

**WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY**  
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Note to Readers: Pages 1-12 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 13.

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## Item 1. CCW Protocol V on Explosive Remnants of War Entered into Force

Protocol V on Explosive Remnants of War (ERW) of the Convention on Certain Conventional Weapons came into force on 12 November 2006, almost three years after it was adopted. The Protocol stipulates that Parties should take “remedial measures to mark and clear, remove or destroy unexploded ordnance or abandoned explosive ordnance” as early as possible after hostilities have ended, whether they control the territory or not, by cooperating directly or indirectly with all parties involved through quick and accurate information exchange. The Protocol is not retroactive, covering only wars occurring after its entry into force. As of the end of November, there were 27 States Parties to the Protocol.

The *Portfolio of Mine Action Projects 2007* found that 26 out of 29 war-ravaged countries or territories surveyed are beleaguered with the lurking remnants of cluster bombs and other explosives. In 2007, the focus of the Projects will be on unexploded ordnance, aiming to deal with the aftermath of conflicts that took place before Protocol V entered into force.

### **Military Implications:**

While the U.S. is not yet a party to Protocol V, it would be wise to assume and plan for the seeming eventuality that future international agreements will begin to include retroactive responsibilities. Protocol V is another example of the increasing international consensus in favor of the “polluter pays” principle. Protocol V has no clear implementation mechanisms or deadlines. To provide some leadership, if not already in existence, relevant military personnel might be tasked to create an information system to help responsible countries prioritize their future cleanup operations and, in anticipation, their legacy remnants of war.

### **Sources:**

CCW Protocol V on Explosive Remnants of War Enters into Force

[http://www.icbl.org/layout/set/print/news/ccw\\_protocol\\_v](http://www.icbl.org/layout/set/print/news/ccw_protocol_v)

Protocol on Explosive Remnants of War (Protocol V to the 1980 Convention), 28 November 2003

<http://www.icrc.org/ihl.nsf/INTRO/610>

Portfolio of Mine Action Projects

<http://www.mineaction.org/section.asp?s=projects>

Annan hails entry into force of new pact on speedy clearance of unexploded weaponry

<http://www.un.org/apps/news/story.asp?NewsID=20588&Cr=landmine&Cr1>

The need for urgent international action on cluster munitions

<http://www.icrc.org/web/eng/siteeng0.nsf/htmlall/cluster-munition-statement-061106?opendocument>

Perils of unexploded remnants of war stressed in UN mine report

<http://www.un.org/apps/news/story.asp?NewsID=20601&Cr=mines&Cr1>

## Item 2. Futuristic Nanotech and Synthetic Bioweapons Regulation

With the forthcoming ability to write genetic code to create new kinds of life forms from scratch, opening a vast potential for new kinds of synthetic bioweapons, a new regulatory environment should be considered. These developments, along with potentials for nanotech weapons, create unique problems of proliferation, health effects, environmental impacts, and post-conflict cleanups that are not well covered by international treaties. It seems inevitable that treaties governing such

futuristic weapons – like treaties that were created for other kinds of weapons in the past – will be negotiated. The factors that make such weapons possible (such as improved computer chips, increased bandwidth, software, nano-engineering) are producing synergistic improvements at an accelerating pace. This makes their speed of development faster than might have been expected.

**Military Implications:**

Military forecasters of such weapons should meet with diplomats to create an agenda to begin the process of creating treaties to better control such futuristic weapons and weapons systems and the effects of their residuals.

**Sources:**

Military nanotechnology - how worried should we be?

<http://www.nanowerk.com/spotlight/spotid=1015.php>

Israel to pursue nanotechnology weapons

<http://www.foresight.org/nanodot/?p=2366>

Israel developing bionic arsenal

<http://www.smh.com.au/news/Technology/Israel-developing-bionic-arsenal/2006/11/18/1163266789754.html>

See a more extended list of sources in the [Appendix](#)

