

WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY
Control No. (TCN) 08152 with Battelle Chapel Hill Operations for the U.S. Army Environmental Policy Institute

NOVEMBER 2009 REPORT

Note to Readers: Pages 1-15 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 16.

Item 1. China and U.S. Announce Climate Change Goals.....	1
Item 2. Changes to War Crimes Proposed for the International Criminal Court.....	1
Item 3. Increased Calls for Banning Nonlethal Riot-control Agents.....	2
Item 4. Technological Advances with Environmental Security Implications.....	3
4.1 New Technique Helps Reduce Nanoparticle Wastewater Pollution.....	3
4.2 Evaporation Provides Power in New Desalination System.....	3
4.3 Increasing Energy Efficiency Technologies.....	3
4.4 Software Standards to Connect Data Globally.....	4
Item 5. Updates on Previously Identified Issues.....	5
5.1 New Decisions Adopted for Strengthening the Montreal Protocol.....	5
5.2 UNECE Guidance on Water and Adaptation to Climate Change.....	5
5.3 International Gene Synthesis Consortium Created for Increasing Biosecurity.....	6
5.4 UK and US Legislators Review Geoengineering Proposals.....	6
5.5 EPA Issues New Regulations on Water Pollution from Construction.....	7
5.6 Ultrathin Solar Panels Could End Up On the EU list of Hazardous Materials, Due to Cadmium Content.....	7
5.7 Climate Change.....	8
5.7.1 Scientific Evidence and Natural Disasters.....	8
5.7.2 Food and Water Security.....	7
5.7.3 Health.....	9
5.7.4 Melting Glaciers and Sea Ice.....	9
5.7.5 Rising Sea Levels.....	10
5.7.6 Migration.....	10
5.7.7 Adaptation.....	10
5.7.8 Climate Modeling.....	11
5.7.9 Post-Kyoto Negotiations.....	11
5.8 Nanotechnology Safety Issues.....	13
Item 6. Reports and Information Suggested for Review.....	14
6.1 Climate Change Threats Increasingly Top Security Agendas.....	14
6.2 European Environment Agency Draws First Map of Europe’s Noise Exposure.....	14
6.3 Consumer’s Handbook for Reducing Solid Waste.....	15
Appendix.....	16

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE NOV 2009	2. REPORT TYPE	3. DATES COVERED 00-00-2009 to 00-00-2009			
4. TITLE AND SUBTITLE Worldwide Emerging Environmental Issues Affecting the U.S. Military. November 2009		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) The Millennium Project ,4421 Garrison Street, N.W. ,Washington,DC,20016-4055		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified	Same as Report (SAR)	28	

Item 1. China and U.S. Announce Climate Change Goals

China announced it will reduce carbon emissions per unit of GDP by 40 to 45% of 2005 levels, by 2020. The U.S. announced its goal of reducing its emissions by 17% (regardless of emissions per unit of GDP) during this period, matching legislation passed by the U.S. House of Representatives. Both President Obama and Premier Wen will attend the Climate Change conference in Copenhagen in December along with more than 85 heads of state and government (confirmed as of November 30, 2009.) Premier Wen Jiabao has also hosted a group from developing countries including India and Brazil to create a technology transfer position from richer countries in exchange for developing countries' mitigation efforts. [See also item 5.7 in this report for updates on climate change issues and research and Item 6.1 for reports on climate change security threats.]

Military Implications:

The military should accelerate its efforts to build military-to-military programs with China that focus on climate change. Potential cooperation might identify resources and programs for reducing GHGs and responding to effects of climate change. A joint information system for this cooperation should be created and updated continuously, to include forecasts for how both militaries might be called upon for mitigation and adaptation and performing joint gap analyses in anticipation of future adaptation requests, which might involve creating a coherent global security plan to address the accelerating threats of climate change.

Sources:

China announces carbon reduction targets

<http://english.cctv.com/program/bizchina/20091126/104112.shtml>

President to Attend Copenhagen Climate Talks

<http://www.whitehouse.gov/the-press-office/president-attend-copenhagen-climate-talks>

Big Developing Countries Form Climate Change Front

<http://planetark.org/wen/55688>

Item 2. Changes to War Crimes Proposed for the International Criminal Court

The 8th session of the Assembly of States Parties to the International Criminal Court discussed proposals to amend the Rome Statute. Belgium proposed modifying Article 8 to cover use of certain weapons (chemicals, gases, and certain bullets) for international and non-international conflict situations and expanding the list of war crimes to include use of chemical, biological, and some conventional weapons, and anti-personnel mines. These proposals are considered relatively non-controversial so as not to deter non-parties from ratifying the Rome Statute and to be consistent with other multilateral agreements in force and with international customary law. Mexico proposed adding the employment or the threat to employ nuclear weapons to article 8. The Netherlands proposed inclusion of Crime of Terrorism under Article 5: Crimes within the jurisdiction of the Court. [See more details in the [Appendix](#)] The first Review Conference on the Rome Statute will be held May 31-June 11, 2010, in Kampala, Uganda.

Military Implications:

It is likely that all proposals will be considered during the 2010 Review Conference on the Rome Statute. Although the U.S. is not a State Party to the ICC, it should be prepared to comply with any new amendments in those countries that are States Party.

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

Report of the Bureau on the Review Conference; Addendum. ICC-ASP/8/43/Add.1, 10 Nov., 2009

http://www.icc-cpi.int/iccdocs/asp_docs/ASP8/ICC-ASP-8-43-Add.1-ENG.pdf

Report of the Bureau on the Review Conference. ICC-ASP/8/43, 15 November 2009

http://www.icc-cpi.int/iccdocs/asp_docs/ASP8/ICC-ASP-8-43-ENG.pdf

Item 3. Increased Calls for Banning Nonlethal Riot-control Agents

Should advances in non-lethal riot control agents be considered in the Chemical Weapons Convention (CWC)? Currently, the Chemical Weapons Convention and its enforcement mechanisms do not apply to non-lethal riot control agents, incapacitants, and certain munitions containing chemical agents. The nature of the global chemical industry and chemical warfare materials are evolving outside international regulations. A report, *Dangerous Ambiguities: Regulation of Riot Control Agents and Incapacitants under the Chemical Weapons Convention* by Michael Crowley of the University of Bradford Non-Lethal Weapons Research Project documents these problems. It notes that the danger of “misuse of riot control agents by law enforcement officials, military personnel and private military company employees” grows exponentially as research on these agents proliferates around the world. The report recommends that the next (third) CWC review conference, scheduled for 2013, considers clarifying ambiguities that undermine effective enforcement of the Convention with regard to such weapons and, in the meantime, adopt a moratorium on weaponization of incapacitants. Some states, led by Switzerland, show an increased interest in discussing a legal framework for incapacitants. [Related item: *Eleventh Chemical Weapons Convention* in December 2006 environmental security report]

Military Implications:

Given the authoritative standard of the report, it is likely that it will find its way onto the policymaking agenda, thereby influencing changes to the CWC. The military and its contractors should be prepared to comply with eventual new restrictions in the States Party to the CWC. Also, until the relevant policy steps are taken, the military should continue exploring how potentially dangerous are the chemical agents and non-lethal weapons used by military and private security companies, in order to discover and eliminate harmful items and practices.

Sources:

Danger of "Nonlethal" Agents Grows Amid States' Inaction, Report Says

http://gsn.nti.org/gsn/nw_20091106_8443.php

Dangerous Ambiguities: Regulation of Riot Control Agents and Incapacitants under the Chemical Weapons Convention. Michael Crowley, 2009

<http://www.brad.ac.uk/acad/nlw/publications/BNLWRPDangerous1.pdf>

Item 4. Technological Advances with Environmental Security Implications

4.1 New Technique Helps Reduce Nanoparticle Wastewater Pollution

Scientists at the UK's Centre for Ecology & Hydrology have discovered that coating nanoparticles with a surfactant causes them to clump together and form a removable solid sludge when they appear in wastewater as a result of their use (now widespread) in commercial products, enabling them to be cleared from treatment plant effluent streams.

Military Implications:

Military personnel concerned with nanotech risk management should investigate this technology for utility in planning and conducting mitigation operations.

