltext=uranium+DNA&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT

7.2 Enzyme-based Biofuel Cells Using Nanotechnology

A team of Japanese scientists from Kyoto University in Japan has engineered carbon electrodes with carbon nanoparticles to develop a simple biofuel cell based on direct electron transfer-type bioelectrocatalysis. The cell uses enzymes to catalyze oxidation of D-fructose and reduction of dioxygen to generate electricity, without needing a mediator molecule. This might represent a significant development for simplifying the construction of biofuel cells.

Military Implications:

The military should consider following and encouraging such research for finding alternative fuel technologies to reduce environmental impacts.

Source:

Simple biofuel cells with nanotechnology

<http://www.nanowerk.com/news/newsid=1446.php>

Fructose/dioxygen biofuel cell based on direct electron transfer-type bioelectrocatalysis

<http://www.rsc.org/publishing/journals/CP/article.asp?doi=b617650j>

Item 8. Compact Fluorescent Light Bulbs (CFLs) May Surge to Fore

A bill to be introduced in the California legislature to ban the use of incandescent light bulbs by 2012, in favor of compact fluorescents, may presage a worldwide tendency in this direction. With global warming concerns burgeoning and CFLs using 75% less energy, this action by California (if it becomes law) could trigger similar measures around the world over the next few years.

Military Implications:

In anticipation of these restrictions (and because of CFLs' inherent advantages), the military should begin planning for an eventual worldwide switchover to the new devices.

Source:

California may Ban Conventional Lightbulbs by 2012

<http://www.planet2025news.net/ntext.rxml?id=4032&photo=>

Item 9. Updates on Previously Identified Issues

9.1 Progress on Global Mercury Ban

The negotiations for a global ban of mercury progressed at the GC-24/GMEF (see Item 2. UNEP Governing Council/Global Ministerial Forum Makes Progress on Global Environmental Governance). Although a legally binding treaty imposing clear targets on cutting mercury use worldwide was not adopted, it was agreed that over the next two years an *ad hoc* open-ended working group will study the options for enhanced voluntary measures and international legal instruments to phase out mercury use. The group will provide a progress report to GCSS-10/GMEF, and a final report to GC-25/GMEF, which will make a decision on the matter. [See also *EU Seeking Global Mercury Ban* in January 2007, *Europe Proposes Ban on Mercury Exports* in November 2006, and other previous environmental security reports on the mercury issue.]

Military Implications:

Relevant military personnel should assess which areas would be affected by an eventual global regulation on the use of mercury and seek replacements.

Sources:

Summary of the 24th Session of the UNEP Governing Council/Global Ministerial Environment Forum
<http://www.iisd.ca/vol16/enb1660e.html>

World leaders agree to phase out mercury

http://www.int.iol.co.za/index.php?set_id=14&click_id=143&art_id=qw1171231741879B251

Ottawa's refusal to join protocol cutting mercury draws critics' fire

<http://www.theglobeandmail.com/servlet/story/LAC.20070210.MERCURY10/TPStory/National>
(by subscription only; full text in the [Appendix](#))

9.2 European Parliament Proposes Tougher Waste Management Strategy

The European Parliament has voted for a tougher waste management strategy, which stipulates that EU production of waste should be stabilized at 2008 levels by 2012, and scaled back by 2020, requiring that 50% of municipal waste and 70% of industrial waste be recycled by 2020. Although the new directive would not impose firm obligations on member states it would establish a "general rule or guiding principle" influencing future waste management practices. EU member states have different waste management strategies and efficiency and are expected to fight the Parliament's proposal. [See also *EU New Strategy on Waste Recycling* in December 2005, *New EU Environmental Strategies* in September 2005, and *Recycling Regulations in the EU* in August 2005 environmental security reports.]

Military Implications:

Since no exception is stipulated for any sector, the Army should consider revising its waste management practices in the European arena to comply with the new directives.