**Item 3. UN Climate Change Conference with 5,900 Explores Post-Kyoto Regulations**

The twelfth Conference of the Parties (COP 12) to the UN Framework Convention on Climate Change and the second Meeting of the Parties to the Kyoto Protocol (COP/MOP 2), as well as some 130 related side events took place in Nairobi, Kenya, November 6-17, 2006, attended by over 5,900 participants, including 2,300 government officials. The foci were on the future of the Protocol and the Convention, and longer-term action to combat climate change and cope with its consequences. The meetings resulted in the adoption of 10 COP decisions and 11 COP/MOP decisions and in the approval of a number of conclusions by the subsidiary bodies, but no agreements were reached on post-Kyoto cuts or a negotiations timetable. However, the governments recognized that there is compelling scientific evidence for global warming and thus global emissions need to be reduced 50% by 2050. At the insistence of the European Union, a thorough examination of the Protocol will take place in 2008. Important achievements include: a) establishment of the Least Developed Countries (LDC) Fund, Special Climate Change Fund (SCCF), and Adaptation Fund; b) launch of the Ad Hoc Working Group on Annex I future commitments; c) the Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention; and d) the assignment of high priority to adaptation activities, mainly in developing countries. It is expected that, at next year's meeting, to be held in Indonesia, governments will start full negotiations for deeper cuts in emissions to keep the rise in global temperatures below the critical 2°C level.

**Military Implications:**

The military should continue to accelerate efforts to reduce their own greenhouse gas emissions. These remarks are offered with the realization that the U.S. military may already be among the institutions most compliant with greenhouse gas emission standards, but that good performance might not be good enough in coming years. New international environmental security-related policies and cooperation to avoid potentially large-scale disasters and conflicts seem inevitable.

Hence, the military should follow the evolution of these discussions to better anticipate future requirements.

**Sources:**

Summary of the Twelfth Conference of The Parties To The UN Framework Convention On Climate Change and Second Meeting of The Parties To The Kyoto Protocol

<http://www.iisd.ca/vol12/enb12318e.html>

United Nations Climate Change Conference - Nairobi 2006

[http://unfccc.int/meetings/cop\\_12/items/3754.php](http://unfccc.int/meetings/cop_12/items/3754.php)

See a more extended list of sources in the [Appendix](#)

## **Item 4. Technological Breakthroughs with Environmental Security Implications**

### **4.1 New Spectroscopy Technique Speeds Up Virus Detection**

A nanotech-based diagnostic test that can detect viruses as diverse as influenza, HIV, and respiratory syncytial virus in a minute or less was developed by a veterinary research team at the University of Georgia. The technique referred to as surface enhanced Raman spectroscopy (SERS) measures the Raman frequency shift of a near-infrared laser as it scatters off viral DNA or RNA. The test has the advantage of detecting the viral DNA or RNA itself rather than the indirectly produced antibodies that are the basis of other viral testing. This provides a much more rapid and reliable evaluation of the threat. The basic method was well known but the signals produced were unusably weak. The breakthrough here was placing silver nanorods at an 86° angle on the specimen slides, an addition that enormously increased the strength of the returns.

**Military Implications:**

The military should follow this development for potential improved environmental biological weapons surveillance systems.

**Source:**

Researchers use laser, nanotechnology to rapidly detect viruses

<http://www.physorg.com/news82816307.html>

### **4.2 "Smog-Eating" Materials**

Environment-friendly materials such as "smog-eating" products are increasingly in demand by architects and are developed not just for the façades of buildings, but also for paint, plaster, and paving materials for roads. An EU initiative for "smart" antipollution materials has found that construction products containing titanium dioxide help to destroy air pollutants found in car exhaust and heating emissions. The new environment-friendly substances are being tested in buildings, squares and highways in Europe as well as Japan.

**Military Implications:**

If the "smog-eating" products prove to be useful, the military should request its contractors to consider them in new buildings and infrastructure development.

**Source:**

Architecture in Italy goes green

<http://www.iht.com/articles/2006/11/22/news/smog.php>

## Item 5. Toxicogenomics Risk Assessment

The Use of Toxicogenomics to Understand Toxic Effects and Improve Risk Assessment workshop held by the U.S. National Research Council, Committee on Emerging Issues and Data on Environmental Contaminants, sought to identify how current toxicogenomic information can be used to inform risk assessment today and to identify toxicogenomic research directions to facilitate risk assessment in the future. Two chemicals of regulatory and scientific interest, dibutyl phthalate and benzene, were used as case studies to highlight the current use, controversies, and potential for using toxicogenomic information in risk assessment.

### **Military Implications:**

Military personnel working in environmental risk assessment should review the available presentations from this meeting for eventual input in improving their own toxicogenomic risk assessment processes.

