

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

**MAY 2005 REPORT**

Note to Readers: Pages 1-15 comprise the summary and analysis of this report. Expanded details for some items that are not be available via the Internet are in the Appendix beginning on page 16.

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## **Item 1. World Health Assembly adopts new International Health Regulations**

The new International Health Regulations adopted by the World Health Organization's annual assembly on May 23, 2005, will increase security against global epidemics of deadly diseases by improving national and international capacity for preventing and responding to disease outbreaks. The new regulations include comprehensive assessment, reporting, and response standards mandatory for each country and to be implemented within a specific timeframe; operational mechanisms; increased collaboration between countries' health offices and with the WHO; and a better coordinated international reporting and response system. The regulations stipulate the increased roles of countries and WHO in identifying, preventing, and responding to public health emergencies of international concern. WHO should be quickly informed of any outbreak of four diseases—SARS, bird flu, smallpox and polio—as well as any outbreaks of “potential international public health concern” from known or unknown causes or sources. The new regulations will formally come into force two years after approved by the Assembly. [See also *UN Report Recommends New Powers to Combat Bioterrorism and Epidemics* in the February 2005 environmental security scanning report.]

### **Military Implications:**

The new WHO regulations should be distributed to relevant military commands so they can determine the implications for their operations and potentials for collaboration with WHO country offices and the Global Outbreak Alert and Response Network (GOARN). Such reviews should also include the new matrix developed by WHO for helping countries identify whether new health incidents are of international concern. Military organizations should be ready to use it on their own initiatives (and for their own protection) in countries that are not well prepared to respond to the new regulations.

### **Sources:**

World Health Assembly adopts new International Health Regulations

[http://www.who.int/mediacentre/news/releases/2005/pr\\_wha03/en/index.html](http://www.who.int/mediacentre/news/releases/2005/pr_wha03/en/index.html)

Fifty-eighth World Health Assembly

<http://www.who.int/mediacentre/events/2005/wha58/en/index.html>

Resolution containing the revised International Health Regulations

[http://www.who.int/gb/ebwha/pdf\\_files/WHA58/A58\\_55-en.pdf](http://www.who.int/gb/ebwha/pdf_files/WHA58/A58_55-en.pdf)

## **Item 2. New Tools to Monitor Environmental Pollution**

### **2.1 Software “Toolkit” for Control of Hazardous Chemicals**

The Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous and Other Wastes developed a software “toolkit” that would greatly help assessing and managing the hazardous chemicals called polychlorinated biphenyls (PCBs). The PCB Inventory and Management Decision Supportive Tool (DST) will help collect and organize PCB data, and support planning for PCB disposal and transboundary movement. In addition to falling under the scope of the Basel Convention, PCBs are to be phased out of use by 2025 under the Stockholm Convention on Persistent Organic Pollutants.

**Military Implications:**

Although the U.S. is not party to either of the two Conventions, the military should consider using the software to inventory and manage its materiel containing PCBs and assessing the eventual hazards; as well as, continue phasing it out in host countries that are Party to the Conventions, where it has such materiel.

**Source:**

Secretariat of the Basel Convention <http://www.basel.int/>

Launch of a PCB Inventory and Management Decision Supportive Tool  
[http://www.basel.int/press/PCB\\_Toolkit.doc](http://www.basel.int/press/PCB_Toolkit.doc)

**2.2 New Web Site on Biomonitoring Technology**

The Environmental Health Research Foundation (EHRF) launched a new web site that is providing comprehensive information on Biomonitoring,” the scientific technique for assessing human exposure to natural and synthetic chemicals <http://www.biomonitoringinfo.org>. [Note: the website is just now being populated.]

**Military Implications:**

In addition to other websites (e.g., FacsNet <http://www.facsnet.org/>, NAS <http://www.nas.edu/>) this site is a good information and risk assessment tool. The military should monitor these web sites (most offer e-mail alerts when new developments are added) and use them as supplementary information in evaluating health impacts of different agents it uses and/or of the environmental conditions where personnel are deployed.

**Source:**

Biomonitoring Info

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

**Item 3. Fostering Environment and Security Connection****3.1 International Conference on Environment, Peace and the Dialogue among Civilizations and Cultures**

The International Conference on Environment, Peace and the Dialogue among Civilizations and Cultures, held May 9—10 in Tehran, Iran, was organized by UNEP, Iranian Department of Environment, the United Nations University (UNU), and UNESCO. It discussed and reaffirmed the interaction between environment and conflict, environment and human security, and the role of dialogue in reducing international conflict and protecting the environment. Other issues discussed were: the efficiency of the current international regulations relating to environmental protection during armed conflict; the status of environmental treaties after parties go to war; the applicability of international law to non-international armed conflicts; and UNEP’s possible role in assessing liability for damages. UNEP representative noted the potential of a future UN Peacebuilding Commission to address these issues. The delegates adopted the Tehran Communiqué that provides nine recommendations and conclusions arising from the Conference: to create a culture of universal peace and solidarity; to deepen and broaden the process of dialogue among civilizations and cultures; UNEP should continue its initiative on environment, peace and dialogue and consider holding annual international meetings; improve understanding and correlation between

security and environment; enlarge the dialogue to include all segments of society; the proposed UN Peacebuilding Commission should contribute to the objectives of the Conference; development of fora for preventive dialogue and post-conflict restitution; and cultural, ethical and spiritual values must be fully integrated into strategies of dialogue for peace, security and development. The Communiqué will be formally submitted to the UN Secretary-General as a message to the September UN General Assembly.

