

**WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY**  
Subcontract No: 1048, LMI Task No: MAN0B.04, for the U.S. Army Environmental Policy Institute

**JUNE 2011 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.

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## Item 1. International Oceans Agreement in Negotiations

The world is increasingly aware that human actions and climate change are having serious impacts on the oceans. International expert groups have been meeting to create regulations for more sustainable use of the oceans. Recommendations concerning biodiversity preservation and ocean areas beyond national jurisdiction will be made to the 66<sup>th</sup> session of the UN General Assembly to be held on September 13, 2011. A central recommendation will be to develop a multilateral agreement under the UN Convention on the Law of the Sea.

### **Military Implications:**

It is fair to assume that the multiple assessments and calls for improved ocean governance will result in an expanded international legal framework. Although the U.S. is not Party to the UN Convention on the Law of the Sea, relevant military personnel should keep track of these negotiations and contribute to them through appropriate channels, since future military enforcement and impacts seem inevitable.

### **Sources:**

Fourth Meeting of the Ad Hoc Open-ended Informal Working Group to Study Issues Relating to the Conservation and Sustainable Use of Marine Biological Diversity Beyond Areas of National Jurisdiction  
<http://www.iisd.ca/oceans/marinebiodiv4/>

Twelfth Meeting of the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea  
<http://www.iisd.ca/oceans/icp12/>

International Earth system expert workshop on ocean stresses and impacts  
[http://www.stateoftheocean.org/pdfs/1906\\_IPSO-LONG.pdf](http://www.stateoftheocean.org/pdfs/1906_IPSO-LONG.pdf)

Mass Extinction of Ocean Species Soon to Be 'Inevitable'  
<http://www.ens-newswire.com/ens/jun2011/2011-06-21-01.html>

## Item 2. European *E. coli* Outbreak Reveals Gaps in WHO and WTO Rules

The European *E. coli* outbreak has become one of the biggest *E. coli* epidemics in history. WHO reported that by June 5, 2011, 12 outbreaks were reported in 12 European countries, with a total of 2,266 *E. coli*-related cases. The ban on vegetables introduced to curb the spread of *E. coli* affected many countries, revealing problems with the international legal system under the WHO and WTO that regulates responses to disease outbreaks, notes an analysis published in *Insights* by the American Society of International Law. The WTO Agreement on the Application of Sanitary and Phytosanitary Measures does not stipulate compensation to exporting states harmed by unjustified trade restrictions and does not protect non-WTO members. Similarly, the IHR does not have enforceable sanctions for countries that adopt unjustifiably severe traffic and trade restrictions.

### **Military Implications:**

Many low-income countries do not have the capacity to identify and respond to pathogenic threats, which can spread worldwide. Often the militaries of these countries are the most reliable national systems to assist in such emergencies; hence, military-to-military assistance in cooperation with the WHO and WTO should be explored. Ethical considerations related to restrictions of trade and movement should be taken into consideration; as is currently evident, even an epidemic's containment can increase factors of conflict, such as loss of livelihoods.

**Sources:**

International Law and the E. coli Outbreaks in Europe

<http://www.asil.org/insights110606.cfm>

Pandemic influenza preparedness: sharing of influenza viruses and access to vaccines and other benefits

[http://apps.who.int/gb/ebwha/pdf\\_files/WHA64/A64\\_R5-en.pdf](http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_R5-en.pdf)

Novartis welcomes endorsement of Pandemic Influenza Preparedness Framework at World Health Assembly

<http://www.pharmanews.eu/novartis/814-novartis-welcomes-endorsement-of-pandemic-influenza-preparedness-framework-at-world-health-assembly>

**Item 3. OSCE in Ukraine Establishes New Program to Address Economic, Environmental, and Military/Political Challenges in Eastern Europe**

The Organization for Security and Co-operation in Europe (OSCE) Project Coordinator in Ukraine (PCU) has developed an Economic-Environmental/Politico-Military Program to support Ukraine's efforts to implement OSCE commitments. Among other foci, the program will address the clearing of areas contaminated by wartime ordnance and disposal of rocket fuel, and build capacity for combating illegal transboundary transportation of hazardous waste in Eastern Europe.