Sources:

Major recycling operation for Europe's waste policy

http://www.europarl.europa.eu/news/expert/infopress_page/064-3005-043-02-07-911-20070208I PR02886-12-02-2007-2007-false/default_en.htm

MEPs vote to cut waste mountain

<http://news.bbc.co.uk/1/hi/world/europe/6355845.stm>

9.3 Climate Change

9.3.1 IPCC Assessment Report Intensifies the Debate on Global Warming

The United Nations Intergovernmental Panel on Climate Change 4th Assessment Report, *Climate Change 2007: The Physical Science Basis*, intensified the debate and worries about global warming and is likely to increase response efforts. The report assesses the global situation as a whole (changes in the Earth's climate including atmospheric composition, global average temperatures, melting glaciers, rising sea levels, ocean conditions, and other climate changes) and presents global and regional future climate projections. It states with “very high confidence” that global warming is being caused by human activity and that “carbon dioxide emissions will continue to contribute to warming and sea level rise for more than a millennium, due to the timescales required for removal of this gas from the atmosphere.” It presents a grim picture of the future — rising sea levels, more intense storms, extensive drought, and spread of some diseases. “We must, without further ado, agree on the definition of an institutional framework that will enable us to take more effective and efficient collective action,” said UN General Assembly President Sheikha Haya Rashed Al Khalifa. “Momentum for action is building; this new report should spur policymakers to get off the fence and put strong and effective policies in place to tackle greenhouse gas emissions,” said Achim Steiner, Executive Director of the United Nations Environment Programme.

9.3.2 Climate Refugees

In addition to melting glaciers, global warming is causing the volume of seawater to expand, rising the sea level. The U.N. Intergovernmental Panel on Climate Change projects that sea levels would rise by 18 to 59 centimeters (7 to 23 inches) by the end of this century. A new World Bank working paper, *The impact of sea level rise on developing countries: a comparative analysis*, estimates that sea levels could rise 1-3m by the end of the century, but even 5m could be possible in the event of an unexpectedly rapid breakup of the Greenland and West Antarctic ice sheets. In a comprehensive assessment of the consequences of sea level rise for 84 developing countries, the paper estimates that a one meter rise by the end of the century would displace hundreds of millions of people in the developing world, generating at least 60 million environmental refugees. The impacts are potentially catastrophic for some countries such as Vietnam, Egypt, and the Bahamas, while for larger ones--such as China--the absolute magnitudes are huge. The most affected regions will be East Asia, the Middle East, and North Africa. The paper warns that the severity of the situation is increased by inadequate attention from the international community in addressing the implications and planning for adaptation. Maldivian President Maumoon Abdul Gayoom warned that at only 1.5m above sea level, the Maldives are at risk of disappearing from increasing sea levels due to global warming, forcing over 300,000 refugees to migrate. An internal report of the Royal Canadian Mounted Police, *External Trends Influencing Policing in B.C.*, notes that implications of climate change could pose serious challenges for the police in British Columbia--from local disorder during natural disasters increasingly affecting coastal areas, to climate refugees fleeing flooded countries. The report notes that “mass movements of that kind” might require increasing military and policing actions. Meanwhile, critical water scarcity could impact between 1.1 and 3.2 billion people by 2100, notes an IPCC report to be published in April. Melting glaciers are endangering future water supplies to farming areas around the world, from the Andes to the Himalayas and Kilimanjaro.

9.3.3 China to Launch Climate Adaptation Program

China is preparing to launch its first four-year comprehensive national program to address the effects of climate change on China. The program, to be launched in two months, will outline goals for reducing emissions of greenhouse gases and developing green technologies, and mitigation measures to address the implications of global warming on China's food production and on coastal cities. A comprehensive report, produced by six Chinese academic and government organizations, warns that because of continuous temperature rise, China's grain production might be reduced by up to 37% in the second half of this century, and water scarcity increase considerably due to rapidly melting glaciers.