**Military Implications:**

Those military personnel studying environment-and-conflict relationships should review the sources below, not only for any new insights, but also to find potential areas to a) help implementation of and compliance with existing laws; b) cooperate in drafting new convention(s) on war and environmental issues; and c) encourage dialogue on security and environmental issues between relevant segments of society.

**Sources:**

International Conference on Environment, Peace, and the Dialogue among Civilizations and Cultures, 9-10 May 2005, Tehran, Iran

<http://www.iisd.ca/sd/sdter/>

Dialogue Among Civilizations Bulletin

<http://www.iisd.ca/sd/sdter/ymbvol108num1e.html>

**3.2 Call for Legally Binding Agreement for Forests' Conservation**

UN Forum on Forests 5th Session, held 16–27 May 2005, reviewed the effectiveness of the International Arrangement on Forests and determined that better international regulations, management mechanisms, and long-term political commitments are needed to improve forest conservation. Several officials called for a legally binding instrument and quantifiable targets eventually linked to the Millennium Development Goals. [These goals will be reviewed for possible modification at the UN General Assembly meeting in September 2005.] The delegates failed to reach agreement on future international arrangements and improving international regulations on forests. The next UNFF is planned for February 13, 2006.

During the Forum, the World Wildlife Federation and the World Bank renewed their World Bank/WWF Alliance for Forest Conservation and Sustainable Use and announced their new forest protection goal to cut global deforestation 10% by 2010.

**Military Implications:**

About 90% of the existing forest cover is in only 24 countries, and comprises the homes to 1.6 billion people whose livelihoods depend on the forests. The degree to which these forests are destroyed is the degree to which potential migration-related conflicts are possible. Hence, protection and conservation efforts create a return of security and stability in those regions. The military should join forces (military-to-military assistance) with relevant international agencies and local governments to help improve forest management and security in those countries where the national military plays a role in such programs. For example, the government of Brazil declared forest conservation a security issue and uses the military to implement forest conservation programs. Eventually, the Forum's efforts may lead to binding international agreements (at least at regional levels) for more forest area protected zones. The Army should be prepared to comply with eventual new regulations that might become applicable to US Forces.

**Sources:**

UN Forum of Forests: <http://www.un.org/esa/forests/index.html>

WWF, World Bank Would Trim Global Deforestation 10 Percent by 2010  
<http://www.ens-newswire.com/ens/may2005/2005-05-26-04.asp>

UN Forest Forum Concludes Two-Week Session At UN Headquarters; Fails to reach full agreement on future global plan  
<http://www.un.org/News/Press/docs/2005/envdev859.doc.htm>

**Item 4. New Resolution on Victims' International Human Rights**

The latest Session of the UN Human Rights Commission approved the "Basic Principles and Guidelines on the Right to a Remedy and Reparation for Victims of Gross Violations of International Human Rights Law and Serious Violations of International Humanitarian Law." This comprehensive Resolution doesn't introduce new international obligations, but identifies "mechanisms, modalities, procedures and methods for the implementation of existing legal obligations under international human rights law and international humanitarian law" and reinforces the obligation of all States to respect the international legal obligations and adapt their respective national legal systems to the international laws and regulations on human rights. The Resolution will come into effect after adoption by the Economic and Social Council and the General Assembly, which could occur at the next meeting this September.

**Military Implications:**

Although there is no specific language on the environment, several international laws recognize the status of victims as a result of harm to the environment. The Resolution would fully apply to those victims, too. The military should review the new Principles and Guidelines to ensure that its actions are consistent with evolving international human rights law and international humanitarian law.

**Source:**

Basic principles and guidelines on the right to a remedy and reparation for victims of gross violations of international human rights law and serious violations of international humanitarian law. Human Rights Resolution 2005/35  
[http://ap.ohchr.org/documents/E/CHR/resolutions/E-CN\\_4-RES-2005-35.doc](http://ap.ohchr.org/documents/E/CHR/resolutions/E-CN_4-RES-2005-35.doc)

**Item 5. Technological Breakthroughs with Environmental Security Implications****5.1 Nano-engineered Powders Tackle Toxic Chemicals**

FAST-ACT is a new family of nano-engineered powders that can clean up hazardous substances such as VX nerve gas and sulfuric acid. This toxic-chemical cleaner composed of magnesium, titanium, and oxygen was developed by Kansas State University chemist Kenneth Klabunde and will be produced by NanoScale Materials Inc.