Source:

Centre for Ecology & Hydrology

New discovery may help manage nanoparticle wastes from consumer products

<http://www.ceh.ac.uk/news/press/Managenanoparticlewastesfromconsumerproducts.asp>

4.2 Evaporation Provides Power in New Desalination System

Saltworks Technologies in Vancouver, BC, Canada claims to have developed a desalination technology that uses up to 80% less energy than current commercial processes, according to the originators. The method depends on using heat in the environment to evaporate salty water to a high degree of concentration, and then setting up an "ionic current" which removes the Na and Cl components. The result, according to the developers, is a system that needs only enough external energy to drive its pumps.

Military Implications:

The military should investigate this technology for its usefulness as a low energy way of producing fresh water in hot, arid environments.

Sources:

Saltworks Technologies Company

<http://www.saltworkstech.com>

Breakthrough in Energy Efficient Desalination Technology

http://www.globe-net.com/green_tech/listing.cfm?ID_Report=1856

A fresh way to take the salt out of seawater

http://www.economist.com/sciencetechnology/displaystory.cfm?story_id=14743791

4.3 Increasing Energy Efficiency Technologies

4.3.1 New Tool for Reducing Carbon Emissions from Building Construction Projects

The Rocky Mountain Institute has released a new on-line computational tool, Green Footstep, which provides the design targets required to achieve carbon neutrality, net zero site energy, and other environmental objectives for a building construction project. It is based on information input about the location and other characteristics of the building, and the local ecosystem. The Green Footstep will produce a carbon emissions performance report for all phases of the work.

Military Implications:

The military should investigate the applicability of this tool to military construction and retrofitting projects.

Source:

Green Footstep

<http://greenfootstep.org>**4.3.2 Quantum Dots Offer New Possibilities for Energy from Waste Heat**

Peter Hagelstein, an associate professor of electrical engineering at MIT, and associates have published a paper setting forth new results that promise major improvements in devices for converting waste heat into electrical energy, offering both high efficiency and high throughput power. Additional technological development will be needed, but MTPV Corp. of Boston is working on exploitation of these ideas.

Military Implications:

The military should keep in touch with these efforts as they proceed toward commercially available, environment-sparing energy sources.

Sources:

Better way to harness waste heat with quantum dot devices

<http://www.nanowerk.com/news/newsid=13604.php>

Quantum-coupled single-electron thermal to electric conversion scheme

<http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=JAPIAU000106000009094315000001&idtype=cvips&gifs=yes>**4.4 Software Standards to Connect Data Globally**

Denis Havlik of the Austrian Institute of Technology is coordinating an EU FP6 project, Sensors Anywhere (SANY), which embodies the technical capability to allow the free exchange and use of environmental monitoring data regardless of its source. SANY allows a user to search for and retrieve raw or processed environmental data using standardized methods and to receive it in a standard format set out by the Open Geospatial Consortium (OGS).

In another project with a related goal, the University of New Mexico, the Oak Ridge National Laboratory, and associated institutions worldwide are beginning work on establishing DataONE, a global data access and preservation network "for organizing and providing large amounts of highly diverse and interrelated but often incompatible scientific data", according to ORNL's Robert Cook.

Military Implications:

Such standards are necessary to aid the military in monitoring environmental change on a global basis to help anticipate future threats and opportunities. The military should consider establishing contact with both of these efforts to offer its assistance in their development, and also to take advantage of them when they are operational.

Sources:

SANY Project

<http://sany-ip.eu/>

Open shop for environmental data

<http://www.physorg.com/news177671377.html>

DataONE

<http://dataone.org>

DataONE helping scientists deal with data deluge
<http://www.physorg.com/news177765736.html>

Item 5. Updates on Previously Identified Issues

5.1 New Decisions Adopted for Strengthening the Montreal Protocol

The 21st meeting of Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (MOP21), held in Port Ghalib, Egypt, November 4-8, 2009, adopted 30 decisions, including examining alternatives to hydrochlorofluorocarbons (HCFCs), environmentally sound management of banks of the ozone depleting substance methyl bromide; and data and compliance issues. A North American proposal on phasing down hydrofluorocarbons (HFCs) was withdrawn after China, India, and several Arab countries disagreed with discussing HFCs under the Montreal Protocol. [Related item: *Powerful Greenhouse Gas HFCs Might be banned under the Montreal Protocol* in the August 2009 environmental security report.]

Military Implications:

[Similar to previous on this issue] The military and its contractors should consider substitutes and promote the phaseout of ozone-depleting compounds.

Sources:

Documents of the 21st Meeting of the Parties to the Montreal Protocol, 4-8 November, 2009

http://ozone.unep.org/Meeting_Documents/mop/21mop/index.shtml

Twenty-first meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer

<http://www.iisd.ca/ozone/mop21/>

5.2 UNECE Guidance on Water and Adaptation to Climate Change

The fifth meeting of the parties to the United Nations Economic Commission for Europe (UNECE) Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) was held November 10-12, 2009 in Geneva. It adopted the *Guidance on Water and Adaptation to Climate Change* to help address the impacts of climate change on transboundary freshwater. The Guidance provides an overview of multilateral agreements related to water issues, and an interdisciplinary methodology on how to develop and implement an adaptation strategy in a transboundary context, as well as recommendations to decisionmakers and water managers on how to assess impacts of climate change on water quantity and quality, perform risk and vulnerability assessments, and design and implement appropriate adaptation strategies. It also contains about 40 case studies. [Related item: *Draft European Transboundary Guidance on Water and Adaptation to Climate Change* in September 2009 environmental security report.]

Military Implications:

The *Guidance on Water and Adaptation to Climate Change* should be reviewed by military personnel involved in activities concerning transboundary issues.

Source:

Guidance on Water and Adaptation to Climate Change

http://www.unece.org/env/documents/2009/Wat/mp_wat/ECE_MP.WAT_30_E.pdf

5.3 International Gene Synthesis Consortium Created for Increasing Biosecurity

Five companies that represent about 80% of global gene synthesis capacity have formed the International Gene Synthesis Consortium for increasing the security of their products, preventing misuse of gene synthesis technology, and helping to prevent bioterrorism and the use of manufactured DNA sequences in producing lethal disease agents. The Consortium’s “Harmonized Screening Protocol for Gene Sequence & Customer Screening to Promote Biosecurity” creates a framework for safe use of synthetic genes covering aspects related to: screening of transactions and customers, record keeping, and regulatory compliance. In the meantime, the International Association of Synthetic Biology finalized the Code of Conduct for Best Practices in Gene Synthesis, and the World Intellectual Property Organization (WIPO) held a ‘Symposium on Future Challenges of International Law: The Way Forward in Patenting Biotechnology’ on November 25, 2009, to address the challenging interface between biotechnology, intellectual property rights, and international trade (the outcomes were not yet available at the time of this writing.) [Related item: *Synthetic Gene Ordering Security Screening Up for Discussion* in September 2009 environmental security report.]

Military Implications:

Military personnel concerned with biosecurity and contractors working in gene synthesis should consider actively participating in these organizations and observe the protocols and codes of conduct of the industry, as well as offering guidance for further improving biosecurity.

Sources:

World’s Top Gene Synthesis Companies Establish Tough Biosecurity Screening Protocol

http://www.genesynthesisconsortium.org/November_19.html

Gene Synthesis Companies Pledge to Foil Bioterrorists

<http://blogs.sciencemag.org/scienceinsider/2009/11/gene-synthesis.html>

Code of Conduct for Best Practices in Gene Synthesis

<http://www.ia-sb.eu/go/synthetic-biology/activities/press-area/press-information/code-of-conduct-for-best-practices-in-gene-synthesis/>

Symposium on Future Challenges of International Law: the Way Forward in Patenting Biotechnology

http://www.wipo.int/meetings/en/2009/wipo_ls_biot_ge_09/

5.4 UK and US Legislators Review Geoengineering Proposals

The US House of Representatives Committee on Science and Technology held a hearing to examine the scientific, engineering, ethical, economic, and governance aspects of geoengineering and intends to hold two or three more. The UK House of Commons Science and Technology Committee has plans for studying whether geoengineering would require new national or international regulations. The two groups plan a partnership, holding parallel hearings and sharing materials when they are publicly available. [Related item: *London Convention Might be Expanded to Include Ocean-based Geoengineering* in November 2007 environmental security report.]

Military Implications:

Military personnel should keep abreast of these efforts, including attending hearings and reviewing materials.