9.3.4 Changes in Disease Patterns across the Globe

Scientists increasingly note the emergence of fatal diseases in places where they were never seen or expected before, heightening concerns that climate change favors the spread of viruses, bacteria, insects, and plants to cold areas where local organisms do not have immunity to fight them. A fungus normally found in tropical or subtropical regions, *Cryptococcus gattii*, has suddenly become endemic on Vancouver Island, on the Pacific coast of Canada, sickening humans and animals. Oysters in Alaska are being infected by the bacterium *Vibrio parahaemolyticus* specific to warmer waters, like the Gulf of Mexico. In Africa, mosquitoes are causing malaria in high villages at Mt. Kenya that had never been exposed to it before. IPCC's 4th Assessment Report, *Climate Change 2007*, warns that global warming might trigger unprecedented health risks such as the spread of mosquito-borne illnesses like malaria, dengue fever, yellow fever and encephalitis; increased respiratory illnesses due to pollen and mold spores; and health problems induced by increased flooding and drought.

Military Implications:

Climate change is now among the highest priorities on the international agenda and it is expected that international efforts for planning for adaptation and mitigation will be intensified. [Same as previous on the same issue:] The U.S. Army Corps of Engineers—having the logistics and know-how—should increase worldwide collaboration with counterparts and international organizations. Also, the issue of environmental refugees should be tackled swiftly to avoid conflicts that this rising segment of world population might cause.

Sources: (see a more expanded list in the [Appendix](#))

Climate Change 2007: The Physical Science Basis (Summary for Policymakers)

www.ipcc.ch/pub/SYR-text.pdf

Evidence is now 'unequivocal' that humans are causing global warming – UN report

<http://www.un.org/apps/news/story.asp?NewsID=21429&Cr=climate&Cr1=change>

Climate changes and impact on coastal countries

<http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:21215328~pagePK:64165401~piPK:64165026~theSitePK:469382,00.html>

Leader of imperiled Maldives issues stark warning on sea level rise

<http://www.iht.com/articles/2007/02/04/news/maldives.php>

Future flood of 'climate refugees' ahead?

<http://www.canada.com/vancouver/news/story.html?id=d6573622-192c-4378-9659-f6cad6f98ede&k=34215>

Tankers may ship water to parched cities of future

<http://sciam.com/article.cfm?chanID=sa003&articleID=291925DDBC6E2D194D0C22D268E0F865>

Global Warming Threatens Double-Trouble for Peru: Shrinking Glaciers and a Water Shortage
<http://www.enn.com/today.html?id=12201>

China prepares to launch climate adaptation plans

<http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=MjI4MTM>

Dangerous fungus thrives on West Coast

<http://www.theglobeandmail.com/servlet/story/RTGAM.20070209.wfungus0210/BNStory/ClimateChange/home>

Global warming: enough to make you sick

<http://www.latimes.com/news/science/environment/la-sci-disease25feb25,1,7922126.story?page=1&ctrack=1&cset=true&coll=la-news-environment> (free subscription required; see article in the [Appendix](#))

9.4 EU Plans Tougher CO₂ Emissions Cuts

9.4.1 EU Commission to Propose Binding Cuts on Car Emissions

The European Commission has proposed a new strategy for reducing cars CO₂ emissions to 120g/km by 2012. The strategy would basically consist of binding legislation requiring European carmakers to reduce the average CO₂ emissions of new vehicles to 130g/km by 2012 complemented by improved fuel-efficiency, increased biofuels use, and better traffic management to produce the further 10g/km reduction. The strategy also proposes increased investment in research for reducing CO₂ emissions to an average of 95g/km by 2020; persuade member states to promote policies for fuel-efficient vehicles; and get car manufacturers to promote more sustainable consumption patterns. The draft legislation is expected to be prepared by the end of 2007 or beginning of 2008. [See also *New European Energy Policy Developments* in March 2006 environmental security report.]

9.4.2 UK Likely to Go beyond EU Greenhouse Gas Emissions Reduction Targets

Further to the new *Energy Policy for Europe* proposed last month by the European Commission, in a recent speech, UK environment minister Ian Pearson said that "If you have a 20% target across Europe, the UK's target is likely to be nearer to 30%." [See also *UK Standard for Carbon Offsetting* and *Advancing Post-Kyoto Negotiations* in January 2007 and other related issues in previous environmental security reports.]

