

WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY
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Note to Readers: Pages 1-13 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 14.

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Item 1. Bali Roadmap Sets Framework for Post-Kyoto Negotiations

About 10,800 participants, including high-level delegations from 187 countries, attended the UN Climate Change Conference in Bali, Indonesia, December 3-15, 2007. The most significant result was the "Bali Action Plan", also called the Bali roadmap. It outlines a two-year agenda of negotiations for a post-2012 global climate regime to enter into force by 2013, but does not include emissions reduction targets, despite strong support by the EU and other countries. The roadmap calls for agreements by the end of 2009 at a major summit in Copenhagen. The agreement is to include both national and international mitigation and adaptation actions to address the effects of climate change, including methods to reduce greenhouse gas emissions, development and transfer of climate-friendly technologies, and financing and investment measures. Four major UNFCCC meetings to implement the Bali roadmap are planned for 2008.

Other results of the Bali Convention included the launch of the Kyoto Protocol's Adaptation Fund to finance projects in developing countries; a Forest Carbon Partnership Facility, an addition of deforestation to a post-2012 treaty agenda; and other capacity-building, financial, administrative, and methodological issues. A consortium of mayors and local governments launched the World Mayors and Local Governments Climate Protection Agreement, with six commitments addressing climate change, including the reduction of carbon emissions by 60% to 80% worldwide by mid-century (cities account for 80% of humanity's production of greenhouse gases).

Military Implications:

The military should review the Bali roadmap for opportunities to apply the Army Strategy on the Environment and to contribute to negotiations on the role of the military on mitigation and adaptation to climate change. As suggested in the September 2007 monthly report, the military should bring together information on all its efforts to reduce climate change and its capacities to anticipate and respond to the effects of climate change (e.g., an executive information system) for continual review and improvement, noting efforts to reduce the military environmental footprint, the environmental dimensions in its operations, its role in developing adaptation and mitigation plans, and the inclusion of environment-related factors in conflict prevention strategies.

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

United Nations Climate Change Conference in Bali

http://unfccc.int/meetings/cop_13/items/4049.php

Secretary-General Ban welcomes climate change breakthrough in Bali

<http://www.un.org/apps/news/story.asp?NewsID=25081&Cr=Climate&Cr1=>

World Mayors and Local Governments Climate Protection Agreement

<http://www.iclei.org/index.php?id=7337>

So hard to see the wood for the trees

http://www.economist.com/world/international/displaystory.cfm?story_id=10329203

Nobel laureates propose global CO₂ tax

<http://euobserver.com/9/25312/?rk=1> (This is a paid subscription site.)

Some like it cool

http://www.economist.com/opinion/displaystory.cfm?story_id=10335267

Item 2. UN General Assembly Adopts Global Forest Agreement

The “Non-Legally Binding Instrument on All Types of Forests” adopted by the UN General Assembly on December 17, 2007 sets the political framework and standards for sustainable forest management and monitoring to stabilize climate change and protect biodiversity and ecosystems. The agreement suggests mechanisms for systematic monitoring and reporting at the national level, as well as means for international collaboration, ranging from funding developing countries for reducing deforestation, to technology transfer and capacity building for forest management. Although not binding, the forests agreement is an important political instrument to improve nations’ forest management. [See also *United Nations Agreement to Protect the World’s Forests Adopted* in May 2007 environmental security report]

Military Implications:

The military should review the agreement for military implications on land and forests usage, especially during future training missions.

Sources:

Non-legally Binding Instrument on All Types of Forests

http://www.un.org/esa/forests/pdf/session_documents/unff7/UNFF7_NLBI_draft.pdf

General Assembly adopts new agreement to protect world’s forests

<http://www.un.org/apps/news/story.asp?NewsID=25099&Cr=forest&Cr1=>

Intersessional Activities, Ad-Hoc Expert Groups. To Consider the Content of the Non-legally Binding Instrument

<http://www.un.org/esa/forests/adhoc-nlbi.html>

New Global Forest Agreement Depends on Local Support

<http://www.ens-newswire.com/ens/dec2007/2007-12-27-01.asp>

Item 3. New European Environmental Regulations

3.1 European Commission Proposed Binding Legislation for Vehicle Emissions Cuts

The European Commission proposed binding legislation to cap CO₂ emissions from some new passenger cars to 120g/km by 2012. In this way, European carmakers will have to reduce the fleet average CO₂ emissions of new vehicles to 130g/km by 2012 through cleaner engines, while the remaining 10g/km would be reduced by improved fuel-efficiency, increased biofuels use, and better traffic management (presently cars count for 12% of the EU’s total CO₂ emissions at an average of around 160g/km). The regulation will be enforced by penalties starting in 2012 at €20 per extra gram of CO₂, increasing gradually to €95 in 2015. The legislation has to be approved by member states. [See also *EU Commission to Propose Binding Cuts on Car Emissions* in February 2007 and *New European Energy Policy Developments* in March 2006 environmental security reports.]

Similarly, the Euro VI proposal for heavy motor vehicles establishes a reduction of 80% in nitrogen oxides and 66% in particulate matter emissions compared to the current Euro V limits. After approval by the European Parliament and the Council of Ministers, the new regulation is expected to enter into force in 2013.

Military Implications:

Although applying only to EU carmakers, such standards may eventually expand to vehicles from outside the EU that operate in the EU area. The military should review its current and future procurements in light of the new regulations.