**Military Implications:**

This initiative may provide a new framework for the military to increase coordination with regional partners in securing hazardous military waste and unprotected nuclear materials.

**Source:**

Economic-environmental & politico-military

<http://www.osce.org/ukraine/45448>

**Item 4. Democratic Republic of the Congo Strengthens Environmental Regulations and Enforcement**

A new law passed by the parliament of the Democratic Republic of the Congo requires companies working in country to submit environmental impact reports. Reportedly, while the details have yet to be finalized by ministers, the new law will apply to all projects—existing and future—in all sectors, from exploitation of raw materials to infrastructure, forestry, and farming.

**Military Implications:**

AFRICOM personnel focusing on environmental security should explore opportunities for cooperation on improved implementation of the new regulations. Also, military coalition forces operating in the DRC should make sure that their actions and those of their contractors comply with the requirements of the new law, as appropriate under Status of Forces or similar agreements.

**Source:**

New Congo Law Demands Environmental Impact Studies

<http://planetark.org/wen/62391>

**Item 5. Myanmar Dam Construction Triggers Internal Conflict on China's Border**

Armed conflicts have erupted in Myanmar's northern Kachin state over construction of large hydropower dams to supply electricity to China. The Kachin Independence Organization had sent a letter to the Chinese government warning that civil war would occur if the construction of the Myitsone Dam on Myanmar's territory proceeds. Construction continued and the Myanmar forces came to the area. The Kachin Independence Army engaged the government's army, casualties have occurred and around 10,000 people have fled the area, some going into China. Fears increase that the fighting will expand to other provinces. The dams on the Dapein River are being built by an association of Chinese companies and the Myanmar Electric Power Enterprise.

**Military Implications:**

This is an example of environment- triggered conflict. As China increases investments in energy and food production in other countries, such conflicts could increase. This could, perhaps should, lead to an international framework to require that development on foreign soil does not adversely affect the livelihood and environment of local citizens. Since much of this investment is increasingly in Africa, AFRICOM might explore the possibilities of such a framework to reduce the likelihood of future conflicts.

**Sources:**

Fighting Erupts Over Chinese Hydropower Dams in Burma

<http://www.ens-newswire.com/ens/jun2011/2011-06-15-01.html>

China Warns Burma Over Fighting

<http://www.rfa.org/english/news/burma/warns-06172011103835.html>

**Item 6. Fast Degradability Adds to Landfill Methane Problem**

A paper by Dr. Morton Barlaz, of North Carolina State Univ.'s Department of Civil, Construction, and Environmental Engineering, calls attention to the fact that the FTC's requirement for quick degradation of "biodegradable" products exacerbates the problem of methane emission from landfills, since the materials tend to degrade before methane collection capabilities are installed.

**Military Implications:**

In view of this new finding and warning, it is likely that some local or even more extensive regulations will emerge, requiring that methane collection systems be installed at landfills. Military installations should try to have methane collection systems installed at landfills they control, and should consider degradation rates in material purchasing decisions.

**Source:**

Study questions the eco-friendliness of biodegradable products

[http://www.gizmag.com/biodegradable-garbage-methane-gas/18765/?utm\\_source=Gizmag+Subscribers&utm\\_campaign=3d63f9d356-UA-2235360-4&utm\\_medium=email](http://www.gizmag.com/biodegradable-garbage-methane-gas/18765/?utm_source=Gizmag+Subscribers&utm_campaign=3d63f9d356-UA-2235360-4&utm_medium=email)

## Item 7. Technological Advances with Environmental Security Implications

### 7.1 New Detection and Cleanup Techniques

#### 7.1.1 Remote Live Video in Rugged Environments

SIE Computing Solutions, Inc. announced its new video streaming system for rugged situational awareness in unmanned vehicles and remote surveillance applications.