**Military Implications:**

Although FAST-ACT is already in testing by the DOD, other relevant military personnel should receive a heads-up about its potential, and if proven efficient, for planning international distribution and training requirements.

**Source:**

Nano-engineered Powders Tackle Toxic Chemicals

[http://www.nsf.gov/discoveries/disc\\_summ.jsp?cntn\\_id=104102](http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=104102)

**5.2 New Environmental-friendly Lighting Based on Gallium Nitride**

Prof. Colin Humphreys from Cambridge University, UK, is developing gallium nitride-based light bulbs that could last 100 times longer than light bulbs used today. Scientists agree that using gallium nitride in light-emitting diodes (LEDs) could help cut emissions of carbon dioxide and other greenhouse gases by 15%. While different nitride-based LED applications could soon materialize, it might take 5-10 years to develop the technology to produce gallium nitride LEDs with an acceptably white light for home and office lighting. Since lighting accounts for 20% of electricity use in developed countries and 40% in developing ones, the financial and environmental savings could be considerable.

**Military Implications:**

The army should investigate the effectiveness of any new energy-efficient systems, and if proven beneficial, speed up their production and introduction into general use, as part of the Army's energy-saving strategy.

**Source:**

UK Scientist's Bright Idea to Fight Global Warming

PlanetArk, Story by Patricia Reaney, 2/5/2005

<http://www.planetark.com/dailynewsstory.cfm/newsid/30647/story.htm>

**5.3 Enviromatics could contribute to Environmental Security**

MIT introduces and explains the emergence of a new field, enviromatics, born from the convergence of information technology and environmental research. Unlike environmental modeling based on statistical data, enviromatics uses real-time ecosystems-status database, Internet tools, and ubiquitous computers. Improved continuous sensing, simulation, and mapping tools make the predictions more reliable than previously. Instantaneous ecosystem analysis and short-term forecasting of ecosystems' conditions is accessible to anybody interested. Possible applications of the new field range from farmers who could avoid eventual damages to their crops, to protection of endangered species that need special habitat conditions. Enviromatics could impact decisionmaking for improving forecasting implications of different action options, as well as increasing public awareness to foster more environmentally friendly practices.

**Military Implications:**

With the rising role of the military in environmental protection and conflict prevention due to environmental degradation and calamities, the military should conduct a feasibility study of implementing enviromatics in regions where critical environmental conditions might cause, for example, famine triggering conflict and/or mass-migration. Collaborating with international and

local agricultural and environmental organizations, the military could contribute to timely implementation of enviromatics and building of early-warning systems.

**Source:**

Enviromatics. Computer forecasts enhance farm production and species diversity  
[http://www.technologyreview.com/articles/05/05/issue/feature\\_emerging.asp?p=8](http://www.technologyreview.com/articles/05/05/issue/feature_emerging.asp?p=8)

#### **5.4 Nets of Agents Probe the Environment**

An important branch of Enviromatics [See previous item 5.3] is concerned with the acquisition of environmental data. Several current projects (Univ. of Wyoming, Univ. of Pennsylvania, UCLA) are developing variations of advanced data acquisition techniques. These are based on large networks of small intercommunicating devices (agents), incorporating sensors, which can monitor wide areas for environmental data, process it, and transmit results back to a central point. These devices may be stationary—laid out in a grid pattern over the region of concern—or they can be a band of mobile robots swarming over a large area in an internally controlled search for sites and information of interest. Individual units might be specialized; e.g., for radiation, biological weapons, or chemical weapons. The key element here is the combination of individual autonomy, in which each device "runs itself", and intercommunication, which permits low-power wireless transmission of data and plans around the network. In this way the assemblage of units can behave in a seemingly intelligent manner, adjusting its behavior to changing conditions or surroundings. A flight of migratory birds, maintaining its V-shape, is the classic example of this kind of emergent behavior, demonstrating that, in fact, the whole can be greater than the sum of its parts. [See also *On-chip Antenna to Solve Communication Problems among Microscopic Sensors* in May 2004, and *Robot Swarms* in June 2004 environmental security monthly scanning reports.]

#### **Military Implications**

[Same as for previous *Robot Swarms* issues] Possible military uses of robot swarms are numerous. Human safety and health can be preserved by using robotics for hazardous missions such as site characterization, decontamination, and explosive ordnance disposal; or—as in this case—for data collection in austere environments. Environmental damage can be minimized by using robots for quick remediation actions, for environmental monitoring, and for mapping of sensitive terrain. With continuing improvements in human health protection requirements, both domestically and overseas, the use of robots in hazardous environments is a logical application of the technology. In addition, because the programming of robots can be easily limited and verified, environmental treaty monitoring that is stymied by distrust of human monitors may actually be improved by allowing the use of robots in nations that fear corollary human espionage.