Sources:

Commission proposal to limit the CO₂ emissions from cars to help fight climate change, reduce fuel costs and increase European competitiveness

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1965&format=HTML&aged=0&language=EN&guiLanguage=en>

EU unveils controversial plans to make cars greener

<http://euobserver.com/9/25367/?rk=1>

The European car industry. Collision course

http://www.economist.com/business/displaystory.cfm?story_id=10329196

Brussels spars with Berlin over car emissions

<http://euobserver.com/9/25381/?rk=1>

Cleaner Trucks and Buses to Roll across Europe

<http://www.ens-newswire.com/ens/dec2007/2007-12-27-02.asp>

3.2 European Parliament Passed the Fine Particles Air Quality Directive

The European Parliament approved the text of a new directive on ambient air quality and cleaner air for Europe. The new legislation replaces and updates five existing laws and for the first time sets binding standards and target dates for fine particles PM_{2.5} (particulate matter that is 2.5 micrometers or smaller in size). EU States will have to reduce exposure levels in their urban areas to PM_{2.5} by an average of 20% by 2020 compared to 2010 levels, and bring them below 20 micrograms/m³ by 2015, while keeping the 25 micrograms/m³ levels throughout their countries. Member States will have two years to adopt the necessary national laws after the directive's entry into force. [See also *EU New Directive on Air Pollution* in October 2006 environmental security report.]

Military Implications:

The military should assess the effects of the new air quality directive on its operations and explore its role in meeting these new requirements.

Sources:

Environment: Commission welcomes EP vote on the air quality directive

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1895&format=HTML&aged=0&language=EN&guiLanguage=en>

EU Air Quality Directive: MEPs set maximum concentration of microparticles

<http://www.env-health.org/a/2762>

Progress on the legislative file of the directive on ambient air quality and cleaner air for Europe

http://ec.europa.eu/prelex/detail_dossier_real.cfm?CL=en&DosId=193497

3.3 European Parliament Passed the Marine Strategy Directive

The European Parliament approved the text of the Marine Strategy Directive that calls for the establishment of marine regions and sub-regions to be managed by Member States on a coherent and coordinated ecosystem-based approach and for ensuring that the marine strategies affecting the regions are coherent and coordinated. Member States are to assess the status of their region's marine environment, set objectives, and establish targets and programs by 2015 to attain good environmental status by 2020 and establishment of marine protected areas. [See also *Political Agreement Reached on the European Marine Strategy Directive* in December 2006 and other similar items in previous environmental security reports.]

Military Implications:

Military personnel with environmental responsibilities should review the directive to identify ways to appropriately cooperate with the EU states in implementing the new directive. Although the directive's power is limited to EU waters, elements of the directive could eventually be adopted in other regions of the world.

Sources:

A Marine Strategy to save Europe's seas and oceans

http://ec.europa.eu/environment/water/marine/index_en.htm

Environment: Commission welcomes EP vote on the Marine Strategy Directive

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1894&format=HTML&aged=0&language=EN&guiLanguage=en>

Item 4. Technological Breakthroughs with Environmental Security Implications**4.1 New Detection and Cleanup Technologies****4.1.1 New Technique Promises Ultra-sensitive Biosensors**

Scientists at MIT, led by Ned Thomas and Patrick Doyle, have developed a technique for producing millions of bar-coded 3D latticework microparticles in which DNA or other biotags can be attached. According to an announcement, “With conventional solid microarrays and particles, biotags only adorn the probe's surface. In contrast, biotags can attach inside the latticework particles, increasing the number of target molecules that bind to a particle, and therefore producing a more intense fluorescent signal”. The developers believe this technique may increase the biosensing device's sensitivity by a factor of 10,000. Commercialization of this diagnostic tool is expected within two years.

Military Implications

The military should explore this development for its applicability to environmental surveillance and cleanup systems.

Source:

Mass-Producing 3-D Particles

<http://www.technologyreview.com/Nanotech/19786/page1/>

4.1.2 EU Launches Mobile Carbon Tracking

The mobGAS program is a personal mobile phone application that enables users to learn the amount of greenhouse gases produced by their daily activities. The software is available in 21 languages and is free to download to a mobile phone. Users can input daily activities and calculate the daily, weekly, and yearly emissions via a secure website. The system compares the user's emissions with national and world averages. The system was developed by the Joint Research Center of the European Commission to help raise public awareness and motivation to reduce GHG emissions.

Military Implications:

The military should experiment with mobGAS to assess its value in motivating military personnel to reduce emissions.

Source:

European Commission scientists launch first mobile application that uses your mobile phone to track your carbon footprint

<http://www.europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1822&format=HTML&aged=0&language=EN&guiLanguage=en>

4.2 Increasing Energy Efficiency Technologies**4.2.1 Energy-free Glow Material**

MPK Co. of Clayton, WI has developed a tritium-based material, “Litrosphere”, which produces a low-level glow for more than 12 years without energy input. Trace tritium beta decay in phosphor microspheres provides the energy source. Safety is claimed. It can cover a standard sheet of paper for about 35 cents, comes in a variety of colors, and can take the form of either paint or injection-molded plastic. Its luminous output cannot compete with conventional lighting sources, but it is highly suitable for marking objects that need to be spotted in the dark, saving energy and lowering maintenance requirements.

Military Implications:

The military should investigate this material for its energy-saving application to a variety of products from labeling materiel and safety hazards to illuminating watch faces and weapon scopes.