Military Implications:

[Same as previous on similar issues] The military should consider following these initiatives that might result in new environmental regulations and new standards policies, and consequently emerging strategies, to ensure that its activities in the respective regions comply with any new requirements.

Sources:

Commission wants binding cuts on car emissions

<http://www.euractiv.com/en//commission-wants-binding-cuts-car-emissions/article-161531>

UK likely to go beyond EU carbon target – minister

<http://www.environmental-finance.com/online/0208ukl.htm>

9.5 Network of Marine Educators Formed to Protect Pacific

According to Environmental News Network, the International Pacific Marine Educators Conference (IPMEC), held 15-18 January 2007, in Honolulu, "has resulted in the establishment of

a Pacific network of marine educators designed to ensure the health of the Pacific and the communities that depend upon it. The network aims to facilitate real action in marine education and highlight the need for ocean stewardship across the Pacific." [See also *International Conferences and Assessments Find Rising Ocean Pollution* in October 2006 environmental security report.]

Military Implications:

In view of increasing activity to protect the oceans, especially the Pacific, and of the high level of US operations in the area, appropriate military personnel, e.g. in USPACOM, should establish liaison with this network (through Sylvia.spalding@noaa.gov) in order to exchange information and ideas with environmental security educators in the region.

Sources:

International Pacific Marine Educators Conference Establishes Network to Protect the Ocean, Presentations Available Online (Press release)

<http://www.ipmec.info/pr.htm>

International Pacific Marine Educators Conference Establishes Network to Protect the Ocean

<http://www.enn.com/net.html?id=1816>

9.6 Nanotechnology Safety Issues**9.6.1 UN Environment Programme Calls for Nanotech Safeguards**

UNEP's annual report on the global environment, GEO 2007, dedicates a whole chapter, *Emerging Challenges – New Findings*, to nanotechnology implications for the environment, looking at 'The environmental benefits of nanotechnology', 'The environmental risks of nanotechnology', and future developments. The report notes that "swift action" is needed to adjust the legislative processes to properly address the challenges presented by nanotechnology, with priority given to assessing the potential risks of nanomaterials already being mass-produced, and calls for global test protocols and greater cooperation between private- and public-sector industries and between the developing and industrialized worlds.

9.6.2 Survey Gives Insight into Effective Nanotech Education Methods

A new survey report from the University of Wisconsin-Madison Materials Research Science and Engineering Center (MRSEC) Interdisciplinary Education Group suggests improved ways of educating audiences on the nature of nanotech, and its problems and possibilities.

9.6.3 New Report on Nanotechnology Applications in Water Treatment

Nanotechnology-based techniques are highly successful in removing both organic and inorganic contaminants from water. The consulting firm of Frost & Sullivan has issued a new report, *Impact of Nanotechnology in Water and Wastewater Treatment*, which outlines key nanotech water treatment applications and analyzes market and industry factors. It also provides a directory of contact information.

9.6.4 French Research Council to Study Nanotube Toxicity

The French National Research Council (CNRS) is beginning a three-year project to study the "eco-toxicity" of carbon nanotubes, as part of a National Research Agency project. The project will investigate three main aspects: the polluting effects of nanotubes in the environment; toxicity in humans; and how to produce nanotubes using cleaner methods.

Military Implications:

Military personnel involved in nanotech might consider reviewing these reports for additional inputs. Also, such reports' recommendations might have a strong impact on nanotech-oriented environmental protection activities.

Sources:

Tighter controls needed for nanotechnology, says UN report

http://www.technologyreview.com/read_article.aspx?id=18144&ch=nanotech

GEO Year Book 2007

<http://www.unep.org/geo/yearbook/yb2007/>

Nanotechnology and the public: Effectively communicating nanoscale science and engineering concepts

<http://springerlink.metapress.com/content/u276420455825217/?p=04e798d9a2d44481907da0176313de28&pi=0> (Short description; full article requires subscription or purchase)

Study points way to communicating nanotech

<http://www.news.wisc.edu/13391.html>

Multiple Benefits of Nanotechnology Encourages Widespread Uptake in Water and Wastewater Treatment

http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20070201005476&newsLang=en

Impact of Nanotechnology in Water and Wastewater Treatment (order form)

<http://www.researchandmarkets.com/reports/c49641>

Carbon nanotubes: what toxicity for the environment and health? (original in French: Nanotubes de carbone : quelle toxicité pour l'environnement et la santé ?)