#### **Military Implications:**

This technology could be valuable to assist post-conflict environmental cleanup needing UAV applications such as remote surveillance for assessing and monitoring radioactive, chemically, and/or biologically contaminated environments.

#### **Sources:**

SIE Computing Solutions Introduces Application-Ready Video Processing Solution for Rugged Situational Awareness

<http://www.sys-con.com/node/1861227>

SIE Computing Solutions Inc., website

[www.sie-cs.com](http://www.sie-cs.com)

Beyond Electronics Corporation, website

<http://www.beyondelectronics.us/>

#### 7.1.2. Imaging System Designed for Gas Detection

Bruker has launched its HI 90 Hyperspectral Imaging System reported to, “detect, identify and quantify a range of organic molecules that exist in the atmosphere. The HI 90 system can identify and visualize hazardous clouds during chemical accidents or terrorist attacks from long distances. The dispersion, dimensions and direction of travel of the discharged chemicals can be assessed and the source of the cloud can also be located.”

#### **Military Implications:**

The imaging system should be investigated for possible applications to detect and prevent contamination from hazardous gas or chemicals.

#### **Sources:**

Bruker Launches HI 90 Hyperspectral Imaging System

<http://www.azosensors.com/news.aspx?newsID=2826>

Bruker, website

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

#### 7.1.3 Protein Fragments Enable Highly Sensitive Explosive Detection

MIT researchers led by Prof. Michael Strano report developing a highly sensitive detector for nitro-aromatic compounds such as TNT. The technology uses protein fragments called bombolitins that are attached to carbon nanotubes and are sensitive to the nitro-aromatic compounds. The nanotubes fluoresce; when the attached peptide picks up a nitro-aromatic molecule, the fluorescence wavelength changes, a change which is more easily detected than the intensity change produced in other systems. Still to be worked out are techniques for bringing the target molecules to the sensors.

**Military Implications:**

This work should be followed for its possible application in environmental surveillance.

**Sources:**

New sensor developed by MIT chemical engineers can detect tiny traces of explosives

<http://web.mit.edu/press/2011/explosive-detection.html>

Peptide secondary structure modulates single-walled carbon nanotube fluorescence as a chaperone sensor for nitroaromatics

<http://www.pnas.org/content/108/21/8544>

**7.2 Increasing Energy Efficiency Technologies****7.2.1 Nanotech Antennas Increase Conversion Efficiencies of Solar Energy to Electricity**

Separate research teams at Rice University and at the University of Missouri, Chemical Engineering Department, announced “nantennas”-- light, flexible sheets of gold structure that capture infrared light (heat). The team at the University of Missouri asserts the sheets could absorb more than 90% of solar energy (greater use of the spectrum including heat – infrared radiation) and has partnered with Cambridge, MA-based MicroContinuum to convert the captured energy into electricity. The Missouri team-lead, Patrick Pinhero, projects the technology will be ready for production in five years and adaptable to existing systems.

**Military Implications:**

Relevant military personnel should investigate the new technology for its promising efficient energy generation from solar energy.

**Sources:**

New Solar Product Captures Up to 95 Percent of Light Energy

<http://www.sciencedaily.com/releases/2011/05/110516181339.htm>

Report: Photo-detection with Active Optical Antennas, Journal

*Science* <http://www.sciencemag.org/content/332/6030/702.abstract>

**7.2.2 Process for Producing Hydrogen from Ethanol**

A team of scientists from Spain, Scotland, and New Zealand has announced the development of a catalyst-based technique for producing hydrogen, using a combination of sunlight and ethanol at ambient temperature and pressure. They claim their method is less expensive and has a higher yield than previous ones.

**Military Implications:**

The technology should be evaluated for its overall effectiveness, considering the full lifecycle environmental impacts of ethanol and hydrogen technologies.