Source:

A company called MPK is designing a light source that will glow continuously for more than 12 years without any additional energy

<http://www.physorg.com/news116776284.html>

4.2.2 Dye-sensitized Solar Cells Offer Shorter Energy Payback Time

It is estimated that conventional photovoltaic solar cells must be in service for around three years before they have produced as much energy as that required to manufacture them. However, the “Grätzel” or “dye-sensitized” solar cell has now gone into large-scale production. This type of device uses a combination of titanium dioxide and an organic dye molecule, often containing ruthenium, which are immersed together in a liquid electrolyte. A Netherlands independent photovoltaic-research firm has estimated that such dye-sensitized cells installed in southern Europe would have as short an energy payback time as six months. G24 Innovations, in Cardiff, Wales, has announced that it expects to be able to make enough dye-sensitized photovoltaic cells each year to provide 30 megawatts of peak generation capacity. Other companies are also pursuing this development.

Military Implications:

The military should investigate this new technology for its possible application to power supplies for portable/mobile tactical and environmental sensing and communication systems.

Source:

Solar Energy's Red Queen

<http://www.americanscientist.org/template/AssetDetail/assetid/56471>

4.2.3 Nanotech Lithium-Ion Battery Material Promises 10× Capacity Increase

Stanford University Assistant Professor Yi Cui has developed an electrode material for lithium-ion batteries (used in laptops, iPods, video cameras, and cell phones) that increases their energy storage capacity ten times above current batteries. This could help make future electric cars more attractive. The material uses silicon nanowires to hold the charge-bearing lithium ions. Silicon structures can hold more lithium than the conventional carbon, but tend to disintegrate because of size changes during recharge cycles; the nanowires do not exhibit this characteristic.

Military Implications

The military should explore this development for its battery requirements from mobile environmental sensing systems to electric vehicles.

Source:

Stanford's nanowire battery holds 10 times the charge of existing ones

<http://news-service.stanford.edu/news/2008/january9/nanowire-010908.html>

4.3 New “Nanohybrid” Plastic Is Stronger and More Biodegradable

A new biodegradable ‘nanohybrid’ plastic that can be engineered to decompose much faster than existing plastics was developed by researchers of Cornell University. The plastic is a modified form of polyhydroxybutyrate (PHB), a promising biodegradable plastic produced from bacteria. The use of PHB has been limited because of its brittleness and unpredictable biodegradation rates. The new material, which is also stronger than the original, contains nanoparticles of clay; its biodegradation rate depends on the amount of clay added. In one case it had almost completely decomposed after seven weeks, while the unmodified version was barely affected. However, bioplastics definition and recycling procedures are yet to be agreed upon and the need for international standards and regulations is increasing as the research and applications expand.

Military Implications:

The military should consider using the new plastic alternatives where possible in anticipation of increasingly environment-friendly policies and reducing environmental footprints.

Source:

'Nanohybrid' Plastic May Expand Use Of Biodegradable Plastic

<http://www.sciencedaily.com/releases/2007/12/071203120115.htm>

'Bioplastic' may become third option to paper or plastic

<http://www.csmonitor.com/2007/1219/p15s01-sten.html>

Item 5. Possible Risk with Bisphenol A Receiving Increased Attention

Opinions continue to be divided on the environmental danger posed by bisphenol A, a chemical widely used to harden plastics. The NIH National Toxicology Program issued a controversial preliminary report citing minimal risk to adults, but another panel, led by Prof. Fred vom Saal of the Univ. of Missouri, expressed “a very high level of concern”, according to one of its members. An EPA spokeswoman has conceded that its 14-year-old safe level for the chemical is out of date, and says the agency is now studying it. Various studies around the world have not yet produced a clear indictment of the compound as a serious environmental hazard.

Military Implications:

Considering possible future restrictive regulation of this compound, the military should closely follow these investigations, review BPA usage in military materiel, and consider making plans for its replacement.

Source:

Peril in plastic?

<http://www.baltimoresun.com/news/opinion/ideas/bal-id.bpa23dec23,0,894641.story>

Item 6. Bottled Water Becomes Target of Environmentalists

Organizations around the world are becoming active in opposing the now rapidly increasing use of bottled water, and regulations and restrictions are beginning to be applied to its distribution. Shipping bottled water across the Atlantic and Pacific by oil-propelled ships does seem odd. One estimate puts the annual fossil fuel footprint of bottled water consumption in the United States at over 50 million barrels of oil equivalent—enough to run 3 million cars for one year. Beginning January 1, 2008 the city government of San Francisco has banned its departments and agencies from purchasing bottled water, and St. Louis is considering the same ban for its city employees in early 2008. With increased discourse around bottled water, it is likely that some international directives will be adopted to regulate its trade and distribution.

Military Implications:

R & D to create alternatives to shipping massive quantities of bottled water in military deployments should be sought. Logistic plans and contracts for bottled water purchases should be reviewed for flexibility to be revised in the event restrictions spread. Necessity versus simple convenience data that might be needed for appeals should be accumulated for use in appeals.