<http://www2.cnrs.fr/presse/communiquer/999.htm> (in French)

New study to assess toxicity of carbon nanotubes

<http://nanotechweb.org/articles/news/6/1/9/1>

Item 10. Reports Suggested for Review**10.1 GEO Year Book 2007**

UNEP fourth annual report, *GEO Year Book 2007*, was released at the opening of the Global Ministerial Environment Forum in Nairobi [see Item 2. UNEP Governing Council/Global Ministerial Forum Makes Progress on Global Environmental Governance]. The report offers a comprehensive overview of global and regional developments over the past year; focuses on implications of globalization on the environment (linkages among ecosystem health, human well-being, and economic development and assesses how policy decisions respond to global change); analyses the environmental implications of nanotechnology; and features several key indicators related to the environment.

Military Implications:

The GEO reports are a valuable source of information on the global state of the environment and trends in future international policy aspects.

Source:

GEO Year Book 2007

<http://www.unep.org/geo/yearbook/yb2007/>

10.2 Report on Lebanon After-war Environmental Assessment

Lebanon Rapid Environmental Assessment for Greening Recovery, Reconstruction & Reform–2006 report is a comprehensive review of the major environmental impacts caused by the July-August 2006 war, proposes some action plans to mitigate them, and explores opportunities for green reconstruction and recovery. It also looks at such environment-related legal aspects as improving national legislation and the options available to the Government of Lebanon to seek compensation for environmental damage.

Military Implications:

The report is a valuable source of information for: after-war environmental damage assessment; possible actions for remediation and mitigation; improved/green reconstruction after conflict; and legal aspects concerning possible compensations.

Sources:

Lebanon Rapid Environmental Assessment for Greening Recovery, Reconstruction & Reform–2006

- announcement: <http://www.un.org.lb/UN/details.asp?id=167>
- the report: <http://www.undp.org.lb/events/DraftReport.pdf>

10.3 New Environmental Security Blog

The Environmental Change and Security Program of the Woodrow Wilson International Center for Scholars has launched a blog on new security threats. The blog provides frequent updates and commentary on the latest news stories and reports pertaining to environmental security, such as global water scarcity, climate change and terrorism.

Military Implication

While the Millennium Project staff regularly checks the blog and reports key insights, relevant military personnel should also check or subscribe to this blog for updates on new environmental security issues and resources.

Sources:

The New Security Beat: <http://newsecuritybeat.blogspot.com/>

ECSP Launches Blog on New Security Threats

New Security Beat Provides Latest on Population, Environment, Security in the News

http://www.wilsoncenter.org/index.cfm/topics/index.cfm?topic_id=1413&fuseaction=topics.item&news_id=224705

APPENDIX

Reference Details

This Appendix contains expanded background information on some items.

Item 9. Updates on Previously Identified Issues

9.1 Progress on Global Mercury Ban

Ottawa's refusal to join protocol cutting mercury draws critics' fire

SUE BAILEY, Canadian Press

The Globe and Mail

<http://www.theglobeandmail.com/servlet/story/LAC.20070210.MERCURY10/TPStory/National>
(by subscription only)

OTTAWA -- Canada's refusal to support a legally binding global pact to cut highly toxic mercury pollution is another Kyoto-style evasion that allies Ottawa with Washington, critics say.

Canada sided with the United States and India during international talks in Nairobi this week. The trio were among a minority of countries that blocked immediate progress of an enforceable system to curb mercury use, including a glut of noxious exports to the developing world.

Instead, Canada favours voluntary reduction while talks continue.

Most of the 58 countries represented, including the European Union, Africa, Japan and Brazil, supported a legally binding treaty.