### **Source:**

Fourteenth meeting of the Committee on Emerging Issues and Data on Environmental Contaminants. Use of Toxicogenomics to Understand Toxic Effects and Improve Risk Assessment: A Workshop. November 13, 2006

[http://dels.nas.edu/emergingissues/toxicogenomics\\_meet14.shtml](http://dels.nas.edu/emergingissues/toxicogenomics_meet14.shtml)

## Item 6. Updates on Previously Identified Issues

### **6.1 Countries Contemplating Tougher Regulations for Mandatory Emission Targets**

In light of last month's report, *The Economics of Climate Change*, the UK announced its intention to introduce new "green" measures to reduce carbon emission, including the Climate Change Bill—to reduce CO<sub>2</sub> emissions by 60% by 2050, and to strengthen official monitoring and reporting. The UK also proposes to set an emissions reduction target of 30% by 2020, and at least 60% by 2050 Europe-wide. Australians polled would favor ratification of the Kyoto Protocol and more stringent reductions, and its government advocates an Asia-wide emissions trading system as part of a planned "new-Kyoto" pact and would invest US\$46.5 million into the world's biggest carbon capture and storage system. [Note: A proposal to allow Clean Development Mechanism (CDM) funds to be used for carbon capture and storage (CCS) projects was deferred by the Climate Change Conference on grounds that the technology is not yet mature.] Japan cannot meet its obligations under the Kyoto Protocol unless it imposes mandatory emission targets on industry and increases spending for carbon credits using Kyoto tools such as the Clean Development Mechanism. [See also *UK Proposes Individual Carbon Trading* in July 2006, *Possible Tougher European Carbon Limits* in May 2006, and other related items in previous environmental security reports.]

### **Military Implications:**

Leadership by the EU, Japan and Australia may stimulate others to set mandatory emission targets, eventually bringing increased attention to military emission practices. Military liaisons in these countries might seek opportunities for collaboration in emissions reductions.

**Sources:**

Factbox - UK Response to Stern Review on Climate Change

<http://www.planetark.com/dailynewsstory.cfm/newsid/38740/story.htm>

Analysis - Japan Needs Policy Overhaul to Avoid Kyoto Failure

<http://www.planetark.com/dailynewsstory.cfm/newsid/38709/story.htm>

Australia to Push for "New Kyoto" in Asia

<http://www.planetark.com/dailynewsstory.cfm/newsid/38807/story.htm>

Australia plans world's largest carbon storage system

<http://www.terradaily.com/2006/061123072009.p1jncbk1.html>

**6.2 Europe to Propose Emissions Targets for All Flights To/From or Within Europe**

The European Commission is proposing to introduce a new policy that would impose emissions controls on all flights within and coming into Europe, seeking to strengthen pollution reduction regulations around the world. The proposal, expected to be presented around December 20, requires airlines to meet emissions targets starting January 1, 2011, for all flights within Europe and round-trips to the European Union from any other part of the world. The proposal also outlines a system and timeframe for airlines to buy carbon credits. [See also *EC Proposed Strategy to Curb Greenhouse Gas Emissions from Air Travel* in September 2005 environmental security report.]

**Military Implications:**

Since the proposed EU regulation mentions no exceptions, the military should explore impacts on its European operations and consult with allied military forces on the significance of that apparent omission.

**Sources:**

EU wants cap on airline emissions as of 2011

<http://www.euractiv.com/en/environment/article-159741>

EU takes aim at airline emissions

<http://iht.com/articles/2006/11/14/business/emit.php>

**6.3 Accelerating Environmental Health Crises in China**

Tens of millions in southwest China suffer because of coal plants. The Yellow River, a water source for 140 million people, is drying up, due to agricultural and industrial demands, falling water tables, and changes in glacial and snow-cap melting patterns. On November 20, Beijing's air quality was rated as 'hazardous' and residents were warned to stay indoors. While per capita emissions remain low compared to developed nations, the growing impact of China on climate change, along with severe intra-country air pollution, is of increasing concern to environmentalists and policy makers. The *World Energy Outlook 2006* reports that China will surpass the U.S. in 2009 as the biggest emitter of carbon dioxide. This is nearly a decade ahead of previous predictions. [See also *China Creates 11 Independent Environmental "Watchdog" Centers* in the July 2006, *China's President Hu Ordered Environmental Regulations for Military Activities* in April 2006, and other related items in previous environmental security reports.]

**Military Implications:**

Since future environmental migrations could lead to internal conflicts, and since China is about 20% of the world, alternative forecasts and plans for how to address potential instabilities in China should be explored. In the meantime, China is increasing pressure (as previously cited in these



monthly reports) on its military to take the environment into account in all its activities. Hence, there are opportunities for military-to-military cooperation with the China Environmental Health Project (partially supported by the U.S. Agency for International Development) to encourage research and training projects focused on finding solutions to safe drinking water and reducing pollution in China.