**Source:**

Couple Receive Grant to Develop Robots  
<http://www.forbes.com/business/healthcare/feeds/ap/2005/05/16/ap2032031.html>

#### **5.5 Progress on Self-replicating Robots**

A team of engineers from Cornell University in Ithaca NY, has created robots that can self-replicate similarly to biological cloning. At this stage, they are just simple sets of 4 modular robot cubes, "molecubes", which are able to assemble copies of themselves, when provided a supply of pre-made cubes. Yet, they represent an important step forward compared to previous



self-replicating robots, due to their flexibility, “memory”, and three-dimension movement possibility.

### **Military Implications:**

Besides the practical applications of having “everlasting soldiers” with numbers adaptable to demand and able to act in austere conditions (either for combat or after-combat cleanup), there are moral and legal implications of self-replicating robots. Although there is no international law yet that would bind robots’ self-replication, it is likely that as these technologies get closer to implementation, regulations will be needed. The military should look into all the ethical aspects of eventual use of such technologies and be active in designing international regulations for their use. Also, as for anything that could become a weapon against human interests, self-replicating robots should be designed with fail-safe human-controlled on-off switches.

### **Source:**

Stuff of sci-fi nightmares? An army of robots that reproduce

By Steve Connor, Science Editor, 12 May 2005

[http://news.independent.co.uk/world/science\\_technology/story.jsp?story=637672](http://news.independent.co.uk/world/science_technology/story.jsp?story=637672) (by subscription only; full text in the [Appendix](#))

Robotics: Self-reproducing machines

Nature 435, 163-164 (12 May 2005) Brief Communication

<http://www.nature.com/nature/journal/v435/n7039/abs/435163a.html> (by subscription only; communiqué in the [Appendix](#))

Robots master reproduction

Andreas von Bubnoff

<http://www.nature.com/news/2005/050509/full/050509-6.html>

## **5.6 Buckyballs Might Affect the Environment**

Scientists have found that buckyballs (the C<sub>60</sub> hollow molecule nanospheres), envisioned for use in a wide variety of applications, are soluble in water, and influence the functioning of bacteria. So far, research shows that the particles at a concentration of 0.5 parts per million inhibited bacterial growth and respiration. Several features influence their behavior, including water’s Ph. Thus, buckyballs are not biologically inert. This reveals that more research is necessary to understand buckyballs’ behaviors and influences on the environment, and to guide the development of any eventual regulations concerning nanotechnology applications.

### **Military Implications**

Although—in addition to the other nanotech functions—the antibacterial effect of buckyballs could have many positive applications (e.g. clean-up), the impact on the ecosystem has to be addressed before their industrial production or use. The military should follow and encourage research in this area, and review existing and future buckyball applications in the light of the new findings. Also, as the researchers mention, international regulations will probably emerge to regulate nanotechnology and nanoparticles production and use, to ensure that best practices are applied for human and environment safety.

### **Sources:**

New research raises questions about buckyballs and the environment

[http://www.eurekalert.org/pub\\_releases/2005-05/acs-nrr050905.php](http://www.eurekalert.org/pub_releases/2005-05/acs-nrr050905.php)

C<sub>60</sub> in Water: Nanocrystal Formation and Microbial Response

<http://pubs.acs.org/cgi-bin/abstract.cgi/esthag/asap/abs/es048099n.html>

### **5.7 Sunlight-powered System for Cleaning Water and Produce Electricity**

Scientists from Aberdeen University of Scotland began a three-year research project for developing a “photoelectrocatalytic” fuel cell that would harness sunlight to break down various organic pollutants in water and produce electricity as a byproduct. [See also *New More Efficient Microbial Fuel Cell Cleans Wastewater and produces Hydrogen* in the April 2005 environmental security report.]

#### **Military Implications:**

[Same as for the April item] The Army should encourage feasibility studies for practical usage and scalability for implementation of these ecologically friendly technologies due to their potential for aiding improved mobility and energy efficiency.

#### **Source:**

Harnessing the power of the sun to clean water

Frank Urquhart, The Scotsman: <http://business.scotsman.com/index.cfm?id=457072005>

### **Item 6. Conviction in Transborder Electromagnetic Pollution Case**

Cardinal Roberto Tucci, former head of Vatican Radio's management committee, and the Rev. Pasquale Borgomeo, the station's director general, were convicted by a Rome court for polluting the environment with electromagnetic waves from a transmission tower in the Rome suburb of Cesano, damaging the health of those living nearby. Although under the 1929 Treaty between the Holy See and Italy, Vatican is an independent city-state, Italy's Supreme Court ruled that the case could be tried.

#### **Military Implications:**

This is an interesting legal precedent that might impact any radio transmission that might be considered harmful, including military, disregarding sovereignty. Military legal experts should follow this case for its precedent setting potential beyond Italian borders, given a long history of US and European plaintiffs claiming brain tumors and leukemia from radio frequency and transmission line emissions.