Sources:

Geoengineering Gets a Hearing in Congress -- and in the U.K., Too

<http://industry.bnet.com/energy/10002452/geoengineering-gets-a-congressional-hearing-and-the-uk-too/>

Geoengineering: Assessing the Implications of Large-Scale Climate Intervention

http://science.house.gov/publications/hearings_markups_details.aspx?newsid=2668

Ken Caldeira Testifies to Congress on Geoengineering

http://www.ciw.edu/news/ken_caldeira_testifies_congress_geoengineering

5.5 EPA Issues New Regulations on Water Pollution from Construction

The Environmental Protection Agency has issued a final rule to be phased in over four years to help reduce water pollution from construction sites. Builders must use best management practices to ensure that construction activity does not pollute nearby bodies of water; and, for larger projects, they must also monitor discharges and ensure they comply with specific limits. [Related item: *Fiber Check Dams with Chemicals Control Polluting Construction Runoff* in April 2009 environmental security report.]

Military Implications:

The military should review its and its contractors' construction practices to ensure that they conform to the new regulations, especially since it is very likely that similar rules will, over time, come into force in other jurisdictions worldwide, if not already in place.

Sources:

Construction and Development. Final Effluent Guidelines

<http://www.epa.gov/waterscience/guide/construction>

EPA Issues Rule to Reduce Water Pollution from Construction Sites

<http://yosemite.epa.gov/opa/admpress.nsf/3881d73f4d4aaa0b85257359003f5348/46b167e60dac2c2185257677005bf4fa!OpenDocument>

5.6 Ultrathin Solar Panels Could End Up On the EU list of Hazardous Materials, Due to Cadmium Content

The ultrathin photovoltaic panels, favored over the conventional crystalline models because they are more versatile, contain cadmium telluride for converting light to electricity. Since cadmium is banned from most products in Europe, rather than amending the law, the EU is expected to propose a way of pressuring solar companies to come up with alternatives to cadmium telluride, *e.g.*, by requiring them to apply for four-year, renewable grace periods. A French government report concluded that risks to human health from cadmium exposure during normal operation of the panels were negligible. One of the largest U.S. panel manufacturers has set up a voluntary system that would be funded in advance to recycle and reuse 95% of the cadmium and tellurium in its modules sold worldwide. [Related items: *RoHS Closer to Deadline* in May 2006 and *UN E-Waste Forum and Basel Convention's Conference of Parties* in December 2006 environmental security reports.]

Military implications:

The military and its contractors should be cautious with procurements of ultrathin photovoltaic panels in case that they might be recalled or might involve complicated waste disposal procedures. R&D on substitution alternatives for cadmium telluride should be considered for cadmium ultrathin photovoltaics.

Source:

Balancing energy needs and material hazards

<http://www.nytimes.com/2009/11/09/business/energy-environment/09iht-green09.html>**5.7 Climate Change****5.7.1 Scientific Evidence and Natural Disasters**

Global mean warming might reach 7°C (12.6°F) by the end of the century, without drastic mitigation efforts, estimate scientists contributing to the IPCC AR5, due in 2013. *The Copenhagen Diagnosis* is “an interim scientific evaluation” prepared for the December climate Summit. Similarly, the Global Carbon Project warns that unless urgent actions are taken to reduce CO₂ emissions, global temperatures are on course to rise by about 6°C by the end of the century. They estimate that emissions rose by 29% between 2000 and 2008, and suggest that in order to limit global temperature rise to 2°C, average carbon emissions per capita for goods and services should be reduced to 0.3 metric tons by 2050, from 1.3 metric tons now.

The 2008 Greenhouse Gas Bulletin by the World Meteorological Organization also reveals that the global trend of rising atmospheric global greenhouse gases (GHG) continues. Globally, the averaged mixing ratios of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) reached new highs in 2008; and, while some halocarbons, such as chlorofluorocarbons (CFCs), are decreasing slowly as a result of the implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer, concentrations of their substitutes, such as HCFCs and HFCs, are increasing rapidly. Simultaneously, the first comprehensive study accounting for oceans’ intake of CO₂ over the past 250 years reveals that since 2000, as the oceans’ acidity increases, their carbon-sequestration capacity is declining. Therefore, “we cannot count on these sinks operating in the future as they have in the past, and keep on subsidizing our ever-growing appetite for fossil fuels,” says lead author, oceanographer Samar Khatiwala, from Columbia University. A recent assessment financed by the Global Environment Facility indicates that 61 of the world’s 64 large marine ecosystems experienced a significant increase in sea surface temperatures in the last 25 years.

5.7.2 Food and Water Security

Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies, released by FAO prior to the World Summit on Food Security, says that 70% of agriculture’s mitigation potential can be realized in developing countries. The report highlights the importance of considering food security, agricultural mitigation, adaptation, and development in global agendas and national strategies for addressing climate change, and it stresses the need for reaching global consensus on measurable, reportable, and verifiable requirements.

Agriculture adaptability was also the main theme of the World Summit on Food Security held at FAO headquarters in Rome, Italy, November 16-18, 2009. UN Secretary-General Ban Ki-moon underlined that “there can be no food security without climate security.” The Summit adopted a Declaration that outlines strategic objectives, commitments and actions, and establishes the Five Rome Principles for Sustainable Global Food Security.

The World Bank report *Agricultural Development Under a Changing Climate: Opportunities and Challenges for Adaptation*, focuses on rural development in the context of climate risk management and adaptation, particularly on issues of seasonal climate forecasting, water management in rain-fed and irrigated production systems, sustainable land management,

crop and livestock breeding, crop genetic diversity, seed systems, pests, and urban and peri-urban agriculture.

The FAO policy brief *Climate Change and Food Security in the Pacific* warns that climate change will have serious impacts on agriculture, forestry, and fisheries in the Pacific islands, leading to increased food insecurity and malnutrition. Considering climate change as a “threat multiplier” in a region that is already under severe ecological and economic stress, FAO urged governments and donors to start implementing robust and action-oriented climate change adaptation plans for all Pacific islands.

Aaron Wolf, Program Director in Water Conflict Management and Transformation at Oregon State University, said that the source of potential tensions and conflicts over water is not scarcity but poor capacity to deal with changes in the water basin. He gives as examples some regions that had organizations to oversee shared river basins; including those formed by India and Pakistan, and by Israel and its Arab neighbors, which had remained intact for decades.

Colin Chartres, Director General of the Consultative Group on International Agricultural Research (CIGAR) warned that countries depending on snowmelt could expect water levels to drop by up to 30%. He underscored the need for investments amounting to \$270 billion in drinking and irrigation infrastructure in Sub-Saharan Africa and India. Along the same lines, the UNEP report, *Fresh Water Under Threat, Vulnerability Assessment of Freshwater Resources to Environmental Change, Africa*, calls for urgent adaptation measures to combat scientific and technical deficiencies, poor governance and management structures, pollution of water resources, and industrialization and urbanization.

5.7.3 Health

The World Health Organization is increasingly publishing articles that highlight the link between environmental conditions and health, such as the need to examine the spatial distribution of vector-borne diseases in relation to climate change, and design strategies that would help mitigate climate change while also improving human health. The *Feeling the Heat* report by Save the Children notes that climate change is the 21st century’s biggest global health threat to children, with impacts including: over 900 million children in the next generation to be affected by water shortages; 160 million more children to be at risk of catching malaria; and 175 million children a year to suffer the consequences of natural disasters such as cyclones, droughts, and floods by 2030. It warns that 250,000 children could die next year due to climate change (a figure that could reach 1 million by 2030).

5.7.4 Melting Glaciers and Sea Ice

The interim scientific report, *The Copenhagen Diagnosis* reveals: summer-time melting of Arctic sea ice surpassed by about 40% the Intergovernmental Panel on Climate Change’s forecasts for the period 2007–2009, Greenland and Antarctic ice-sheets are losing mass at an increasing rate, and glaciers and ice-cap melting accelerated in most parts of the world since 1990. Similarly, an analysis of data from NASA’s Gravity Recovery and Climate Experiment (Grace) mission reveals that the East Antarctic ice sheet, thought to be stable, has been losing 57 billion metric tons per year since 2006.

5.7.5 Rising Sea Levels

Sea-level rise might reach 2 meters by 2100, say the new estimates by the interim scientific report *The Copenhagen Diagnosis*. It notes that global average sea-level rise was 3.4 mm/year over the past 15 years, 80% above the IPCC forecasts, but consistent with an accelerating melting of glaciers, ice caps, and the Greenland and West-Antarctic ice-sheets. The report also underlines that sea level will continue to rise over the next few centuries after global temperature have been stabilized.