**Sources:**

A Troubled River Mirrors China's Path to Modernity. *New York Times*, November 19, 2006  
<http://www.nytimes.com/2006/11/19/world/asia/19yellowriver.html?ex=1321592400&en=8c861f8995a67dd&ei=5088&partner=rssnyt&emc=rss>

Environmental Health Crises in Southwest China (WWIC conference video archived)  
[http://www.wilsoncenter.org/index.cfm?fuseaction=events.event\\_summary&event\\_id=206921#](http://www.wilsoncenter.org/index.cfm?fuseaction=events.event_summary&event_id=206921#)

China to Pass U.S. in 2009 in Emissions  
[http://www.stopglobalwarming.org/sgw\\_read.asp?id=4393611102006](http://www.stopglobalwarming.org/sgw_read.asp?id=4393611102006)

Beijingers told to stay indoors as smog hangs, *China Daily* (November 20, 2006)

[http://www.chinadaily.com.cn/china/2006-11/20/content\\_738054.htm](http://www.chinadaily.com.cn/china/2006-11/20/content_738054.htm)

World Energy Outlook 2006, International Energy Agency

<http://www.iea.org/w/bookshop/add.aspx?id=279>

#### **6.4 Lawsuits over Failure to Meet Kyoto Commitments**

The Friends of the Earth threaten to sue the government of Canada over its refusal to adopt adequate policies to cut greenhouse-gas emissions and meet its commitments as agreed under the Kyoto Protocol. The environmental group will file the lawsuit with the Canadian federal court and the Kyoto Protocol Compliance Committee, unless the government changes its position. In May, South Africa filed with the international Kyoto Committee a complaint against Canada and 14 other countries over failure to report on their progress, as required. [See also *Global Warming Goes to Court* in October 2006 environmental security report.]

**Military Implications:**

[Similar to previous on related issues] Lawsuits may one day be filed against the military for its greenhouse gas emissions. The sooner military efforts to reduce greenhouse gas emissions are fully compliant with “best practices” and documented, the less likely it is that the military will be sued for damages. The military should be prepared for more stringent decisions and regulations worldwide against atmospheric emissions. These remarks are offered with the realization that the U.S. military may already be among the institutions most compliant with greenhouse gas emission standards, but that good performance might not be good enough in coming years.

**Source:**

Canada faces lawsuit over failure to meet Kyoto commitment  
<http://www.terraily.com/2006/061031230116.bm84p217.html>

#### **6.5 Europe Proposes Ban on Mercury Exports**

The European Commission has proposed legislation to ban all European Union exports of mercury starting in 2011, and the European Parliament has drafted a measure that would forbid its use in non-electrical measuring devices, with the exception of barometers and antique instruments. [See also *Mercury Instruments May Be Banned in EU* in February 2006, *EU Sets 2011 Deadline to Ban*

*Mercury Exports* in June 2005, and *Governments Call for Global Assessment and Control of Mercury Pollution* in February 2005 environmental security reports.]

**Military Implications:**

Logistics personnel should review these measures to determine their effect on military materiel planning, and should be prepared to comply with the final set of regulations, as appropriate under status of forces agreements. This development could complicate repatriation of materiel or movement to non-EU nations.

**Sources:**

Environment: Commission proposes ban on EU mercury exports

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/1481&format=HTML&aged=0&language=EN&guiLanguage=en>

EU Parliament Backs Plans to Ban Mercury

<http://www.physorg.com/news82736827.html>

**6.6 Climate Change**

During the Climate Change Conference held in Nairobi [see *Item 3. UN Climate Change Conference with 5,900 Explores Post-Kyoto Regulations*], many reports and papers documenting new climate change-related evidence and challenges were released. Noteworthy ones include:

A report by German scientists is renewing the call on nations to promptly consider strategies for dealing with "sea level refugees"—population living in coastal areas endangered by the rising sea levels and increasing frequency of extreme storms. Canada's northern native peoples might become environmental refugees, being increasingly isolated as their ice roads and paths to supplies melt.

The Global Carbon Project report shows that carbon dioxide emissions over the last five years grew four times faster than in the preceding 10 years. Global growth rates in 2000–05 reached 3.2%, compared to 1990–1999's 0.8%. The report also draws attention to environmental inertia, by which the environment stores up part of the energy generated by greenhouse gas emissions; causing global temperatures to continue to increase for two or more centuries after emissions are stabilized or begin to drop.