#### **Source:**

Cardinal Convicted in Environmental Case

By Frances D'emilio, May 9, 2005 6:01 PM

<http://www.guardian.co.uk/worldlatest/story/0,1280,-4993374,00.html>

### **Item 7 New Developments for Climate Change**

#### **7.1 Earth is Absorbing an Excess of Solar Energy**

A recent paper in *Science* by NASA scientists reports that Earth is absorbing much more heat than it is losing, a result that adds weight to the pessimistic forecasts on global warming. Their prediction shows a global rise of 1° F. this century even if greenhouse gases remained at their

present level. Some of their new data comes from the Argo ocean sensing project and, combined with readings from other sources, indicates that the planet's surface has a solar energy imbalance of +0.85 watts/square meter.

### **Military implications**

This new contribution to the growing evidence for the catastrophic menace of global warming from greenhouse gases will increase the public outcry and add to the pressure on military activities to severely limit emissions from their activities, by both curtailing operations and improving the environmental characteristics of equipment. Getting ahead of the issue with new approaches to cutting greenhouse gas emissions would be wise, especially those approaches that can be spun out to the public for commercialization.

### **Source:**

Experts Say New Data Show Global Warming

<http://www.enn.com/today.html?id=7640>

## **7.2 Reversal of Global Dimming**

Researchers found that the amount of sunlight reaching the Earth's surface is increasing, and has been for at least the past ten years, reversing a dimming trend that extended over several prior decades. The reasons for these fluctuations are obscure, but it is likely that this brightening, and consequent increased warming, is at least partly due to a decrease in the emission into the atmosphere of particulates and other sunlight-shielding pollutants from industrial operations. If this trend persists, or even stabilizes, it raises doubts as to whether the current forecasts of global warming are pessimistic enough.

### **Military Implications**

The implications for possibly even more severe global warming raised by these new results could increase the demand for more widespread and stringent international controls on climate-affecting activities. The military should be proactive in planning and logistics development for new environment-protecting measures.

### **Source**

Earth Lightens Up

<http://www.arm.gov/science/research/show.php?id=R00077>

From Dimming to Brightening: Decadal Changes in Solar Radiation at Earth's Surface

Science, Vol 308, Issue 5723, 847-850, 6 May 2005

<http://www.sciencemag.org/cgi/content/abstract/308/5723/847?rbfvrToken=d8502253205de84408e9ca3802db700a416cf35b> (full article by subscription only)

## **7.3 UN Meeting Fails to Agree on Post-Kyoto Strategy**

The UN meeting in Bonn trying to extend the spectrum of the Kyoto Protocol after 2012 failed to agree on an international post-Kyoto framework mainly because of EU-US disagreements and major emerging economies that are reluctant to curb their surging greenhouse gas emissions. This two-day seminar attended by delegates from 190 nations, was the first formal UN climate meeting since the Kyoto Protocol entered into force. The next negotiations will be at a meeting of environment ministers in Montreal, Canada, in December. [See also items *8.4 Ambitious*

*Post-Kyoto EU Emissions Goals in March 2005 and 7.1 Kyoto Protocol Came into Force on February 16, 2005 in February 2005 environmental security reports.]*

A recent World Bank study shows that trade in carbon dioxide permits surged this year since the Kyoto Protocol came into force and as the EU launched its "cap and trade" scheme.

### **Military Implications:**

[Same as in the previous reports on this topic] Although the U.S. has not ratified the Kyoto Protocol, its implementation could affect U.S multinationals and military stationed in countries Party to the Convention. The military and its contractors should be prepared to anticipate and accommodate potential changes. Also, as noted in previous reports: the military might be required to provide exact data on their greenhouse gas emissions in countries Party to the Convention. The Kyoto Protocol requires each country that is a Party to the Convention to develop and regularly update a greenhouse gas "inventory" listing its polluting sources. Since the state-of-knowledge of carbon sequestration to address greenhouse gases is not well established, the military should consider the options available and research necessary to develop its own carbon sequestration strategies.

### **Sources:**

Bonn Talks To Promote Progress On Climate Change Convention

<http://www.un.org/News/Press/docs/2005/envdev849.doc.htm>

Post-2012 climate talks stalled at UN conference

<http://www.euractiv.com/Article?tcmuri=tcm:29-139557-16&type=News>

Greenhouse Gas Trade Growing Sharply - World Bank

<http://www.planetark.com/dailynewsstory.cfm/newsid/30772/story.htm>

## **Item 8. Updates on Previously Identified Issues**

### **8.1 Gothenburg Air Pollution Protocol Entered into Force on May 17, 2005**

The Protocol to Abate Acidification, Eutrophication and Ground-level Ozone entered into force on 17 May 2005. The Protocol was originally adopted on 30 November 1999 in Gothenburg (Sweden) and signed by 31 countries. It is the eighth to take effect under the Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe (UNECE). The Protocol sets targets for emission cuts for sulphur dioxide, nitrogen oxides, volatile organic compounds (VOCs), and ammonia, and sets limit values for specific emission sources (e.g. combustion plants, electricity production, dry cleaning, cars and lorries) and requires best available techniques to be used to keep emissions down. [See also item 8.1 *The Gothenburg Protocol on Air Pollution to Enter into Force on May 17* of March 2005, and item 9.2 *Changes to the Convention on Long-range Transboundary Air Pollution* of December 2004 environmental security scanning reports.]