5.7.6 Migration

Nearly 10% of the world's population—500 million to 600 million people—are at risk from displacement by climate change, and up to 150 million “climate refugees” might move to other countries by 2050, predicts the report *No Place Like Home* by the Environmental Justice Foundation. Some countries—Tuvalu, Fiji, the Solomon Islands, the Marshall Islands, the Maldives and some of the Lesser Antilles—are in danger of losing a significant part of their land in the next 50 years, while others could see large movements of people: Bangladesh, Kenya, Papua New Guinea, Somalia, Yemen, Ethiopia, Chad, and Rwanda.

In an address to the Third Meeting of the Global Forum on Migration and Development held November 4th, in Athens, Greece, UN Secretary-General Ban Ki-moon, identified climate change along with human trafficking and economic crisis as a cause of international migration, , therefore emphasizing that protection of vulnerable communities should be a priority of adaptation efforts.

5.7.7 Adaptation

The UN International Strategy for Disaster Reduction Secretariat (UNISDR) *2010-2011 Biennial Work Programme: Invest Today for a Safer Tomorrow* includes four strategic objectives: 1) accelerate the promotion of national coordination mechanisms for disaster risk reduction with the goal of including climate change concerns; 2) participate in UNFCCC processes; 3) promote joint adaptation and risk reduction measures in countries; and 4) increase global inter-agency coordination on risk analysis and risk reduction, as a tool for climate change adaptation. While the current strategic overview is for two years, the vision, targets, and strategic directions are forward looking to 2015. Key expected outcomes include improved knowledge, strategies, and political and financial commitments, as well as better coherence and coordination among international and regional actors to address climate-related risks.

In partnership with the IPCC, UNISDR is working on a special report, *Managing the Risk of Extreme Events and Disasters to Advance Climate Change Adaptation*, to be released in 2011, representing the first global scientific effort to examine the linkages between disaster risk reduction and adaptation to climate change.

A Declaration of ‘climate vulnerable’ States demands that the Copenhagen outcome document include adaptation finance mechanisms to address the needs of the most vulnerable countries, amounting to at least 1.5% of developed countries' GDP (in addition to the 0.7% for overseas development assistance) annually by 2015 to assist developing countries to make their transition to a climate-resilient economy and to address the health, human rights, and security implications of climate change, including communities' relocation and a legal framework to protect climate refugees. A follow-up Climate Vulnerable States Forum will be held in Kiribati in 2010.

The Economics of Ecosystems and Biodiversity for National and International Policy Makers; Summary: Responding to the Value of Nature assesses reasons and methods for measuring the value of ecosystems and includes a series of recommendations for improving decisions. It highlights that the ratio of benefits to costs for ecosystem protection ranges between 25-to-1 and 100-to-1. For example, expanding marine protection from less than 1% to 30% would cost about \$40-50 billion per year, whereas the annual benefit would be about \$4-5 trillion. “Recognizing and rewarding the value delivered to society by the natural environment must become a policy priority,” said The Economics of Ecosystems and Biodiversity study leader, Pavan Sukhdev.

The EU estimates that €100 billion (\$150 billion) a year by 2020 would cost-effectively address climate change. It estimates it would cost about €7 billion (\$10.5 billion) a year for the first three years to “fast-track” funding in the developing world. There is no agreement on who should pay what and if the contributions should be voluntary or mandatory, or linked to the “polluter pays” principle. Chancellor Angela Merkel reportedly said that the European and the U.S. shares should be around one-third each.

The *State of World Population 2009* report by the UN Population Fund focuses on the impacts of climate change on the most vulnerable - and poor women specifically. The report argues that the fight against climate change is more likely to be successful if decisions take into account the needs, rights, and potential of women.

5.7.8 Climate Modeling

A newly revised NASA model trying to address the complexities of atmospheric chemistry, suggests that some greenhouse gases have considerably stronger warming effects than previously estimated. When the hydroxyl-consuming effect is factored in, methane’s planet-warming potential is about 28 times more than that of CO₂ (compared to 25 times shown by previous studies), while carbon monoxide’s greenhouse warming potential rises from 2.2 times to 3.3 times that of CO₂. It further finds that their greenhouse effect increases even further if their inhibiting influence on the formation of planet-cooling clouds is incorporated into the model. The new finding, published in the October 29 *Science*, reveals the difficulty of making long-term climate predictions under various emissions scenarios. However, the model can help policymakers better assess the potential climatic effects of specific types of emissions and design reduction targets accordingly.

Recent discoveries reveal that it took only six months to plunge Europe into the last ice age. The research, conducted by William Patterson from the University of Saskatchewan in Saskatoon, Canada, using mud deposits from Lough Monreagh lake in western Ireland, shows that 12,800 years ago, most probably due to a sudden slowdown of the Gulf Stream, the northern hemisphere was plunged into a mini-ice age that lasted for 1,300 years. Professor Tim Lenton from the University of East Anglia notes, “In the period from 65,000 to 10,000 years ago there were periods of abrupt warming and cooling roughly every 1,500 years, when the temperature in Greenland might fall or rise by 10°C (18°F) in a decade.”

5.7.9 Post-Kyoto Negotiations

The final round of negotiations before the Climate Summit to be held in Copenhagen took place November 2-6, 2009, in Barcelona, Spain. Despite some progress, concluding a legally binding instrument in Copenhagen remains uncertain. While some suggest that a new mandate might be needed to continue negotiations and possibly reach a global climate pact in 2010, new

hopes emerged when Britain suggested the creation of a Copenhagen launch fund for helping poorer states deal with climate change-related challenges. The fund, to begin in 2010, would reach \$10 billion per year by 2012. Britain already pledged £800 million (\$1.3 billion). The Committee of African Heads of State and Government on Climate Change (Committee of Ten) mandated to speak on behalf of Africa expressed that Africa expects the agreement to stipulate clear measures for providing Africa technology and capacity-building to “resolve the present climatic crises and spare the continent from catastrophes.” The vulnerable island states also ask for funds and concessions to deal with rising sea level consequences. At the same time, new targets were announced by the world’s largest GHG emitters: U.S. intends to reduce its GHG emissions “in the range of” 17% below 2005 levels by 2020 and 83% by 2050, while China plans to reduce its CO₂ intensity — emissions per unit of GDP — by 40–45% by 2020, compared to 2005 levels. The EU already announced its 20/20/20 policy cutting emissions by 20% (30% if other industrialized states follow suit) by 2020 compared to 1990 levels. Brazil, the fourth-biggest GHG contributor, offered a reduction of 36-39% based on its projected economic output in 2020. India is also expected to make some announcement soon.

Military Implications:

[Same as previous on this issue] The military should identify all its resources and programs for reducing GHGs and responding to effects of climate change, update information continuously, forecast how it might be called upon for both mitigation and adaptation, and perform a gap analysis in anticipation of future requests. International discourse over climate change is increasing the development of international policies and strategies to mitigate and adapt to climate change.

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

The Copenhagen Diagnosis: Climate Science Report

<http://copenhagendiagnosis.org/>

Earth 'heading for 6C' of warming

<http://news.bbc.co.uk/2/hi/science/nature/8364926.stm>

Oceans' ability to sequester carbon diminishing

http://news.mongabay.com/2009/1118-hance_ocean_carbon.html

World Summit on Food Security

<http://www.fao.org/wsfs/world-summit/en/>

Food security in the Pacific at risk due to climate change

<http://www.fao.org/news/story/en/item/37758/icode/>

2nd Africa Water Week

http://www.dwaf.gov.za/dir_ws/2aww/

Taking the heat out of the population and climate debate

<http://www.who.int/bulletin/volumes/87/11/09-072652/en/index.html>

'Feeling the Heat: Climate Change and Child Survival'

http://www.savethechildren.net/alliance/what_we_do/emergencies/climate_change/feelingtheheat.html

The Copenhagen Diagnosis: Climate Science Report

<http://copenhagendiagnosis.org/default.html>

East Antarctic ice sheet may be losing mass

<http://news.bbc.co.uk/2/hi/science/nature/8371773.stm>

Global warming could create 150 million 'climate refugees' by 2050

<http://www.guardian.co.uk/environment/2009/nov/03/global-warming-climate-refugees>