According to the Office of Maritime Transportation and Hydrography in Hamburg, the North Sea was 2.4 °C warmer in October 2006 than the 1968-1993 average; and, since 1988 is in its strongest heating period since the start of recording (1873). Another German institute of research, WGBU, notes that everywhere seas and oceans are transformed by the climatic change: the surface water is heated, the sea level rises, the oceans become more acid, the storms are stronger.

Some diseases such as malaria, heart ailments and dengue fever appear on the rise with warmer temperatures, reported health experts, citing surges of such diseases in Kenya, China and Europe.

*Adaptation and Vulnerability to Climate Change: The Role of the Finance Sector*, a report by UNEP, warns that by 2040, there will be a "peak year" in which losses from extreme weather could reach \$1 trillion and calls for a financing mechanism that would help developing countries cope with the effects of climate change.

**Military Implications:**

[Similar to previous on the same issue] There is compelling evidence of the consequences of anthropogenic climate change, and a growing world demand for action. The military should continue to accelerate efforts to reduce their own greenhouse gas emissions. New international



environmental security-related policies and cooperation to avoid potentially large-scale disasters and conflicts seem inevitable.

**Sources:**

Scientists Say Millions Could Flee Rising Seas

<http://www.planetark.org/dailynewsstory.cfm?newsid=38918&newsdate=10-Nov-2006>

Ice-melt isolates remote communities in Canada

<http://www.sciam.com/article.cfm?chanID=sa003&articleID=5E80048377635F2A67E0E5BE24012F09>

Carbon emissions rising faster than ever

<http://www.newscientist.com/article/dn10507-carbon-emissions-rising-faster-than-ever.html>

Global Carbon Project

<http://www.globalcarbonproject.org/>

2,4 degrees Celsius: the North Sea is heating up (original:2,4 degrés : la mer du Nord se réchauffe)

<http://www.lemonde.fr/web/article/0,1-0@2-3228,36-834748@51-816848,0.html> (French)

Diseases appear on rise with temperature

<http://www.physorg.com/news82749082.html>

New forms of insurance against ravages of climate change needed in poor nations – UN

<http://www.un.org/apps/news/story.asp?NewsID=20594&Cr=climate&Cr1=>

## 6.7 Nanotechnology-related Issues

### 6.7.1 Grand Challenges for Nanotechnology

A group led by Andrew Maynard of the Woodrow Wilson Center's Project for Emerging Nanotechnologies suggest five "grand challenges" for nanotechnology over the next 15 years:

- develop instruments to assess exposure to engineered nanomaterials in air and water within next 3-10 years
- create and test ways of evaluating the toxicity of nanomaterials in 5-15 years
- generate models to predict their possible impact on the environment and human health over the next 10 years
- develop ways to assess the health and environmental impact of nanomaterials over their entire lifetime, within the next five years
- organize programs to enable risk-focused research into nanomaterials, within the next 12 months

The leadership of the House of Representatives Science Committee commented, "This paper should be a landmark in the history of nanotechnology research. It lays out a clear, reasonable, prioritized, consensus-based set of priorities for examining the potential environmental and health consequences of nanotechnology over the next decade and a half."

### 6.7.2 UK to Have New Nanotechnology Risk Information Service

The UK Department of Trade and Industry has announced that a new nanotechnology risk information service, Safenano.org, is due for launch in April 2007, and "will take the form of a web-based information service ... with a regular bulletin service and comprehensive database of relevant publications. Emerging scientific evidence concerning the potential risks of nanoparticles and nanotubes, together with information about Health and Safety, Occupational Hygiene, Toxicology and Risk Assessment will be interpreted and delivered to the audience in an integrated way, to support effective risk management. "

### 6.7.3 Risks of Nanotechnology Applications

A recent article in Nanowerk pointed out the increasing use of nanomaterials in building construction, and the consequent rise in health and environmental risks because of this usage.

### 6.7.4 Berkeley, California, Considering Nanoparticle Health and Safety Law

The city of Berkeley, California is proposing the world's first local regulation of nanomaterials. It would add a nanoparticles health and safety disclosure to a city law that already requires an inventory and safety plan from any business or other person handling large quantities of hazardous materials. Other localities have discussed such measures, but this is the furthest any has progressed.

### **Military Implications**

Relevant military personnel should consider these new information resources for inputs to their own nanotech research and applications.