### **Military Implications:**

[Same as in previous reports on this item] The military should study the new requirements and adjust its materiel and practices to comply with the Gothenburg Protocol, as appropriate under Status of Forces Agreements. It should also follow the outcomes of the expert group on fine particles for eventual implications for its operations. The establishment of international air

pollution engineering requirements gives the military the opportunity of adhering to a universal standard rather than multiple countries' standards.

**Source:**

New Air Pollution Protocol to take effect on 17 May 2005

[http://www.unece.org/press/pr2005/05env\\_p02e.htm](http://www.unece.org/press/pr2005/05env_p02e.htm)

## **8.2 New Chemicals Proposed to be Added to Stockholm Convention on POPs**

The Punta del Este meeting of the parties to the Stockholm Convention on Persistent Organic Pollutants (POPs) established a POPs Review Committee that will be responsible for evaluating additional chemicals that can be added to the current list of 12. Four candidate chemicals were given to the Committee, whose first meeting will be held in Geneva later this year, with its recommendations forwarded to future annual meetings of the Conference of the Parties to the Convention. The four candidates for phaseout are: the flame retardant pentabromodiphenyl; the hexachlorocyclohexanes, including the pesticide lindane; the pesticide chlordecone; and the flame retardant hexabromobiphenyl. [See also *Stockholm Convention on Persistent Organic Pollutants (POPs) First Meeting of the Conference of the Parties* in the April 2005, and *Stockholm Convention on POPs Came Into Force this Month* in the May 2004 environmental security scanning reports.]

### **Military Implications**

Although the U.S. is not Party to the Convention, it should be prepared to comply with its requirements when acting in countries Party. Thus, in addition to the preparation for phaseout of the 12 already listed POPs, it should consider the military implications of the additional four new substances and initiate their replacement.

**Sources:**

Governments to take decisive action to implement UN-backed treaty against organic pollutants <http://www.un.org/apps/news/story.asp?NewsID=14200&Cr=pollut&Cr1=>

Stockholm Convention on Persistent Organic Pollutants <http://www.pops.int/>

## **8.3 Meeting of the Parties (MOP-2) to the Aarhus Convention**

The second meeting of the Parties to the Aarhus Convention—UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters—took place in Almaty, Kazakhstan, on 25-27 May 2005. It reviewed progress so far and improvement of its mechanism to increase performance of the Convention's implementation in all regions. It assessed the application of principle 10<sup>1</sup> [access to environmental information at all levels] of the Rio Declaration at both global and regional levels. Agreement was reached on an amendment to the Convention for extending the role of the public in decisions involving genetically modified organisms (GMOs). The declaration adopted by the Ministerial segment of the meeting was not yet available at the time of this writing. [See also related items *Aarhus Clearing House Launched* in September 2004, *Full Application of the Aarhus Convention* in November 2003, *The Aarhus Convention and GMOs* in October 2003 environmental security scanning reports.]

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<sup>1</sup> Principles of Rio Declaration on Environment and Development

<http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163>

**Military Implications:**

[Same as in previous reports on this item] The U.S., although a member of the United Nations Economic Commission for Europe (UNECE), whose member states entered into the Aarhus Convention, is not a signatory to the Convention. However, the U.S. military forces in Europe should comply, within the scopes of respective Status of Forces Agreements, with the environmental laws imposed by the EU on host nations, and the potential secondary ramifications for host nation contractors used by US military forces. Also, the military along with national and regional organizations in the countries Party to the convention could contribute to strengthening environmental democracy by helping the efforts for effective implementation of the Convention.

**Source:**

Aarhus Convention; Second Meeting of the Parties

<http://www.unece.org/env/pp/mop2.htm>

**8.4 Review Conference of the Non-Proliferation Treaty**

In spite of all the current discussions on different forms of nuclear threats, the Review Conference of the Nuclear Non-Proliferation Treaty (NPT) ended its month-long meeting without adopting any significant decisions to improve the NPT and its mechanisms. The three working committees were organized on the main topics of the Treaty: disarmament, verification of safeguards on national nuclear programs, and the peaceful use of atomic energy. No consensus was achieved on any of them and the final document has no “recommendations” section. Yet, many delegates attested their nations’ continuous commitment to push for nuclear disarmament, entry into force of the Comprehensive Nuclear Test Ban Treaty, and other measures to promote nuclear safety. Ambassador Sérgio de Queiroz Duarte (Brazil), President of the Conference, acknowledged, however, that the ways in which the issues have been discussed, the interest of the delegations, the documents presented, and the debates were an important step forward and a great opportunity for the delegations to put forth their nations’ views on how to improve the system of the Treaty. Canadian Ambassador Paul Meyer suggested that annual conferences be held to accelerate progress of the negotiations. Among the positive outcomes of the Conference is the agreement on “indicators of noncompliance” and possible consequences for withdrawal from the treaty.