UNISDR 2010-2011 Biennial Work Programme

<http://www.unisdr.org/news/v.php?id=11801>

First global scientific effort to examine the linkages between disaster risk reduction and climate change adaptation

<http://www.unisdr.org/news/v.php?id=11682>

Aerosols cloud the climate picture

http://www.sciencenews.org/view/generic/id/48940/title/Aerosols_cloud_the_climate_picture

Climate change catastrophe took just months

<http://www.timesonline.co.uk/tol/news/science/earth-environment/article6917215.ece>

Barcelona Climate Change Talks 2009

http://unfccc.int/meetings/intersessional/barcelona_09/items/5024.php

UK's Brown backs \$10 billion climate change fund

<http://www.reuters.com/article/latestCrisis/idUSGEE5AQ1KN>

5.8 Nanotechnology Safety Issues

More detailed descriptions of the following nanotechnology issues are in the [Appendix](#)

- New results reveal potential toxicity of TiO₂ Nanoparticles ([more](#))
- Sodium cholate found to be safe surfactant for carbon nanotubes ([more](#))
- OECD to release Guidance for Manufactured Nanomaterials Testing ([more](#))
- UK Nanotech EHS Directory published ([more](#))
- European Consumer Organizations call for better nano regulation ([more](#))
- Nanomaterials labeling in new EU uniform cosmetics rule ([more](#))
- New Centre for Nano Safety established in Scotland ([more](#))
- Petition filed for EPA to regulate nanosilver ([more](#))
- NIEHS awards 13 grants for nanomaterials assessment methods ([more](#))
- Australian group releases two workplace nanosafety reports ([more](#))
- Australian government proposes new nanotech regulations ([more](#))
- Lack of standards for engineered nanoparticles in European surface waters ([more](#))
- Questions raised on reliability of in vitro nanomaterials toxicity testing ([more](#))
- Risk assessment leader warns against "Temptations" ([more](#))
- Conference on the potential environmental benefits of nanotechnology ([more](#))
- Possibly unfounded concern over nanoparticle cell damage study ([more](#))
- FramingNano upcoming conference to present nanotech governance framework ([more](#))

Item 6. Reports and Information Suggested for Review

6.1 Climate Change Threats Increasingly Top Security Agendas

The first study assessing quantitative links between climate change and the risk of civil war found that in sub-Saharan Africa, between 1980 and 2002, the incidence of conflicts across the continent rose by nearly 50% with a 1°C temperature increase in a given year. Using these assumptions and 20 global climate models, the researchers warn that without swift mitigation action, the incidence of African civil war could increase 55% by 2030 relative to 1990.

“If uncontrolled, climate change will have security implications of similar magnitude to the World Wars, but which will last for centuries [...] Security sector actors must not just prepare responses to the security challenges of climate change; they must also be part of the solution,” states the report *Climate Change and the Military: The State of the Debate* prepared by the Institute for Environmental Security and partner organizations. In this spirit, the First Statement of the Military Advisory Council of the Climate Change and the Military project calls upon governments to integrate into their respective military strategies the security implications of climate change, and on the military to reduce its own carbon “bootprint.” *Climate and Energy the Dominant Challenges of the 21st Century* from members of the Center for Naval Analyses Military Advisory Board states that climate and energy security threats “will dominate and shape the state of nations in the decades to come.”

Military Implications:

These reports should be studied by military personnel responsible for developing climate change mitigation and adaptation policies, strategies and training. Those creating military-to-military plans should consider the potential for creating a coherent global security prevention and response plan to address the accelerating threats deriving from climate change.

Sources:

The Role of the Military in Climate Change and Security

http://www.brookings.edu/events/2009/1029_climate_change_military.aspx

"Climate and Energy the Dominant Challenges of the 21st Century

http://www.acus.org/new_atlanticist/environmental-threats

The war against warming

<http://www.nature.com/climate/2009/0912/full/climate.2009.120.html>

Climate change could boost incidence of civil war in Africa, study finds

http://www.berkeley.edu/news/media/releases/2009/11/23_africa_climate_change.shtml

6.2 European Environment Agency Draws First Map of Europe’s Noise Exposure

The European Environment Agency has launched the most comprehensive map of noise exposure, NOISE (Noise Observation and Information Service for Europe). Using database map software, map products show the numbers of people exposed to noise generated by air, rail and road traffic across Europe and in 102 large urban agglomerations. NOISE is expected to help enforce the Environmental Noise Directive adopted in 2002 and to reduce human noise exposure.

Military Implications:

It is reasonable to speculate that the map will provide a tool for the population to request more stringent noise regulations and their enforcement. In anticipation of this the military stationed in Europe should explore methods of reducing noise pollution.

Source:

EEA draws the first map of Europe's noise exposure

<http://www.eea.europa.eu/pressroom/newsreleases/eea-draws-the-first-map-of-europe2019s-noise-exposure>

6.3 Consumer's Handbook for Reducing Solid Waste

The booklet "Consumer's Handbook for Reducing Solid Waste" describes how individual consumers can help alleviate modern society's mounting solid waste problem by making environmentally aware decisions about everyday needs. This booklet outlines many practical steps to reduce the amount and toxicity of solid waste.

Military implications:

Military personnel responsible for facilities management should see if this handbook has useful new suggestions to improve or add to current solid waste storage and disposal protocols. It could be considered for distribution to on-base residents.

Sources:

Consumer's Handbook for Reducing Solid Waste

<http://www.epa.gov/osw/wycd/catbook/index.htm>

APPENDIX

Reference Details

This Appendix contains expanded background information on some items.

Item 2. Changes to War Crimes Proposed for the International Criminal Court

The eighth session of the Assembly of States Parties to the Rome Statute of the International Criminal Court was held November 18-26, 2009 at the World Forum Convention Center in The Hague. The Assembly focused on advancing the discussions concerning the Review Conference of the Rome Statute, to be held in 2010: proposed amendments to the Statute, the budget for 2010, and the institutional framework of the Court, including the establishment of an independent oversight mechanism pursuant to article 112, paragraph 4, of the Rome Statute. Several proposals got into final stage of negotiations:

- Standardizing the rules for situations of international as well as non-international armed conflict covering three types of weapons (poison and empoisoned weapons; asphyxiating, poison or other gases and all analogous liquids; and ammunition which expand or flatten easily in the human body) be standardized (Amendment 1, proposed by Belgium)
- Expanding the list of war crimes (for both international and non-international armed conflict situations) to cover the use of biological and chemical weapons, anti-personnel mines and some weapons falling under the Convention on certain conventional weapons, so that it be consistent with some international treaties already in force, such as the Chemical Weapons Convention, Biological Weapons Convention, Convention on Anti-Personnel Mines, and Protocols to the Conventional Weapons Convention referring to non-detectable fragments, and to blinding laser weapons (Amendments 2 and 3 proposed by Belgium). Note: Belgium's amendment to include the use of cluster munitions as a war crime was removed in the revised proposal due to concerns that the Cluster Munitions Convention is not yet in force.
- Specifying the employment of nuclear weapons or the threat to employ nuclear weapons in Article 8, in accordance to paragraph 2(b)(iv) (which also stipulates "long-term and severe damage to the natural environment") (proposed by Mexico)
- Including crime of terrorism within the Court's jurisdiction—when a definition is agreed upon (proposed by The Netherlands), and in the meantime, establishment of an informal working group to assess eventual adaptations needed to the Statute to cover crimes of terrorism.
- Expanding the definition of crimes of aggression, particularly, allowing the Court power over war crimes in armed conflicts that are not necessarily international (proposed by Liechtenstein)
- Including the crime of international drug trafficking under Article 5: Crimes within the jurisdiction of the Court (proposed by Trinidad and Tobago and Belize).

The final negotiations of the proposals will take place at the Review Conference on the Rome Statute, to be held May 31-June 11, 2010, in Kampala, Uganda.