### **Sources:**

Five-step check for nano safety

<http://news.bbc.co.uk/2/hi/science/nature/6153814.stm>

Nature report proposes nanotech safety strategy

[http://www.smalltimes.com/display\\_article/277298/109/ARTCL/none/none/Nature\\_report\\_proposes\\_nanotech\\_safety\\_strategy](http://www.smalltimes.com/display_article/277298/109/ARTCL/none/none/Nature_report_proposes_nanotech_safety_strategy)

Berkeley considering need for nano safety

<http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2006/11/24/MNGP9MJ4KI1.DTL>

Safe handling of nanotechnology. *Nature* 444, 267-269. Published online 15 November 2006 (by subscription only)

IOM's SAFEnano Initiative announced as DTI's newest Nanotechnology Centre

[http://www.iom-world.org/news/nanotech\\_centre.php](http://www.iom-world.org/news/nanotech_centre.php)

Risks in architectural applications of nanotechnology

<http://www.nanowerk.com/spotlight/spotid=1007.php>

### 6.7.5 Upcoming Conferences on Nanotechnology with Environmental Security Implications

'Nanotechnology for Security and Crime Prevention' 18 January 2007, The Royal Society, London, will examine a wide spectrum of new scientific developments taking place in the fight against crime, from anti-terrorism laser technology with the potential to revolutionize airport security to the latest research discoveries in nanoforensics.

"Health & Environmental Summit on Nano" will be held during Nanotech 2007, May 20-24, 2007 in Santa Clara, California, convened by the Nano Science and Technology Institute (NSTI) in collaboration with the U.S. Food and Drug Administration, to assist with the FDA's fact-finding programs for Nanotechnology in Consumer Goods, including drugs, biologics, food and cosmetics. The 4th NanoSpain Workshop will be held in Seville, 12-15 March 2007, bringing together several hundred participants to discuss the latest developments in nanotechnology.

### **Military Implications:**

Appropriate military personnel should consider attending or obtaining the proceedings of these meetings for possible input to their own work.

### **Sources:**

'Nanotechnology for Security and Crime Prevention', email—see [Appendix](#)

Health & Environment Summit on Nano” at Nanotech 2007

[http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news\\_view&newsId=20061026005829&newsLang=en](http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20061026005829&newsLang=en)

4th NanoSpain Workshop <http://www.nanospain.org/Workshop4>

## **Item 7. Reports Suggested for Review**

### **7.1 *World Energy Outlook 2006* Warns on Energy Security and Environmental Implications of Increasing Energy Demands**

The IEA’s *World Energy Outlook 2006*, looking ahead to 2030, names two major issues facing the world over the next 24 years: the threat of “insecure” and “inadequate” energy supplies at reasonable prices, and environmental damages caused by increasing energy demands. The report also suggests that the solutions to these problems are cost effective and reiterates that investment in cleaner energy supplies and more efficient use of energy are vital to cutting energy demand by a significant margin – 10% by 2030. The report notes that energy demand will rise 53% by 2030 and increased nuclear energy and biofuel use are vital to cutting emissions.

#### **Military Implications:**

Military institutions have to develop rigorous strategies to combat the two main issues of insecure and inadequate energy supplies, and environmental damage, and to look beyond the upfront investment costs of making these changes in order for their operations to be more cost effective in the long run. There is a paradox to be resolved; the energy input to military materiel and operations has historically been on an upward curve, as potential and actual combatants seek to overwhelm opponents by sheer force.

#### **Sources:**

WEO 2006 <http://www.worldenergyoutlook.org/2006.asp>

The World Energy Outlook 2006 Maps Out a Cleaner, Cleverer and More Competitive Energy Future [http://www.iea.org/Textbase/press/pressdetail.asp?PRESS\\_REL\\_ID=187](http://www.iea.org/Textbase/press/pressdetail.asp?PRESS_REL_ID=187)

### **7.2 *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization***

Thomas Homer-Dixon argues that five "tectonic stresses" are menacing today's global order: demographics; energy scarcity; local and regional degradation of environmental resources; climate change; and widening rich-poor gap. These stresses are amplified by multipliers such as increasing connectivity and speed of social change and the power shifts (ability of small groups to cause extensive disorder). To avoid a "synchronous failure" that these factors might induce, the author suggests two “prescriptions:” build resilience into the system, and plan on a large-scale basis for unpredictable futures. This is an opportunity to improve governance, reform institutions and social relations, advance ingenuity, and to prepare for the “catagenesis” (renewal after breakdown). Homer-Dixon argues for an open source architecture that can be applied to social systems. *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization* is a comprehensive and well-structured overview of today’s threats and opportunities.