Environmental groups blamed the U.S. and Canada for effectively delaying an enforceable system. Repeated studies clearly document health threats posed by air pollution, water contamination and mercury-laced electronic junk, they say.

"They want more talk but they don't back up that talk with action," said Michael Bender, spokesman for Zero Mercury, a coalition of 48 public-interest groups.

"What's really unfortunate is that Canada would not even consider supporting voluntary demand-reduction goals or looking at export restrictions," he said from Nairobi.

"The Canadian government really is not being proactive. If they tell you they are, they're not."

Environment Minister John Baird's spokesman said that the Conservatives will continue to discuss all reduction options with other countries.

Eric Richer also cited government plans to ensure mercury switches are removed before discarded cars are crushed for scrap metal. The small parts conduct electricity so lights come on when the hood or trunk is raised.

There's also a discussion paper before Environment Canada to assess mercury content in a range of products.

Critics say it's not nearly enough action. Mercury is a highly potent element that persists in the environment, builds up in the food chain and can neurologically harm humans.

The United Nations Environment Program, which sponsored the Nairobi talks that ended yesterday, says much of the developed world's mercury-laden e-waste -- obsolete computers, cellphones and printers -- is being dumped in African countries and other poor nations.

Mercury in large doses can damage the brain, nervous system and babies in the womb. Yet the heavy metal known as quicksilver is still widely used in processes ranging from mining to plastics and chemicals manufacturing.

Canadians are typically exposed through air pollution from coal-fired plants in Asia and the U.S., and through diets, especially in the Arctic, that rely on contaminated fish.

Canada conceded in documents submitted to the UN Environment Program that "there is sufficient evidence of significant global adverse impacts from mercury . . . to warrant further international action to reduce the risks to human health and the environment."

Still, Ottawa favours voluntary reduction efforts while binding rules are discussed for the next two years.

Nick Nuttall, a spokesman for the UN Environment Program, says any legally binding treaty would have to be approved by a consensus of all member countries.

9.3 Climate Change

Sources: (a more expanded list)

Climate Change 2007: The Physical Science Basis (Summary for Policymakers)

www.ipcc.ch/pub/SYR-text.pdf

UN officials urge global push to reverse environmental damage

<http://www.un.org/apps/news/story.asp?NewsID=21440&Cr=climate&Cr1=change>

Evidence is now 'unequivocal' that humans are causing global warming – UN report

<http://www.un.org/apps/news/story.asp?NewsID=21429&Cr=climate&Cr1=change>

Global Warming Poses Health Threats

<http://www.washingtonpost.com/wp-dyn/content/article/2007/02/02/AR2007020201198.html>

(free registration required)

Climate changes and impact on coastal countries. Risk of sea-level rise: High stakes for developing countries

<http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:21215328~pagePK:64165401~piPK:64165026~theSitePK:469382,00.html>

World Bank study: rising sea levels could displace millions of world's poor

<http://www.iht.com/articles/ap/2007/02/13/america/NA-GEN-World-Bank-Global-Warming.php>

Leader of imperiled Maldives issues stark warning on sea level rise

<http://www.iht.com/articles/2007/02/04/news/maldives.php>

Future flood of 'climate refugees' ahead?

<http://www.canada.com/vancouver/news/story.html?id=d6573622-192c-4378-9659-f6cad6f98ede&k=34215>

Tankers may ship water to parched cities of future

<http://sciam.com/article.cfm?chanID=sa003&articleID=291925DDBC6E2D194D0C22D268E0F865>

Tomgram: McKibben, The Real News about Global Warming

<http://tomdispatch.com/index.mhtml?pid=167460>

Global Warming Threatens Double-Trouble for Peru: Shrinking Glaciers and a Water Shortage

<http://www.enn.com/today.html?id=12201>

China prepares to launch climate adaptation plans

<http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=MjI4MTM>

An island of natural airborne killers

<http://www.theglobeandmail.com/servlet/story/RTGAM.20070209.wfungalfears0210/BNStory/Front>

Dangerous fungus thrives on West Coast

<http://www.theglobeandmail.com/servlet/story/RTGAM.20070209.wfungus0210/BNStory/ClimateChange/home>

Global warming: enough to make you sick

<http://www.latimes.com/news/science/environment/la-sci-disease25feb25,1,7922126.story?page=1&ctrack=1&cset=true&coll=la-news-environment> (free subscription required; see article in the below)

Global warming: enough to make you sick

Rising temperatures are redistributing bacteria, insects and plants, exposing people to diseases they'd never encountered before.