Source:

Bottled Water Boycotts. Earth Policy Institute. Plan B Update, December 7, 2007

<http://www.earthpolicy.org/Updates/2007/Update68.htm>

Chicago plans bottled water tax

<http://www.freep.com/apps/pbcs.dll/article?AID=/20071228/NEWS07/712280392/1009>

Item 7. Updates on Previously Identified Issues**7.1 OSCE-NATO Workshop on Environmental Security in the Mediterranean**

The "Water Scarcity, Land Degradation and Desertification in the Mediterranean region—Environment and Security Aspects" workshop held in Valencia, December 10-11, was organized jointly by the NATO Public Diplomacy Division and the Organization for Security and Co-operation in Europe (OSCE) Office of the Coordinator for Economic and Environmental Activities. Policymakers, scientists and experts assessed implications that water scarcity, land degradation, and desertification might have on population movements and security in the Mediterranean region. Since water management also offers opportunities for cooperation and conflict prevention, specific roles for the OSCE, NATO and other organizations were explored with OSCE Mediterranean Partners for Co-operation and the NATO Mediterranean Dialogue, which include Algeria, Egypt, Israel, Jordan, Mauritania, Morocco and Tunisia. [See also *OSCE*

Adopts Ministerial Declaration on Environment and Security in November 2007 and other previous environmental security reports on similar issues.]

Military Implications:

Military personnel involved in environmental security issues should review the "Water Scarcity, Land Degradation and Desertification in the Mediterranean region - Environment and Security Aspects" background paper for the conference referenced in sources below and seek ways to support their colleagues in the Mediterranean region.

Sources:

Mediterranean countries discuss environmental security at OSCE, NATO workshop

<http://www.osce.org/item/28784.html>

"Water Scarcity, Land Degradation and Desertification in the Mediterranean region - Environment and Security Aspects," Background Paper

<http://www.csic.es/documentos/actividades/cide111207.pdf>

7.2 Progress for Enforcing Biological Weapons Convention

This year's meeting of states parties to the Biological Weapons Convention focused on strengthening the treaty's implementation at the national level and advancing regional cooperation. The Implementation Support Unit established last year presented its report on helping member states implement the convention. Also discussed were efforts to increase the pact's membership beyond the present 159 nations. The Nonaligned Nations Movement presented several recommendations to strengthen the BWC, such as a verification regime to ensure compliance, and seven issues to be considered at BWC meetings through 2010, including stricter export and import controls mechanisms, and monitoring of viruses that could be spread intentionally or accidentally. The next Meeting of States Parties is scheduled for December 1-2008 to consider measures to improve biosafety and biosecurity, scientific codes of conduct, and approaches for increasing awareness. The next review conference of the BWC is scheduled for 2011. [See also *Sixth Review Conference of the Biological Weapons Convention* in December 2006 and other related environmental security reports.]

Military Implications:

[Similar to previous on the same issue] Without better international controls, terrorist access to biological weapons seems inevitable. Great progress has been made on bioweapons sensors over the past several years, some of which have been referenced in these monthly reports for AEPI. Relevant military personnel should consider making recommendations at the upcoming intersessional meetings.

Sources:

From Adjacency To Synergy: Meeting of States Parties to Biological Weapons Convention Concludes

[http://www.unog.ch/80256EDD006B9C2E/\(httpNewsByYear_en\)/5275A9CC8C5EE6A7C12573B1005C0D28?OpenDocument](http://www.unog.ch/80256EDD006B9C2E/(httpNewsByYear_en)/5275A9CC8C5EE6A7C12573B1005C0D28?OpenDocument)

2007 Meeting of States Parties: 10-14 December 2007

http://www.opbw.org/new_process/msp2007/msp2007.htm

NAM Concerned At Biological Weapons Convention

<http://www.namnewsnetwork.org/read.php?id=35499>

7.3 Climate Change

As international attention to climate change escalates, the events related to it increase. This month was exceptionally prolific, due to the Bali Climate Change Conference. Following is a list of the events considered most important; an expanded elaboration is available in the [Appendix](#).

7.3.1 Intensified Disasters

The World Meteorological Organization (WMO) summarizes the notable climate events of 2007 and reports that the decade of 1998-2007 is the warmest on record. Some scientists believe that weird weather patterns might become the norm as the world fails to avoid the critical 2°C (3.6°F) temperature rise. [\[more details\]](#)

7.3.2 Melting Glaciers and Sea Ice

Arctic ice is shrinking and thinning at a much faster pace than expected, and northern polar waters could be ice-free in summers within just 5-6 years. The Greenland ice sheet melted at its highest rate since satellite measurements began in 1979. Greenland's glaciers' flow towards the sea has doubled and is speeded up possibly by the holes created in the ice due to warming. While Greenland's melt water presently increases global sea level by about a quarter of an inch per decade, an accelerated melt would seriously endanger the world's shorelines. [\[more details\]](#)

7.3.3 Rising Sea Levels

Since 1993, global averaged sea level has been rising at about 3 mm per year, considerably more than the 20th century average of about 1.7 mm per year. WMO reports that global averaged sea level in 2007 is estimated to be about 20 cm higher than the 1870 estimate. More than 180 Alaskan villages are in danger because of shoreline erosion and permafrost melting due to global warming. Some are in immediate need of moving, although there are no clear relocation plans, nor adequate funding. Rising sea levels and freshwater shortage could exacerbate security risks in the Middle East warns *Climate Change: A New Threat to Middle East Security*, a report by Friends of the Earth Middle East (FOEME) [\[more details\]](#)

7.3.4 Food Security

World food supply is diminishing relatively rapidly and food prices reached historic highs. Food and Agricultural Organization (FAO) records show that world grain stocks declined to 12 weeks for wheat and only 8 weeks for corn. New computer projections warn of possible future crop production reductions due to climate change. The present situation shows that changes are happening faster than computer-based climate simulations have forecast; hence, the future situation might be more critical. [\[more details\]](#)

7.3.5 Adaptation

The Bali roadmap key negotiation topics include adaptation and mitigation issues. Eight South African and Indian Ocean nations decided to enhance regional cooperation for emergency response in case of natural disasters. The first international symposium on public weather services discussed the use of weather information gathering and dissemination to reduce the consequences of disasters. The ITU Framework for Cooperation in Emergencies (IFCE) was launched to help government and relief agencies improve disaster preparedness and response. A new adaptation website <http://adaptation.cbd.int> helps governments and agencies to include biodiversity considerations in their adaptation planning. [\[more details\]](#)

Military Implications:

[Same as previous on similar issues] Increasingly more compelling evidence and warnings on climate change amplify international discourse and increase the emergence of international

policies trying to tackle the causes and develop strategies to mitigate climate change effects. Hence, the military should be doing its part in reducing greenhouse gas emissions and preparing to both manage violent reactions and help mitigate the human-made and natural catastrophes that could ensue.