Meantime, addressing the “Mayors for Peace” conference, UN Secretary-General Kofi Annan called on the world’s mayors to revitalize their view for a global ban on nuclear weapons by 2020 and advance the organization’s Programme to Promote Solidarity of Cities toward the Total Abolition of Nuclear Weapons.

**Military Implications:**

[See also *Multilateral Approach Needed To Keep Nuclear Arms from Terrorists* and *Increasing Calls for Improved Management of Nuclear Materials and Nonproliferation* in the February and January 2005 environmental security monthly scanning reports, respectively.]

The military should seek alternative means that might be more effective to work with the appropriate agencies to facilitate the NPT negotiations to improve global nuclear safety.

**Sources:**

Non-Proliferation of Nuclear Weapons 2005 Review Conference

<http://www.un.org/events/npt2005/>

NPT Conference to Deadlock

[http://www.nti.org/d\\_newswire/issues/2005\\_5\\_27.html#D7AE4A63](http://www.nti.org/d_newswire/issues/2005_5_27.html#D7AE4A63)

Nuclear Weapon Ban only Guarantee They Will Never again Be Used, Says Secretary-General in Remarks to Mayors for Peace

<http://www.unis.unvienna.org/unis/pressrels/2005/sgsm9853.html>

## Item 9. Reports to Review

### 9.1 *Biodiversity Synthesis Report (Millennium Ecosystem Assessment 2)*

The second Millennium Ecosystem Assessment report, *Biodiversity and Human Well-being: A Synthesis Report for the Convention on Biological Diversity (CBD)* was released on May 22 to mark the International Day of Biodiversity. [See the March 2005 ES Report, Item 8.7, for the first in this series of seven similar Millennium Assessment papers] In response to requests for information received through the CBD, the report synthesizes and integrates findings related to biological diversity from the four MA Working Groups: Conditions and Trends, Scenarios, Responses and Sub-global Assessments. The key findings of the report are: in the last 50 years, human actions have changed the diversity of life on the planet more than at any other time in human history; biodiversity is the foundation for human well-being; human activities are leading to the loss of the variety of life; in the past, actions and programs that promoted conservation and the sustainable use of biological diversity limited biodiversity loss; the size of the task ahead of us is so great that the 2010 biodiversity target will only realistically be achieved in certain areas and regions if we engage in substantial efforts.

#### **Military Implications**

The findings of this report re-enforce and add to the previous reports of this kind. The military should review the report's findings and analyze their probable effects on military planning, training and operations. It is likely that these findings will lead to new international restrictions protecting the biosphere from human-caused damage.

#### **Sources:**

MA releases second report: Biodiversity and Human Well-being (news release)

<http://www.maweb.org/en/index.aspx>

Biodiversity and Human Well-being (report downloadable)

<http://www.maweb.org/proxy/document.aspx?source=database&TableName=Documents&IdField=DocumentID&Id=354&ContentField=Document&ContentTypeField=ContentType&TitleField=Title&FileName=CBDSynthesisFINAL.pdf&Log=True>

### 9.2 *Reforming International Environmental Governance: From Institutional Limits to Innovative Reforms*

*Reforming International Environmental Governance: From Institutional Limits to Innovative Reforms* by the UNU addresses the international institutional framework that would best serve global environmental governance. The ad hoc nature of the current over 500 international agreements and institutions dealing with environmental issues around the world complicates the implementation and compliance process of environmental regulations. The contributors suggest institutional reform of the current international environmental governance system and evaluate three potential models: enforcement, centralization, and cooperation through increased coordination and collaboration. They examine the possibilities of improving international

environmental governance by strengthening UNEP and clustering the existent international regulations; a potential World Environment Organization; and the prospect of a World Environment Court; as well as UN reforms.

**Military Implications:**

Relevant military personnel should study the report to evaluate current institutional arrangements and weaknesses and to be prepared for potential institutional and legislative reforms. The report would be a key reference for formulating the military's contributions to policy debates for improving the current international environmental governance system.

**Source:**

*Reforming International Environmental Governance: From Institutional Limits to Innovative Reforms*. Edited by W. Bradnee Chambers and Jessica F. Green. UN University, May 2005  
<http://www.unu.edu/unupress/2005/reforming-ieg.html>

**9.3 Vital Signs 2005**

Worldwatch Institute *Vital Signs 2005* report discusses 35 economic, social, and ecological trends that have crucial impacts on the world's future. It raises awareness and a warning signal on the ecological and social costs of today's unsustainable growth and consumption. The report notes that if present trends and patterns continue, environmental refugees could reach 50 million by 2010.