#### **Military Implications:**

The book can provide additional input to understand and deal with situations on a large scale that threaten human security and world stability.

**Sources:**

*The Upside of Down*

<http://www.theupsideofdown.com/>

WWICS, Book Discussion--Homer-Dixon's *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization* (archived video of the discussion)

[http://www.wilsoncenter.org/index.cfm?fuseaction=events.event\\_summary&event\\_id=205754](http://www.wilsoncenter.org/index.cfm?fuseaction=events.event_summary&event_id=205754)

**7.3 Human Biomonitoring for Environmental Chemicals**

This is an independent study by the National Research Council (NRC) of the National Academies to address the challenges related to biomonitoring, including improving biomonitoring systems, interpreting the results of biomonitoring data to the public health, addressing ethical uses of the data, and communicating the results of biomonitoring to different forums. The report recommends improving the interpretation of biomonitoring results by expanding the scientific database on many chemicals; better coordination between biomarker development and population biomonitoring and the potential health implications; improved ability to assess the real health risks of detected chemicals; development of strategies for efficient communication of biomonitoring studies' results; and a review of the bioethical issues concerning biomonitoring, including confidentiality and reporting.

**Military Implications:**

Military personnel concerned with biomonitoring should review the report since its findings and recommendations might find their way in new national and possibly international policies on biomonitoring. Also, they might be useful for improving military biomonitoring strategies.

**Source:**

Human Biomonitoring for Environmental Chemicals

<http://www.nap.edu/catalog/11700.html>

**7.4 A Review of Current Practices in the Nanotechnology Industry**

The International Council on Nanotechnology and the University of California at Santa Barbara have issued a new report, *A Review of Current Practices in the Nanotechnology Industry*, the second in a series. [See *Review of Safety Practices in the Nanotechnology Industry* in the October 2006 environmental security report]. According to the announcement, it is "the first comprehensive, international survey of workplace safety practices in the nanotechnology industry" and "documents results from survey data collected from 64 organizations in North America, the European Union, Asia and Australia." The release also says it, ..."finds that many nanotech companies and laboratories believe nanoparticles ... may pose specific environmental and health risks for workers. In response, companies are reporting that they are developing special programs and procedures for mitigating risks to workers and consumers. Yet, due in part to a lack of general information regarding nanomaterials risks, companies and labs have workers using conventional environmental, health and safety (EHS) practices when handling nanomaterials, even though the practices were developed to deal with bulk materials that can have markedly different chemical properties than their nano-sized counterparts." The Director of ICON says "The use of conventional practices for handling nanomaterials appears to stem from a lack of information on the toxicological properties of nanomaterials, as well as nascent regulatory guidance regarding the proper environmental, health and safety practices that should be used with them."

**Military Implications:**

As before, military personnel concerned with nanotech safety should review this report for insights on nanotech environmental risk assessment.

**Source:**

A Review of Current Practices in the Nanotechnology Industry

<http://cohesion.rice.edu/CentersAndInst/ICON/emplibrary/ICONNanotechSurveyFullReduced.pdf>

ICON website <http://icon.rice.edu>

**7.5 Measuring the Un-Measurable**

The *Measuring the Un-measurable* report published by the Institute for Environment and Human Security of the United Nations University, shows the challenges and difficulties in developing appropriate methodologies, indicators, and criteria to identify and assess vulnerabilities of societies at risk. It illustrates the vulnerabilities by analyzing four case studies: tsunami in Sri Lanka; coastal communities in the U.S. Gulf Coast through hurricane Katrina; recent floods in the Volga region of Russia; and vulnerability assessment undertaken in Tanzania covering multiple hazards. The recommendations include suggestions for future research projects and particular aspects to be considered when aiming to measure the un-measurable.

**Military Implications:**

Non-traditional threats to security such as natural disasters are increasingly of concern to the military. Relevant military personnel should review this report and explore how findings and recommendations in the report can be applied for the military's work in planning to reduce and mitigate these emerging security risks.

**Source:**

Measuring the Un-Measurable, United Nations University Institute for Environment and Human Security, <http://www.ehs.unu.edu/index.php/article:278>

## APPENDIX

### Reference Details

This Appendix contains expanded background information on some items.

#### Item 2. Futuristic Nanotech and Synthetic Bioweapons Regulation

##### A more extensive list of sources:

Military nanotechnology - how worried should we be?