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

United Nations Climate Change Conference in Bali

http://unfccc.int/meetings/cop_13/items/4049.php

The global climate in 2007

<http://www.wmo.ch/pages/publications/meteoworld/en/climate.html>

Greenland ice sheet melting at record rate

<http://www.reuters.com/article/environmentNews/idUSN1017865420071210>

Arctic summers ice-free 'by 2013'

<http://news.bbc.co.uk/2/hi/science/nature/7139797.stm>

Tiny Newtok, Alaska, against the tide

<http://www.latimes.com/news/printedition/asection/la-na-newtok27dec27,1,4983375.story?ctrack=1&csset=true> (Free registration required.)

Climate Change: A New Threat to Middle East Security

<http://newsecuritybeat.blogspot.com/2007/12/climate-change-threatens-middle-east.html>

Toll of Climate Change on World Food Supply Could Be Worse Than Thought

<http://www.earth.columbia.edu/articles/view/2001>

Southern African nations band together to scale up disaster preparedness – UN

<http://www.un.org/apps/news/story.asp?NewsID=25110&Cr=disaster&Cr1=>

International Symposium on PWS: A Key to Service Delivery (Geneva, 3- 5 December 2007)

http://www.wmo.ch/pages/prog/amp/pwsp/PWS_Symposium_en.htm

ITU Global Forum adopts actions to strengthen response in emergencies

http://www.itu.int/newsroom/press_releases/2007/38.html

7.4 New ISO Standard on Sustainable Building

ISO 21930:2007—Sustainability in Building Construction -- Environmental Declaration of Building Products complements ISO 14025 for the environmental product declarations (EPD) of building products, containing specifications, principles, and requirements, to encourage sustainable building. It sets the framework for environmental declarations of building products and takes into consideration the entire life cycle of a building.

Military Implications:

ISO 21930:2007 is primarily intended for use in business-to-business communication. Hence the military should encourage its contractors to use it and also examine the impact that this new standard will have on the specification and procurement of military construction.

Sources:

ISO Creates Standard for Sustainable Building

http://www.greenerbuildings.com/news_detail.cfm?NewsID=36364

ISO 21930:2007—Sustainability in building construction -- Environmental declaration of building products

http://www.iso.org/iso/catalogue_detail?csnumber=40435

7.5 Nanotechnology Safety Issues

The first nanotechnology genotoxicity (toxicity at the molecular level) tests found that carbon nanotubes could damage DNA. Researchers at the University of Dayton have assessed the DNA damage response to multi-walled carbon nanotubes (MWCNT) in mouse embryonic stem cells. The methodology used is highly versatile for testing genotoxicity and hence can be expanded for genotoxicity tests of other nanomaterials.

The “Nanotechnology & the Media: The Inside Story” meeting held at the Woodrow Wilson Center discussed the results of a study analyzing media coverage of nanotechnology risks in the U.S. and UK. The study reveals a large increase in the number of articles, with the focus being mainly on health, environmental and security aspects. Coverage is higher for regulatory and reports related issues than for scientific matters. Concerns about nanotech risk are increasing at non-profits and governments, and governments are responding most strongly to risk concerns. In general, there was a strong feeling that there is not enough media coverage on the nanotech risk issues.

Military Implications:

[Same as previous on this issue] Military personnel concerned with nanotech issues should contribute their views to these activities. Also, relevant military personnel should review the information generated by such activities to improve military and contractor practices, as well as to assist and cooperate with the organizations working on those issues for enriching their studies. Some nanotech products could become the next “asbestos” in materiel and in military work environments, unless carefully managed from the outset of research and use.

Sources:

First nanotechnology genotoxicity tests find that carbon nanotubes could damage DNA

<http://www.nanowerk.com/spotlight/spotid=3632.php>

DNA Damage Induced by Multiwalled Carbon Nanotubes in Mouse Embryonic Stem Cells

<http://pubs.acs.org/cgi-bin/abstract.cgi/nalefd/2007/7/i12/abs/nl071303v.html>

Nanotechnology & the Media: The Inside Story. Tuesday December 18, 2007

http://www.wilsoncenter.org/index.cfm?fuseaction=events.event&event_id=343009#

Item 8. Reports Suggested for Review

8.1 Security Risk due to Climate Change

World in Transition –Climate Change as a Security Risk, a report by the German Advisory Council on Global Change based on the work of international experts and organizations including the UN Environmental Program (UNEP), assesses the possible security implications of climate change and warns that inaction might lead to destabilization and raise the threats to international security to a new level. It suggests four 'climate-induced conflict constellations': 1) freshwater scarcity, 2) decline in food production, 3) increased natural disasters, and 4) environmentally-induced migration. The geographic areas at greater risk include: northern and southern Africa and the Sahel zone; central Asia, India, Pakistan and Bangladesh, China; Caribbean and the Gulf of Mexico (especially Central America); and Andean and Amazonian regions of Latin America. The report makes extensive recommendations, including: shaping global political change, reforming the UN, developing pro-active climate protection and adaptation policies, and “financing international conflict prevention.” It also underlines the need to

develop strategies for avoiding destabilization and conflict in the event that climate protection fails.