**Military Implications**

Worldwatch Institute reports are a valuable source of information to feel the pulse of the planet and assess ecological, social, and not lastly, security implications of today's habits. Its findings should be considered in any policymaking—as any decision, in any domain, touches the environment.

**Source:**

*Vital Signs 2005*, Worldwatch Institute  
<http://www.worldwatch.org/pubs/vs/2005/>

**9.4 Nanotechnology: Environmental Implications and Solutions**

Although the book review in *Small Times* says that the title is overstated—the book not offering “solutions”—it presents a comprehensive overview of today's environmental regulations and their current status, addresses pollution issues including control techniques, and does an assessment of nanotechnology referring to its potential health risks, risk communication, and ethical issues. The book appears to be a good source of information both for environmentalists—explaining nanotechnology – and for nanotech scientists—informing about environmental policies and procedures.

**Military Implications:**

Together with the Millennium Project's study on Potential Health and Environmental Implications of use of Nanotechnology, and other literature and information already available, this book might be both a good source of information and an awareness-raising instrument. The overview of environmental regulations might also be of special interest.

**Source:**

Book Review: Eco-Friendly And Nano Smart, In Theory  
By Candace Stuart, *Small Times* Editor-in-Chief  
[http://www.smalltimes.com/document\\_display.cfm?section\\_id=76&document\\_id=9139](http://www.smalltimes.com/document_display.cfm?section_id=76&document_id=9139)



## APPENDIX

### Reference Details

This Appendix contains the full text for the articles that are not available on the Internet or are usually stored for a limited time on the respective Web sites.

### Item 5. Technological Breakthroughs with Environmental Security Implications

#### 5.5 Progress on Self-replicating Robots

##### **Stuff of sci-fi nightmares? An army of robots that reproduce**

By Steve Connor, Science Editor, 12 May 2005

[http://news.independent.co.uk/world/science\\_technology/story.jsp?story=637672](http://news.independent.co.uk/world/science_technology/story.jsp?story=637672) (by subscription only)

It has been the dream - and nightmare - of science fiction writers for decades. Now a team of engineers has conjured up a robot that can reproduce itself.

The robot can self-replicate in much the same way that some living organisms are able to reproduce by cloning themselves.

Although the machine in question serves no useful purpose other than to make copies of itself, scientists believe it has set a precedent for a future in which robots will proliferate on their own.

In the long term, the scientists envisage a day when armies of self-replicating robots will be able mend themselves when broken, expand their population, explore space and even establish self-sustaining colonies on other planets.

Hod Lipson, a mechanical engineer at Cornell University in Ithaca, New York, who led the research team, is one of a number of robot specialists who believes that machines will one day design and build themselves as a form of "artificial life".

"Self reproduction is central to biological life for long-term sustainability and evolutionary adaptation," Professor Lipson writes with his colleagues in the journal *Nature*.

"Although these traits would also be desirable in many engineered systems, the principles of self reproduction have not been exploited by machine design.

"Here we create simple machines that act as autonomous modular robots and are capable to physical self-reproduction using a set of cubes."

Modular cubes called "molecubes", each of which contains the machinery and computer program necessary for replication, are at the heart of the robot's ability to self-replicate.

Electromagnets on each of the cubes' faces allow them to attach and detach themselves to another cube according to the computer's instructions.

This allows a damaged robot to jettison defective cubes and replace them by working ones or for it to construct a separate robot from scratch by building a stack of individual cubes.

When the newly-formed robot reaches a certain height it helps to finish off its own replication by adding the last molecules to its own body.

Professor Lipson said that although the robot they have designed would only work in a laboratory, it would - in theory - be possible to adapt the design to enable self-replication to take place in space or other hazardous environments.

"Self-reproduction is an extreme case of self-repair from an engineering point of view," Professor Lipson said. "Ultimately we hope that we can build machines that can self-repair, especially in a hazardous environment when we need machines to work for an extended period without human maintenance.

"Although the machines we have created are still simple compared with biological systems, they demonstrate that mechanical self-reproduction is not unique to biology. This design concept could be useful for long-term, self-sustaining robotic systems in emerging areas such as space exploration and operation in hazardous environments, where conventional approaches to maintenance are impractical."

The researchers were able to demonstrate a robot made from four modules that could build a replica of itself in two and a half minutes by lifting and assembling the cubes from a "feeding point" on the ground.

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### **Robotics: Self-reproducing machines**

Brief Communication

Nature 435, 163-164 (12 May 2005) | doi: 10.1038/435163a

Victor Zykov<sup>1</sup>, Efsthios Mytilinaios<sup>2</sup>, Bryant Adams<sup>3</sup> and Hod Lipson<sup>1,4</sup>

Self-reproduction is central to biological life for long-term sustainability and evolutionary adaptation. Although these traits would also be desirable in many engineered systems, the principles of self-reproduction have not been exploited in machine design<sup>1</sup>. Here we create simple machines that act as autonomous modular robots and are capable of physical self-reproduction using a set of cubes.

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