Sources: (a more expanded list)

Report of the Bureau on the Review Conference; Addendum. ICC-ASP/8/43/Add.1, 10 Nov., 2009

http://www.icc-cpi.int/iccdocs/asp_docs/ASP8/ICC-ASP-8-43-Add.1-ENG.pdf

Report of the Bureau on the Review Conference. ICC-ASP/8/43, 15 November 2009

http://www.icc-cpi.int/iccdocs/asp_docs/ASP8/ICC-ASP-8-43-ENG.pdf

Proposal of Belgium on amendments to Article 8 of the Rome Statute

<http://www.iccnw.org/?mod=belgianproposal>

ICC Eighth session

<http://www.icc-cpi.int/Menu/ASP/Sessions/General+Debate/GENERAL+DEBATE+ +Eighth+Session+of+the+Assembly+of+States+Parties.htm>

Intervention of Belgium at the 8th Session of the Assembly of States Parties to the International Criminal Court

http://www.icc-cpi.int/iccdocs/asp_docs/ASP8/Statements/ICC-ASP-ASP8-GenDeba-Belgium-FRE.pdf (in French)

Chemical, biological weapons use should be war crime, Dutch say

<http://www.earthtimes.org/articles/show/293595,chemical-biological-weapons-use-should-be-war-crime-dutch-say.html>

5.7 Climate Change

A more expanded list of the Sources

5.7.1 Scientific Evidence and Natural Disasters

The Copenhagen Diagnosis: Climate Science Report

<http://copenhagendiagnosis.org/>

Climate science update: from bad to worse

<http://newsinfo.inquirer.net/breakingnews/world/view/20091125-238204/Climate-science-update-from-bad-to-worse>

Earth 'heading for 6C' of warming

<http://news.bbc.co.uk/2/hi/science/nature/8364926.stm>

Main Greenhouse Gases Reach Highest Level Ever Since Pre-Industrial Time

http://www.wmo.int/pages/mediacentre/press_releases/pr_868_en.html

Oceans' ability to sequester carbon diminishing

http://news.mongabay.com/2009/1118-hance_ocean_carbon.html

World's Coastal Oceans Warming Faster Than Predicted

http://www.gefweb.org/interior_right.aspx?id=27296

5.7.2 Food and Water Security

Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies

<ftp://ftp.fao.org/docrep/fao/012/ak596e/ak596e00.pdf>

Promoting climate-smart agriculture

<http://www.fao.org/news/story/en/item/36894/icode>

World Summit on Food Security (IISD RS Coverage)

<http://www.iisd.ca/ymb/food/wsfs2009/>

World Summit on Food Security

<http://www.fao.org/wsfs/world-summit/en/>

Declaration of the World Summit on Food Security

http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf

FAO Summit boosts agriculture to end hunger

<http://www.fao.org/news/story/en/item/37465/icode/>

At UN food summit, Ban lays out steps to save billions from hunger

<http://www.un.org/apps/news/story.asp?NewsID=32959&Cr=hunger&Cr1=>

Secretary-General Ban Ki-moon Opening remarks at Food Security Summit

http://www.un.org/apps/news/infocus/sgspeeches/statments_full.asp?statID=646

Agricultural Development Under a Changing Climate

http://siteresources.worldbank.org/INTARD/Resources/climate_change_combined.pdf

Press Conference on Key Issues Relating to Climate Change, Sustainable Development

http://www.un.org/News/briefings/docs/2009/091106_Climate_Change.doc.htm

Climate Change and Food Security in the Pacific

<ftp://ftp.fao.org/docrep/fao/012/i1262e/i1262e00.pdf>

Food security in the Pacific at risk due to climate change

<http://www.fao.org/news/story/en/item/37758/icode/>

Fresh Water Under Threat, Vulnerability Assessment of Freshwater Resources to Environmental Change, Africa

http://www.unep.org/dewa/assessments/EcoSystems/water/Freshwater%20under%20Threat%20Africa%20Pub_72dpi.pdf

2nd Africa Water Week: http://www.dwaf.gov.za/dir_ws/2aww/

Africa must act to tackle water crisis, says report

<http://www.scidev.net/en/news/africa-must-act-to-tackle-water-crisis-says-report.html>

5.7.3 Health

More health for your buck: health sector functions to secure environmental health

<http://www.who.int/bulletin/volumes/87/11/08-059865/en/index.html>

Taking the heat out of the population and climate debate

<http://www.who.int/bulletin/volumes/87/11/09-072652/en/index.html>

'Feeling the Heat: Climate Change and Child Survival'

http://www.savethechildren.net/alliance/what_we_do/emergencies/climate_change/feelingtheheat.html

Climate change 'can kill children'

http://www.google.com/hostednews/ukpress/article/ALeqM5hcu1bVTifUsTT3o5TuA_fge8oWcA

Climate change threatens lives of millions of children, says charity

<http://www.guardian.co.uk/environment/2009/nov/02/save-the-children-climate-change>

5.7.4 Melting Glaciers and Sea Ice

The Copenhagen Diagnosis: Climate Science Report

<http://copenhagediagnosis.org/default.html>

Climate science update: from bad to worse

<http://newsinfo.inquirer.net/breakingnews/world/view/20091125-238204/Climate-science-update-from-bad-to-worse>

East Antarctic ice sheet may be losing mass
<http://news.bbc.co.uk/2/hi/science/nature/8371773.stm>

5.7.5 Rising Sea Levels

The Copenhagen Diagnosis: Climate Science Report
<http://copenhagediagnosis.org/default.html>

5.7.6 Migration

Global warming could create 150 million 'climate refugees' by 2050
<http://www.guardian.co.uk/environment/2009/nov/03/global-warming-climate-refugees>
No Place Like Home - Climate Refugees
<http://www.ejfoundation.org/page590.html>
"No Place Like Home" (report)
http://www.ejfoundation.org/pdf/climate_refugees_final.pdf
Remarks to the Third Meeting of the Global Forum on Migration and Development
http://www.un.org/apps/news/infocus/sgspeeches/statments_full.asp?statID=642

5.7.7 Adaptation

UNISDR 2010-2011 Biennial Work Programme
<http://www.unisdr.org/news/v.php?id=11801>
First global scientific effort to examine the linkages between disaster risk reduction and climate change adaptation
<http://www.unisdr.org/news/v.php?id=11682>
Climate Vulnerable Countries Issue Declaration for Copenhagen
<http://climate-l.org/2009/11/16/climate-vulnerable-countries-issue-declaration-for-copenhagen/>
The Economics of Ecosystems and Biodiversity for National and International Policy Makers; Summary: Responding to the Value of Nature
<http://www.teebweb.org/LinkClick.aspx?fileticket=I4Y2nqqliCg%3d&tabid=1278&language=en-US>
Big profit from nature protection
<http://news.bbc.co.uk/1/hi/sci/tech/8357723.stm>
EU puts €100bn-a-year price on tackling climate change
<http://www.guardian.co.uk/environment/2009/oct/30/eu-climate-change-funding-deal>
UNFPA State of the World Population 2009
http://www.unfpa.org/swp/2009/en/pdf/EN_SOWP09.pdf
Women Central to Efforts to Deal With Climate Change, Says New UNFPA Report
<http://www.unfpa.org/public/News/pid/4259>

5.7.8 Climate Modeling

Aerosols cloud the climate picture
http://www.sciencenews.org/view/generic/id/48940/title/Aerosols_cloud_the_climate_picture
Climate change catastrophe took just months
<http://www.timesonline.co.uk/tol/news/science/earth-environment/article6917215.ece>

5.7.9 Post-Kyoto Negotiations

Barcelona Climate Change Talks 2009

http://unfccc.int/meetings/intersessional/barcelona_09/items/5024.php

Summary of the Barcelona Climate Change Talks, 2-6 November 2009

<http://www.iisd.ca/vol12/enb12447e.html>

Not a climate treaty, but political deal possible

<http://news.moneycentral.msn.com/provider/providerarticle.aspx?feed=AP&date=20091116&id=10677838>

Hopes rise for climate talks as rich countries ante up

<http://www.france24.com/en/node/4935560>

UK's Brown backs \$10 billion climate change fund

<http://www.reuters.com/article/latestCrisis/idUSGEE5AQ1KN>

African "Committee of Ten" Discusses Strategy for Copenhagen

<http://climate-1.org/2009/11/18/african-%E2%80%9Ccommittee-of-ten%E2%80%9D-discusses-strategy-for-copenhagen/>

Obama to Go to Copenhagen With Emissions Target

http://www.nytimes.com/2009/11/26/us/politics/26climate.html?_r=1&th&emc=th

China to dramatically slow emissions growth

http://news.yahoo.com/s/ap/20091126/ap_on_re_as/climate

5.8 Nanotechnology Safety Issues

More detailed descriptions of the nanotechnology issues

5.8.1 New Results on TiO₂ Nanoparticle Toxicity to Cells

Scientists at UCLA's Jonsson Comprehensive Cancer Center have published the results of a study showing that a physicochemical reaction to ingestion of TiO₂ nanoparticles can induce DNA breaks, chromosomal damage, and inflammation in cells in various organs in a mouse model.