A Christian Science Monitor article, *Six places in the world where climate change could cause political turmoil* gives another view of areas vulnerable to consequences of global warming: 1) Nepal (lack of freshwater due to melting glaciers causes migration and increased power of Maoists); 2) Indonesia (deforestation); 3) Lagos, Nigeria (sea-level rise in an overpopulated and unstable region); 4) U.S. (overstretched America's armed forces due to disaster relief and war-fighting); 5) Arctic (race for natural resources and navigation change sovereignty questions as Arctic ice melts); 6) East Africa (desertification and decreased food production induced migration).

The *Climate Change: A New Threat to Middle East Security* report by the Friends of the Earth Middle East (FoEME) [see item [7.3.3 in the Appendix](#)] highlights that consequences of climate change—mainly rising sea levels and freshwater shortage — could exacerbate security risks in the Middle East.

Military Implications:

These papers should be reviewed by those military personnel studying potential environmental security hot spots and interventions to prevent conflict.

Sources:

World in Transition –Climate Change as a Security Risk (Report PDF)

http://www.wbgu.de/wbgu_jg2007_engl.html

Climate Change and Conflict - New Report Weighs the Risks and Pin Points Likely Hotspots

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=523&ArticleID=5720&l=en>

Six places in the world where climate change could cause political turmoil

<http://www.csmonitor.com/2007/1206/p14s01-sten.html>

Climate Change: A New Threat to Middle East Security

<http://newsecuritybeat.blogspot.com/2007/12/climate-change-threatens-middle-east.html>

Egypt, Jordan and Palestine threatened by global warming

<http://www.albawaba.com/en/countries/Palestine/220130>

Climate Change Threatens Middle East, Warns Report

<http://newsecuritybeat.blogspot.com/2007/12/climate-change-threatens-middle-east.html>

Middle East: Rising Sea Levels Could Lead To Political Tensions – Report

http://yubanet.com/artman/publish/article_73048.shtml

8.2 Modern Warfare Increasingly Harmful to the Environment

War and the environment, an article published by Worldwatch Institute, shows that modern warfare tactics have an increasingly devastating impact on the ecosystems. By thoroughly analyzing the ecological effect of the American war in Vietnam, the Rwandan and Congolese civil wars, and the current war in Iraq, the article illustrates the long-term damage caused by modern “ecocide.” [See also *Addressing Post-Conflict Environmental Security Issues* in August 2006, and other similar items in previous environmental security reports.]

Military Implications:

As international discourse on the environmental damages and related restoration costs intensifies, it is likely that there will be increasing pressure for updating laws, assigning liability, and defining redress issues concerning environmental damages in war.

Sources:

War and the environment; by Sarah DeWeerd, World Watch, Vol.21, no.1, Jan/Feb 2008, Worldwatch Institute (by subscription only)

Modern Warfare Causes Unprecedented Environmental Damage

<http://www.worldwatch.org/node/5544>

8.3 China's Energy Conditions and Policies—White Paper

China's Information Office of the State Council issued the country's first-ever, white paper on its energy conditions and policies. The paper indicates a shift towards a more environment-centered energy policy, prioritizing sustainable development based on S&T, and strengthened international cooperation in the field of energy. It emphasizes, "China did not, does not and will not pose any threat to the world's energy security." [See also *China May Restructure Environmental Effort* in October 2007, and other related items in previous environmental security reports.]

Military Implications:

Relevant military personnel should consider increased cooperation with their Chinese counterparts to offer the benefit of U.S. experience in environmental security efforts.

Source:

China report says coal to remain top energy source

<http://afp.google.com/article/ALeqM5jRdR9Nd-GnyWN1FainAfHONr-imA>

China's Energy Conditions and Policies

http://www.chinadaily.com.cn/china/2007-12/26/content_6349803.htm

China's energy policy puts more emphasis on environment

<http://www.cctv.com/program/bizchina/20071227/102997.shtml>

China's energy policy puts more emphasis on environment (video)

http://www.cctv.com/video/bizchina/2007/12/bizchina_300_20071227_8.shtml

APPENDIX

Reference Details

This Appendix contains expanded background information on some items.

Item 1. Bali Roadmap Sets Framework for Post-Kyoto Negotiations

Sources (more expanded list):

United Nations Climate Change Conference in Bali

http://unfccc.int/meetings/cop_13/items/4049.php

Bali Action Plan

http://unfccc.int/files/meetings/cop_13/application/pdf/cp_bali_action.pdf

Summary of The Thirteenth Conference of Parties to the UN Framework Convention on Climate Change and Third Meeting of Parties to the Kyoto Protocol

<http://www.iisd.ca/vol12/enb12354e.html#REDUCING%20EMISSIONS%20FROM%20DEFORESTATION%20IN%20DEVELOPING%20COUNTRIES>

Secretary-General Ban welcomes climate change breakthrough in Bali

<http://www.un.org/apps/news/story.asp?NewsID=25081&Cr=Climate&Cr1=Countries>

Countries Agree to Write New Climate Action Pact

<http://www.ens-newswire.com/ens/dec2007/2007-12-15-01.asp>

World Mayors and Local Governments Climate Protection Agreement

<http://www.iclei.org/index.php?id=7337>

US Prevails on Climate Draft, Ban Says

http://www.latimes.com/news/printedition/asection/la-sci-bali13dec13,1,3565669.story?coll=la-news-a_section&ctrack=1&cset=true