<http://www.nanowerk.com/spotlight/spotid=1015.php>

Israel developing bionic arsenal

<http://www.smh.com.au/news/Technology/Israel-developing-bionic-arsenal/2006/11/18/1163266789754.html>

Israel to pursue nanotechnology weapons

<http://www.foresight.org/nanodot/?p=2366>

Synthetic Biology 2.0

<http://www.innovationwatch.com/choiceisyours/choiceisyours.2006.05.30.htm>

The National Science Advisory Board on Biosecurity (NSABB). <http://www.biosecurityboard.gov>

Bedfellows at the Biosecurity Board

<http://www.unobserver.com/layout5.php?id=2827&blz=1>

*Conventional Arms Transfers to Developing Nations, 1998-2005*

<http://www.fas.org/sgp/crs/weapons/RL33696.pdf>

World Military Spending Out Does Anything Else

<http://www.globalissues.org/Geopolitics/ArmsTrade/BigBusiness.asp#>

Israel's 'spy fly' to track and kill terrorists

[http://timesofindia.indiatimes.com/NEWS/Health\\_Science/Israels\\_spy\\_fly\\_to\\_track\\_and\\_kill\\_terrorists/articleshow/481778.cms](http://timesofindia.indiatimes.com/NEWS/Health_Science/Israels_spy_fly_to_track_and_kill_terrorists/articleshow/481778.cms)

Nanotechnology goes to war

<http://bulletin.sciencebusiness.net/ebulletins/showissue.php3?page=/548/art/6669/>

#### Item 3. UN Climate Change Conference with 5,900 Explores Post-Kyoto Regulations

##### A more extensive list of sources:

Summary of the Twelfth Conference of The Parties To The UN Framework Convention On Climate Change and Second Meeting of The Parties To The Kyoto Protocol

<http://www.iisd.ca/vol12/enb12318e.html>

United Nations Climate Change Conference - Nairobi 2006

[http://unfccc.int/meetings/cop\\_12/items/3754.php](http://unfccc.int/meetings/cop_12/items/3754.php)

See a more extended list of sources in the Appendix

Nairobi climate talks end in deal

<http://news.bbc.co.uk/2/hi/science/nature/6158022.stm>

One small step forward for Kyoto Protocol

<http://www.panda.org/index.cfm?uNewsID=87340>



Reports on the side events

<http://www.iisd.ca/climate/cop12/enbots/>

Climate Change and Economic Development

<http://www.ourplanet.com/imgversn/172/content.html>

Officials report progress in talks at UN climate change conference

<http://www.un.org/apps/news/story.asp?NewsID=20605&Cr=climate&Cr1=change>

## **Item 6. Updates on Previously Identified Issues**

### **6.7. Nanotechnology-related Issues**

#### 6.7.5 Upcoming Conferences on Nanotechnology with Environmental Security Implications

Conference announcement

Source: email

From: Institute of Nanotechnology <NanoNews\_1036934@emt0.co.uk>

To: acunu@igc.org

Subject: Nanotechnology for Security and Crime Prevention

Date: Thu, 2 Nov 2006 12:46:58 -0500 (EST)

'Nanotechnology for Security and Crime Prevention'

18th January 2007, The Royal Society, London

This one day event will examine a wide spectrum of new scientific developments taking place in the fight against crime. The latest discoveries and advances will be discussed, from anti-terrorism laser technology with the potential to revolutionise airport security to the latest research discoveries in nanoforensics.

The 2004 Security & Crime Prevention conference delegates included:

The Home Office, EPSRC, Pira, Thales Research and Technology Ltd, Sun Chemicals, QinetiQ, Scottish Business Crime Centre, Cranfield University, Tayside Police, Pera, Metropolitan Police, Forensic Science Service, Lothian and Borders Police, Strathclyde Police, Forensic Telecommunications Services, Scottish Police College, NPL, Mitsui & Co., Bank of Scotland, Royal Netherlands Embassy.

Followed by:

Albert Franks Memorial Lecture

'Micro and Nano Technologies for Food - a healthy and safe option?'

This year's speaker - Frans Kampers

Discounted rates and priority bookings for members.

To find out more about membership please contact Gemma McCulloch.

Fax to: 01786 447530 or contact Carrie Smith Tel: +44 (0)1786 447520

Email: [carrie.smith@nano.org.uk](mailto:carrie.smith@nano.org.uk) for further information

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