Military Implications:

Military personnel concerned with nanotech applications and risk assessment should review this paper for its possible impact on their work.

Sources:

Nanoparticles used in common household items caused genetic damage in mice

<http://www.physorg.com/news177608158.html>

Titanium Dioxide Nanoparticles Induce DNA Damage and Genetic Instability In vivo in Mice
Cancer Res. 69: 8784-8789

<http://cancerres.aacrjournals.org/cgi/gca?sendit=Get+All+Checked+Abstract%28s%29&SEARCHID=1&FULLTEXT=tio2&VOLUME=69&ISSUE=22&FIRSTINDEX=0&hits=10&RESULTFORMAT=&gca=canres%3B69%2F22%2F8784>

5.8.2 Sodium Cholate Found to Be Safe Surfactant for Carbon Nanotubes

Prof. Lifeng Dong and associates at Missouri State University, Springfield MO, have shown that sodium cholate is an environmentally friendly surfactant for the purification and dispersion of single-walled carbon nanotubes, not affecting cell morphology, proliferation, or growth.

Military Implications:

Military risk assessment personnel should take these findings into account in evaluating nanotube processing.

Source:

Cytotoxicity Effects of Different Surfactant Molecules Conjugated to Carbon Nanotubes on Human Astrocytoma Cells

<http://www.springerlink.com/content/g5x542181j646494/>

5.8.3 OECD to Release Guidance for Manufactured Nanomaterials Testing

The Organization for Economic Cooperation and Development plans to publish in the next month or so new draft guidance on the preparation of samples used for safety testing of manufactured nanomaterials. According to the Bureau of National Affairs, an OECD official stated that using traditional bulk chemical test methods with nanomaterials can lead to unexpected results and, “Materials tend to agglomerate or will attach themselves to other things that are in the [test] medium. So there is always the possibility that people are not testing the thing that they thought they were testing,” He also announced that OECD will be explaining human health and environmental safety aspects of nanotechnology at a series of regional meetings. “We will be explaining the kind of work we've been doing and the kind of guidance documents that we've developed,” he said. The first such event will be Nov. 27 in Beijing, for the Asia-Pacific region.

Military Implications:

The military should review this report when it appears, and should consider having a representative attend a future regional meeting.

Source:

OECD to Release Preliminary Guidance For Testing of Manufactured Nanomaterials

<http://ehscenter.bna.com/pic2/ehs.nsf/id/BNAP-7XGFWX?OpenDocument>

5.8.4 UK Nanotech EHS Directory Published

The UK's Nanotechnology Knowledge Transfer Network has published the UK Nanotechnology Health, Safety and Environment Directory 2009, listing more than 30 institutes, government departments, networks and commercial service providers that are recognized as contributing in some way to the EHS debate.

Military implications:

Military personnel concerned with nanotech EHS issues should become familiar with this useful reference work.

Sources:

NanoKTN publishes a UK nanotechnology health, safety and environment directory

http://www.nanowerk.com/news/newsid=13506.php?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29

UK Nanotechnology Health, Safety and Environment Directory 2009

http://mnt.globalwatchonline.com/epicentric_portal/binary/com.epicentric.contentmanagement.servlet.ContentDeliveryServlet/MNT/Knowledge%2520Centre/UKNanoHSEDirectory1.5.pdf

5.8.5 European Consumer Organizations Call for Better Nano Regulation

Two European consumer organizations – the European Consumers' Organisation (BEUC) and the European consumer voice in standardization (ANEC) – have issued a preliminary inventory of products on the EU market that contain nanomaterials. Its launch was accompanied by a series of demands from the organizations for better European regulation of nanotechnology.

Military Implications:

Military personnel concerned with nanotech regulation, especially in Europe, should review the inventory and the accompanying statement for insight into the probable course of regulatory activities on the continent. Also, similar developments could occur in the U.S.

Source:

EU consumer bodies launch nanotechnology consumer product inventory
<http://www.nanowerk.com/news/newsid=13465.php>

5.8.6 Nanomaterials Labeling in New EU Uniform Cosmetics Rule

A story in Nanowerk News reports that the EU has harmonized 55 existing directives into a single regulation on the labeling of cosmetics in the Union. One provision, opposed by Germany, requires that product labels indicate the presence of nanomaterials.

Military Implications:

The military should note this action as a possible harbinger of more stringent regulation of nanomaterials in other product lines and by other jurisdictions, and prepare for appropriate changes in procurement, use and disposal.

Sources:

Germany resists EU regulation for 'nanotechnology' label for cosmetics
http://www.nanowerk.com/news/newsid=13681.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29
Regulation of the European Parliament and of the Council on cosmetic products (recast);
PE-CONS 3623/09
<http://register.consilium.europa.eu/pdf/en/09/st03/st03623.en09.pdf>

5.8.7 New Centre for Nano Safety Established in Scotland

Edinburgh Napier University has set up a new Centre for Nano Safety as "a multi-disciplinary centre addressing the potential human and environmental effects of nanomaterials, incorporating human and environmental toxicology as well as microbiology."

Military Implications:

The military should establish contact with the new center to ensure receipt of its research results.

Sources:

New nanomaterials safety research center launched in the UK
<http://www.nanowerk.com/news/newsid=13489.php>
Centre for Nano Safety
<http://www.napier.ac.uk/RANDKT/RKTCENTRES/NANOSAFETY/Pages/CentreforNanoSafety.aspx>

5.8.8 Petition Filed for EPA to Regulate Nanosilver

The International Center for Technology Assessment (ICTA) and a coalition of consumer, health, and environmental groups has filed a petition with EPA, requesting that it regulate all nanosilver products as pesticides and ban all consumer products containing nanosilver, under the Federal Insecticide, Fungicide and Rodenticide Act. The action is being interpreted as a first step in a campaign for more intensive evaluation and possible regulation of nanoproducts.

Military Implications:

The military should follow the further course of this effort, in order to be prepared for possible future nanotech regulations.

Sources:

Demands for Regulation of NanoSilver – The First Battle for the Industry’s Future? Vol. 6/3
<http://www.nanolabweb.com/index.cfm/action/main.default.viewArticle/articleID/300/CFID/2812526/CFTOKEN/41767117/index.html> (Abstract; full article by subscription)
Legal Petition Challenges EPA’s Failure to Regulate Environmental and Health Threats from Nano-Silver. Executive Summary
http://www.icta.org/nanoaction/doc/CTA_nano-silver_executive_summary_5_1_08.pdf

5.8.9 NIEHS Awards 13 Grants for Nanomaterials Assessment Methods

The NIH National Institute of Environmental Health Sciences has awarded 13 new two-year grants to develop better methods to assess exposure and health effects associated with nanomaterials. According to Nanowerk News, the grants, "focus on ensuring that we have reliable and reproducible methods and models to assess exposure, exposure metrics, and biological response to nanomaterials", and the "research is also essential for the harmonization of research results and forming a scientifically sound basis for hazard assessment, as well as the safe design and development of [engineered nanomaterials]".

Military Implications:

The military should follow each of these projects to be in a position to utilize their results in planning, carrying out, and evaluating nanotech risk assessment.

Sources:

NIEHS grants to focus more research on health and safety of nanomaterials
http://www.nanowerk.com/news/newsid=13626.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29
 NIEHS Awards Recovery Act Funds to Focus More Research on Health and Safety of Nanomaterials
<http://www.niehs.nih.gov/news/releases/2009/nanotech.cfm>

5.8.10 Australian Group Releases Two Workplace Nanosafety Reports

Safe Work Australia has announced the release of two research reports on engineered nanomaterials, *Engineered Nanomaterials: Evidence on the effectiveness of workplace controls to prevent exposure*, prepared by the Royal Melbourne Institute of Technology, and *Engineered nanomaterials: A review of the toxicology and health hazards*, researched by Toxikos Pty Ltd..

Military Implications:

Relevant military personnel should consider the Australian reports for eventual inputs to their own work.