By Jia-Rui Chong, Times Staff Writer

February 25, 2007

<http://www.latimes.com/news/science/environment/la-sci-disease25feb25,1,7922126.story?page=1&ctrack=1&cset=true&coll=la-news-environment> (free subscription required)

CORDOVA, ALASKA — Oysterman Jim Aguiar had never had to deal with the bacterium *Vibrio parahaemolyticus* in his 25 years working the frigid waters of Prince William Sound.

The dangerous microbe infected seafood in warmer waters, like the Gulf of Mexico. Alaska was way too cold.

But the sound was gradually warming. By summer 2004, the temperature had risen just enough to poke above the crucial 59-degree mark. Cruise ship passengers who had eaten local oysters were

soon coming down with diarrhea, cramping and vomiting — the first cases of *Vibrio* food poisoning in Alaska that anyone could remember.

"We were slapped from left field," said Aguiar, who shut down his oyster farm that year along with a few others.

As scientists later determined, the culprit was not just the bacterium, but the warming that allowed it to proliferate.

"This was probably the best example to date of how global climate change is changing the importation of infectious diseases," said Dr. Joe McLaughlin, acting chief of epidemiology at the Alaska Division of Public Health, who published a study on the outbreak.

The spread of human disease has become one of the most worrisome subplots in the story of global warming. Incremental temperature changes have begun to redraw the distribution of bacteria, insects and plants, exposing new populations to diseases that they have never seen before.

A report from the World Health Organization estimated that in 2000 about 154,000 deaths around the world could be attributed to disease outbreaks and other conditions sparked by climate change.

The temperature change has been small, about 1.4 degrees Fahrenheit over the last 150 years, but it has been enough to alter disease patterns across the globe.

In Sweden, fewer winter days below 10 degrees and more summer days above 50 degrees have encouraged the northward movement of ticks, which has coincided with an increase in cases of tick-borne encephalitis since the 1980s.

Researchers have found that poison ivy has grown more potent and lush because of increased carbon dioxide in the atmosphere.

In Africa, mosquitoes have been slowly inching up the slopes around Mt. Kenya, bringing malaria to high villages that had never been exposed before.

"It's going to get very warm," said Andrew Githeko, a vector biologist who heads the Climate and Human Health Research Unit at the Kenya Medical Research Institute in Kisumu. "That's going to mean a huge difference to malaria."

Githeko, 49, grew up in the central highlands in a tiny village near the town of Karatina, about 5,700 feet above sea level.

His home was different from most of Africa. The air was damp and chilly. On clear days, he could see the glaciers on Mt. Kenya, the second-highest peak in Africa at 17,058 feet.

When he was a child, lowland diseases like malaria were unknown in Karatina. But perhaps 10 years ago, a smattering of cases began to appear.

He had long ago left his home to study the great plagues of Africa — Rift Valley fever, malaria, cholera and others. The appearance of malaria in the highlands, however, was a mystery worth returning home for.

Githeko dispatched a colleague to collect mosquito larvae in puddles and streams around Mt. Kenya, some as high as 6,300 feet. Tests later identified some of the mosquitoes as *Anopheles arabiensis*, one of the species that carry malaria.

Githeko's findings, published in 2006, marked the highest *A. arabiensis* breeding site ever recorded in Kenya and was the first published report of malaria infections in the central highlands, he said.

He knew by watching Mt. Kenya's gradually disappearing glaciers that his world was warming, and that lowland diseases would eventually work their way higher. "But we did not expect this to happen so soon," he said.