Gore Exhorts UN Climate Conference to Act Now

<http://www.ens-newswire.com/ens/dec2007/2007-12-13-01.asp>

World Bank Will Pay to Leave Forests Standing

<http://www.ens-newswire.com/ens/dec2007/2007-12-11-01.asp>

So hard to see the wood for the trees

http://www.economist.com/world/international/displaystory.cfm?story_id=10329203

UN Climate Change Conference represents crossroads, Secretary-General says

<http://www.un.org/apps/news/story.asp?NewsID=25018&Cr=climate&Cr1=change>

EU and US at Loggerheads over Climate Change

<http://euobserver.com/9/25338/?rk=1>

Nobel laureates propose global CO2 tax

<http://euobserver.com/9/25312/?rk=1>

Some like it cool. *The Economist*, Dec 19th 2007

http://www.economist.com/opinion/displaystory.cfm?story_id=10335267

Item 7. Updates on Previously Identified Issues

7.3 Climate Change

More detailed explanations:

7.3.1 Intensified Disasters

Summarizing the notable climate events of 2007, the World Meteorological Organization (WMO) remarks on devastating floods; drought and falling freshwater reserves; intense storms in various places around the world; and record-low Arctic sea ice extent that opened the Canadian Northwest Passage for the first time. It reports that the decade of 1998-2007 is the warmest on record, with the global mean surface temperature for 2007 estimated at 0.41°C (0.74°F) above the 1961-1990 annual average of 14°C (57.20°F). Extreme temperatures included unusually cold winters in South America, heat waves affecting Europe, and making 2007 probably the hottest year on record in the Northern Hemisphere. Some scientists believe that weird weather patterns might become the norm and that the world is more than 50% likely to experience serious climate change as it is unlikely to keep greenhouse gases levels low enough to avoid the critical 2°C (3.6°F) temperature rise.

7.3.2 Melting Glaciers and Sea Ice

Scientists attending the American Geophysical Union meeting in San Francisco revealed that ice sheets melt faster than expected. The Arctic ice is shrinking and thinning at a much faster pace than expected and latest modeling studies indicate that the northern polar waters could be ice-free in summers within just 5-6 years. Similarly, the Greenland ice sheet melted at a record rate this year, the largest ever since satellite measurements began in 1979.

Scientists observed that over the past few years the speed at which some of Greenland's glaciers flow towards the sea has doubled. They think that one factor might be the holes created in the ice due to warming, through which the water of melting surface ice is penetrating below the ice and thus speeding the flow of ice toward the open ocean. While Greenland's melt water presently increases global sea level by about a quarter of an inch per decade, an accelerated melt would seriously endanger world's shorelines.

7.3.3 Rising Sea Levels

WMO reports that global averaged sea-level in 2007 is estimated about 20 cm higher than the 1870 estimate. Satellite measurements show that, since 1993, global averaged sea-level has been rising at about 3 mm per year, considerably more than the 20th century average of about 1.7 mm per year.

At the Bali Climate Change Conference, small island states reiterated the catastrophic impacts that global warming and rising sea levels could have for their nations and called for swift action to reduce man-made causes and increase adaptation measures.

According to U.S. government reports, more than 180 Alaskan villages are in danger because of shoreline erosion and permafrost melting due to global warming. Some are in immediate need of moving, although there are no clear relocation plans, nor adequate funding.

The *Climate Change: A New Threat to Middle East Security* report by Friends of the Earth Middle East (FoEME) highlights that consequences of climate change—mainly rising sea levels and freshwater shortage could exacerbate security risks in the Middle East. Unless adequate adaptation actions, the large-scale consequences include threat to “national, regional, and global security” warns Nader Khatib, Palestinian Director of FoEME.

7.3.4 Food Security

UN Food and Agriculture Organization warns that world food supply is diminishing rapidly and food prices reached historic highs, increasing the “very serious risk that fewer people will be able to get food,” particularly in the developing world. FAO records show that world grain stock—corresponding to the world’s total consumption—declined to 12 weeks for wheat and only 8 weeks for corn . Population growth, the effects of global warming and increase of biofuels industry are among the main factors. Josette Sheeran, executive director of the World Food Program expressed concerns that we are “facing the perfect storm for the world’s hungry.”

New computer projections also warn of possible future crop production reduction due to climate change. NOAA models show the effects that climate changes could have on the tropical belt and the possible consequences to ecosystems and human settlements. New projections by the Massachusetts Institute of Technology indicate that unless there are serious emission cuts, ozone pollution might increase 50% by 2100, which could result in a decrease of global economic value of crop production by 10% to 12%. Nevertheless, the present situation shows that changes are happening faster than computer-based climate simulations have forecast.

Three studies coauthored by researchers from prestigious organizations in North America, Europe and Australia, published by the National Academy of Sciences, warn that the future food situation might be worse than presently estimated, since many parameters that would influence crops were not efficiently factored in. “Many people assume that we will never have a problem with food production on a global scale. But there is a strong potential for negative surprises,” said Francesco Tubiello, a physicist and agricultural expert at NASA's Goddard Institute of Space Studies, who coauthored all three studies.