Sources:

Safe Work Australia releases two new reports for its Nanotechnology Occupational Health and Safety Program

http://www.nanowerk.com/news/newsid=13469.php?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29

5.8.11 Australian Government Proposes New Nanotech Regulations

The Australian government is inviting discussion of a proposal to strengthen regulation of industrial nanomaterials use in Australia. According to Nanowerk News, "Major regulatory reforms ... include: refinement of pre-market assessment categories for nanoforms of new chemicals, particularly where human health or environmental exposure can reasonably be anticipated; and a mandatory notification and assessment program for nanoforms of existing chemicals." It is expected that this carefully drafted proposal may serve as a model for other jurisdictions' regulatory efforts.

Probably also adding to the prominence of nanotech risk in the public eye in Australia is a new report, "*What you should know about nano*" for the Australia Institute by Fern Wickson of the University of Bergen, presented at the Asia-Pacific Science, Technology and Society Network Conference in Brisbane, and recommending stronger regulatory measures.

Military Implications:

Military personnel concerned with nanotech regulation should review this proposal, especially considering its possible role as a model, and also consult Dr. Wickson's paper for its recommendations.

Sources:

Nanotechnology - Stakeholder Consultation

http://www.nicnas.gov.au/Current_Issues/Nanotechnology/Stakeholder_Consultation.asp

Government invites consultations on strengthening nanomaterial regulations in Australia

<http://www.nanowerk.com/news/newsid=13431.php>

Australia Seeks Comment on Proposal for Regulating Industrial Nanomaterials

http://news.bna.com/deln/DELNWB/split_display.adp?fedfid=15757279&vname=denotallissue&fn=15757279&jd=a0c1k2r9g5&split=0

What you should know about nano. Policy Brief No. 8, November 2009, ISSN 1836-9014

https://www.tai.org.au/file.php?file=/media_releases/PB8%20Nanotechnology%20final.pdf

Nanotechnology - the sexy new science with lots of unanswered questions

http://www.nanowerk.com/news/newsid=13702.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29

5.8.12 Lack of Standards for Engineered Nanoparticles in European Surface Waters

As reported by Meridian Nanotechnology and Development News, a recent article in the Journal of Environmental Monitoring "concludes that it is impossible to set limit values for engineered nanoparticles (ENPs) in European surface waters now and in the foreseeable future...due to the extensive lack of knowledge not only of toxic effects, degradability, and bioaccumulation of

ENPs in the aquatic environment, but also due to the questionable validity of test systems and methods to establish environmental quality standards" and goes on to explain the role of the EU Water Framework Directive (WFD) as an environmental control.

Military Implications:

Military personnel concerned with nanotech risks should monitor probably forthcoming work on how ENPs should be handled in the WFD, in anticipation of regulatory measures.

Sources:

Setting the limits for engineered nanoparticles in European surface waters – are current approaches appropriate? *J. Environ. Monit.*, 2009, 11, 1774 - 1781, DOI: 10.1039/b909730a
http://www.rsc.org/delivery/_ArticleLinking/DisplayHTMLArticleforfree.cfm?JournalCode=EM&Year=2009&ManuscriptID=b909730a&Iss=10

EU Water Framework Directive—information page
http://ec.europa.eu/environment/water/water-framework/index_en.html

5.8.13 Questions Raised on Reliability of In Vitro Nanomaterials Toxicity Testing

In talks, one self-characterized as provocative, at the National Science and Technology Council's workshop Nanomaterials and Human Health & Instrumentation, Metrology, and Analytical Methods, Prof. David Grainger of the Univ. of Utah and Dean Martin Philbert of the University of Michigan's School of Public Health raised serious questions about the reliability of in vitro tests for toxicity of nanomaterials and advocated more whole body research, basing their criticism on the variability of in vitro tests and the lack of knowledge of nanomaterial interactions in a full biological environment.

Military Implications:

The military should consider these factors in planning and conducting nanotech risk assessment activities.

Sources:

In vitro assessments of nanomaterial toxicity (Abstract)
http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6T3R-4W3PT31-2&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_docanchor=&_view=c&_searchStrId=1103877437&_rerunOrigin=google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=77b493bee3add76d325ab37d621acc00

Cell Tests Can Produce Any Desired Result about Nanomaterial Toxicity, Speaker Says
<http://www.merid.org/NDN/more.php?id=2270>

5.8.14 Risk Assessment Leader Warns against "Temptations" (ARTICLE)

Dr. Kristen M. Kulinowski, Director of the International Council on Nanotechnology, has recently written an article, *Temptation, Temptation, Temptation: Why Easy Answers About Nanomaterial Risk are Probably Wrong*, citing three temptations that can produce misleading conclusions about nanotech risks. T 1: "Generalizing Results from One Study to All of 'Nanotechnology'": she suggests using the Virtual Journal of NanoEHS (<http://icon.rice.edu/virtualjournal.cfm>) and its accompanying analysis tool to aid in placing new results in their proper place in the developing body of risk knowledge. T 2: "Mischaracterizing the Impacts Research as Either Non-Existent or Conclusive": The current lack of full understanding of the nanomaterial/biosphere interaction makes difficult the evaluation of results.

T 3: “Basing Risk Management Decisions on Non-Nanoscale Material”: Nanomaterials may be qualitatively different.

Military Implications:

Military risk management personnel should review this article and consider its recommendations in their work.

Source:

Temptation, Temptation, Temptation: Why Easy Answers About Nanomaterial Risk are Probably Wrong

<http://www.azonano.com/details.asp?ArticleId=2448>

5.8.15 Conference on the Potential Environmental Benefits of Nanotechnology

Presentations from the OECD Conference on the Potential Environmental Benefits of Nanotechnology are now available. According to Nanowerk News, "...the conference explored the environmental profiles of emerging nanoscale innovation with the goal of encouraging development of technologies that can result in environmental gain while addressing unintended consequences."

Military Implications:

Military involved in nanotech should review the outcomes of the OECD conference as input to their own work.

Source:

Presentations from the OECD Conference on the Potential Environmental Benefits of Nanotechnology

<http://www.nanowerk.com/news/newsid=13420.php>

5.8.16 Possibly Unfounded Concern over Nanoparticle Cell Damage Study

Gevdeep Bhabra, et al., contend in Nature Nanotechnology that cobalt-chromium nanoparticles damage DNA across cell boundaries. Other experts in the field are upset over wide and alarmist publicity being given to this new study. Critics say it is seriously flawed. The study claims that cells in the farthest layer of a four-layer cellular barrier were damaged by cobalt-chromium particles introduced into the nearest layer. These critics point out that the particle concentration was thousands of times higher than could be expected to occur in the human body, and the particle size was not limited to the nano range.

Military Implications:

Nanotech risk assessment personnel encountering this study and/or articles about it should be aware of both positions and evidence supporting them in order to make balanced judgments..

Sources:

Nanoparticles can cause DNA damage across a cellular barrier

<http://www.nature.com/nnano/journal/vaop/ncurrent/abs/nnano.2009.313.html>

Experts Criticize Nanoparticle Study

<http://sciencenow.sciencemag.org/cgi/content/full/2009/1106/1>

5.8.17 FramingNano Conference to Present Nanotech Governance Framework

The Final International Conference of the FramingNano FP7 project will take place December 15, 2009 at the Sheraton Brussels Airport Hotel. The Governance Plan developed within the Project will be discussed, in preparation for its presentation to the European Commission (EC) as a model of management to be followed by European policy makers and stakeholders. Its aim is described as, "to ensure that the development of nanosciences and nanotechnologies takes place responsibly, and to the benefit of individuals and society as a whole."

Military Implications:

The military should plan to have a representative attend this conference, in order to remain aware of the nanotech regulation situation in Europe. As background, it would also be useful to review the EC's just released Second Implementation Report 2007-2009, (reporting on *Nanosciences and Nanotechnologies: an action plan for Europe 2005-2009*), which, according to Nanowerk News, states, "...the past two years have seen a substantial development of nanotechnology, supported by a further growth in research funding and the active development of policy", and, "In view of this, efforts to address societal and safety concerns must be continued to ensure the safe and sustainable development of nanotechnology".

Sources:

A new governance framework for nanotechnology

<http://www.nanowerk.com/news/newsid=13435.php>

A New Governance Framework for Nanotechnologies

http://www.framingnano.eu/index.php?option=com_content&task=blogcategory&id=39&Itemid=63

Nanosciences and Nanotechnologies: An action plan for Europe 2005-2009. Second Implementation Report 2007-2009

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0607:FIN:EN:PDF>