Githeko's work has been echoed in a small number of studies around the world.

In 1996, health authorities reported a human case of tick-borne encephalitis in the Czech village of Borova Lada, elevation 3,000 feet. Until then, the *Ixodes ricinus* tick, which carries the disease, had never been seen above 2,600 feet.

The case caught the attention of Milan Daniel, a parasitologist at the Institute for Postgraduate Medical Education in Prague who has been studying the movement of ticks in the Czech Republic for half a century.

He scoured the Sumava and Krkonose mountains and found that the ticks had migrated as high as 4,100 feet largely because of milder autumns over the last two decades, according to a series of studies published over the last four years.

From 1961 to 2005, the mean temperature in the Krkonose Mountains had increased about 2 1/2 degrees.

"This shift of the ticks," Daniel said, "is clearly connected with climate changes."

According to a landmark United Nations report released this month, global warming has reached a point where even if greenhouse gas emissions could be held stable, the trend would continue for centuries.

The report painted a grim picture of the future — rising sea levels, more intense storms, widespread drought.

Predicting the future of disease, however, has proven difficult because of myriad factors — many of which have little to do with global warming. Diseases move with people, they follow trade routes, they thrive in places with poor sanitation, they develop resistance to medicines, they can blossom during war or economic breakdowns.

"No one's saying global warming is the whole picture here," said Dr. Paul R. Epstein, associate director of the Center for Health and the Global Environment at Harvard University. "But it is playing a role. As climate changes, it's projected to play an even greater role."

In a Beltsville, Md., laboratory filled with bathroom-sized aluminum chambers, U.S. Department of Agriculture weed physiologist Lewis Ziska is peering into the future of one of the key components of global warming — rising carbon dioxide levels.

CO₂ levels have been on the rise since the dawn of the Industrial Revolution more than 200 years ago. Today, they are at their highest point in more than 650,000 years.

In the tightly sealed chambers, Ziska re-created pre-industrial conditions by turning down the concentration of carbon dioxide to 280 parts per million. In another box, he simulated the present with 370 parts per million. In a third box, he pumped up the carbon dioxide to 600 parts per million, the estimate for 2050.

Much of Ziska's work has centered on ragweed, a noxious plant that sets off allergy sufferers, such as Ziska himself. The weeds inside the tanks suck up carbon dioxide. "It's like feeding a hungry teenager," he said.

Collecting yellow pollen in plastic bags fitted around the plants, Ziska found that current conditions produced 131% more pollen than pre-industrial conditions. Future conditions produced 320% more.

"For us weed biologists, this is the worst of times and the best of times," he said.

The impact of global warming has not been all bad. Researchers recently found that rising temperatures have helped reduce some diseases related to cold weather. One British study found that the number of children infected with a cold-like virus known as respiratory syncytial virus has been declining with warming temperatures.

Combining meteorological data and emergency room admission rates from 1981 to 2004, physiologist Gavin Donaldson at University College London found each increase of 1.8 degrees clipped three weeks off the end the virus' winter season.

"A small amount of warming can go a long way, as far as changing disease transmission dynamics," said Dr. Jonathan Patz, director of Global Environmental Health at the University of Wisconsin in Madison.

Given the gradual pace of warming, there are also some chances to adapt.

After Prince William Sound's *Vibrio* outbreak in 2004, the state required more oyster testing in some areas. In the last two years, there have been only four cases of *Vibrio* food poisoning.

Life in Aguiar's remote inlet has largely returned to the way it was before. This winter has been cold. Aguiar, a bear of a man with a riotous beard, huddled inside the houseboat for warmth recently as the temperature outside hovered around 20 degrees. The pale Northern Lights pulsed over the snow-laced Chugach Mountains, and skins of ice grew on the still water.

Come summer, Aguiar will start sending oyster samples to the state. When the temperature hits about 55 degrees, he'll drop his oyster baskets 60 or 100 feet in the water for about 10 days to clear out the bacteria.

It's a solution he can live with in a warming world.

"It's not all evil," he said. "I just don't like to see rapid change."