7.3.5 Adaptation

“It is now recognized that mitigation alone is unlikely to fully address, in a reasonable time, the challenges that human-induced climate change is likely to bring and that, therefore, much greater attention needs to be given to adaptation to climate change,” said WMO Secretary-General Michel Jarraud, addressing the UN Climate Change Conference in Bali, Indonesia.

Small island states called for help with adaptation programs. Grenada mentioned that the two devastating hurricanes over the last seven years caused damage that amounted to 200% of the country’s GDP. Maldives is spending considerable sums on adaptation efforts, which include building 14 ‘safe islands.’

The Bali roadmap includes, as key issues for the upcoming negotiations, taking action to adapt to the negative consequences of climate change—such as droughts and floods; developing ways to reduce greenhouse gas emissions; finding ways to deploy climate-friendly technology; and financing adaptation and mitigation measures.

At the "Emergency Preparedness and Response Workshop" organized by the UN Office for the Coordination of Humanitarian Affairs (OCHA) in Johannesburg, eight South African and Indian Ocean nations—the Comoros, Madagascar, Malawi, Mozambique, Namibia, Zambia, Zimbabwe and South Africa—decided to enhance regional cooperation for emergency response in case of natural disasters. The draft Declaration of Intent stipulates cooperation for improved information sharing, establishing regional rapid response teams, and developing measures for free movement of emergency personnel and relief materials in the region.

The first international symposium on public weather services, organized by the WMO has brought together about 120 experts to prepare a road map for improving communities’ protection from natural disasters and adaptation to climate change. The discussions covered issues from weather information gathering and dissemination by national meteorological and hydrological

services, to use of weather forecasts and reaction in case of emergencies. The symposium was held in Geneva, 3- 5 December 2007.

The UN International Telecommunications Union three-day global forum on "Effective Use of Telecommunications/ICT for Disaster Management: Saving Lives" held in Geneva, launched the ITU Framework for Cooperation in Emergencies (IFCE), which outlines actions helping government and relief agencies to improve disaster preparedness, early warning, and response by using telecommunications resources.

The Convention on Biological Diversity, launched a new adaptation website <http://adaptation.cbd.int> to help governments and agencies to include biodiversity considerations in their adaptation planning.

Sources: (a more expanded list)

United Nations Climate Change Conference in Bali

http://unfccc.int/meetings/cop_13/items/4049.php

UN climate change conference in Bali (Telegraph Earth)

<http://www.telegraph.co.uk/earth/main.jhtml;jsessionid=1XADKK0EA00LDQFIQMGCFFWAVCBQUIV0?xml=/earth/exclusions/bali/nosplit/bali-climate-change-conference.xml>

The global climate in 2007

http://www.wmo.ch/pages/publications/meteoworld/_en/climate.html

1998-2007 Is Warmest Decade on Record

http://www.wmo.ch/pages/mediacentre/press_releases/pr_805_en.html

Year weather records fell

<http://www.thestar.com/sciencetech/Environment/article/288763>

Climate change goal 'unreachable'

<http://news.bbc.co.uk/2/hi/science/nature/7135836.stm>

Another Warm Year As Bali Conference Ends

http://www.terraviva.com/reports/Another_Warm_Year_As_Bali_Conference_Ends_999.html

Greenland ice sheet melting at record rate

<http://www.reuters.com/article/environmentNews/idUSN1017865420071210>

New evidence that the ice in Arctic is melting faster than ever was presented at the American Geophysical Union's annual meeting in San Francisco

<http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2007/12/13/MNC9TT0TQ.DTL&type=science>

<http://news.bbc.co.uk/2/hi/science/nature/7139797.stm>

Greenland's Mysterious Holes Speed Ice Flow to Sea

<http://www.npr.org/templates/story/story.php?storyId=17463283&ps=bb1>

The global climate in 2007

http://www.wmo.ch/pages/publications/meteoworld/_en/climate.html

Tiny Newtok, Alaska, against the tide

<http://www.latimes.com/news/printedition/asection/la-na-newtok27dec27,1,4983375.story?ctrack=1&cset=true>

Climate Change: A New Threat to Middle East Security

<http://newsecuritybeat.blogspot.com/2007/12/climate-change-threatens-middle-east.html>

Middle East: Rising Sea Levels Could Lead To Political Tensions – Report

http://yubanet.com/artman/publish/article_73048.shtml

A worrisome forecast for the world's crops

<http://www.csmonitor.com/2007/1213/p17s01-sten.html>

World food stocks dwindling rapidly, UN warns

<http://www.iht.com/articles/2007/12/17/europe/food.php?page=1>

Toll of Climate Change on World Food Supply Could Be Worse Than Thought

<http://www.earth.columbia.edu/articles/view/2001>

Southern African nations band together to scale up disaster preparedness – UN

<http://www.un.org/apps/news/story.asp?NewsID=25110&Cr=disaster&Cr1=>

African nations to coordinate fight against natural disasters: UN

http://news.yahoo.com/s/afp/20071218/wl_africa_afp/africasadcdisasterun

WMO Hosts First International Symposium on Public Weather Services

http://www.wmo.ch/pages/mediacentre/Info%20notes/info_40_en.html

International Symposium on PWS: A Key to Service Delivery (Geneva, 3- 5 December 2007)

http://www.wmo.ch/pages/prog/amp/pwsp/PWS_Symposium_en.htm

ITU Global Forum adopts actions to strengthen response in emergencies

http://www.itu.int/newsroom/press_releases/2007/38.html

Integrating Biodiversity into Climate Change Adaptation Planning

<http://adaptation.cbd.int>