**Sources:**

Hydrogen generated from sunlight and ethanol

[http://www.gizmag.com/upc-hydrogen-ethanol/18755/?utm\\_source=Gizmag+Subscribers&utm\\_campaign=7566bba00f-UA-2235360-4&utm\\_medium=email](http://www.gizmag.com/upc-hydrogen-ethanol/18755/?utm_source=Gizmag+Subscribers&utm_campaign=7566bba00f-UA-2235360-4&utm_medium=email)

The effect of gold loading and particle size on photocatalytic hydrogen production from ethanol over Au/TiO<sub>2</sub> nanoparticles

<http://www.nature.com/nchem/journal/v3/n6/full/nchem.1048.html>

### 7.2.3 Rotating Mirrors Double Output of Solar Power

Smart Solar International, a spin-off from the University of Tokyo's Research Center for Advanced Science and Technology, will soon start production of a solar power generator in which a row of slowly rotating aluminum mirrors tracking the sun continually directs the moving sunbeams onto a central tube that is packed with high-performance, multi-layered solar cells, protected by an anti-overheating system. The developers claim the technology produces double the output of conventional structures.

#### **Military Implications:**

This product should be investigated for its usefulness as an efficient renewable energy source.

#### **Source:**

Japan firm develops 'sun-chasing' solar panels

<http://www.physorg.com/news/2011-06-japan-firm-sun-chasing-solar-panels.html>

### 7.2.4 Liquid Electrodes Promise Major Battery Improvements

Profs. W. Craig Carter and Yet-Ming Chiang of MIT have described a new form of battery in which the electrodes are composed of particles suspended in a liquid electrolyte and separated by a filter, such as a thin porous membrane. They claim a ten times improvement in energy density over current liquid flow batteries and cheaper manufacturing than conventional lithium-ion batteries. The new technology is being licensed to 24M Technologies of Cambridge MA.

#### **Military Implications:**

The military should investigate this new product for its asserted advantages in energy generation and storage.

#### **Sources:**

New battery design could be breakthrough for electric vehicles and grid storage

<http://www.kurzweilai.net/new-battery-design-could-be-breakthrough-for-electric-vehicles-and-grid-storage>

Semi-Solid Lithium Rechargeable Flow Battery (abstract)

<http://onlinelibrary.wiley.com/doi/10.1002/aenm.201100152/abstract>

### 7.2.5 New Alloy Is Basis for Thermoelectric Generation

Prof. Richard James and colleagues at the Univ. of Minnesota have announced the discovery of a new multiferroic alloy,  $\text{Ni}_{45}\text{Co}_5\text{Mn}_{40}\text{Sn}_{10}$ , which may be able to form the basis for a practical thermoelectric generating system. (Multiferroic is a specialized term of art for some materials exhibiting ferromagnetic properties, but that may lack iron in their composition.)

#### **Military Implications:**

This line of development should be followed as it proceeds toward practical embodiment in a renewable energy system.

#### **Sources:**

New alloy converts heat directly into electricity

<http://www.gizmag.com/alloy-converts-heat-into-electricity/19025/>

The Direct Conversion of Heat to Electricity Using Multiferroic Alloys

<http://onlinelibrary.wiley.com/doi/10.1002/aenm.201000048/abstract>

## Item 8. Updates on Previously Identified Issues

### 8.1 Climate Change

#### 8.1.1 Scientific Evidence and Natural Disasters

Every month for the past 25 years, the global temperature has been higher than the 20<sup>th</sup> century average for that month says the Climate Monitoring Branch at the National Climatic Data Center. Meanwhile, CO<sub>2</sub> emissions reached a record 30.6 metric gigatonnes in 2010— a 1.6Gt rise compared to 2009, mainly from burning fossil fuel, according to IEA estimates. May 2011 Atmospheric CO<sub>2</sub> reached a record 394.35 ppm.

#### 8.1.2 Food and Water Security

The Agricultural Outlook 2011-2020 by OECD and FAO predicts that prices for agricultural commodities will increase over the next decade at an average 20-30% in real terms over the 2001-2010 decade. The FAO warns that climate change will have major impacts on the availability of water for growing food and on crop productivity in the decades to come. The report, *Climate Change, Water, and Food Security*, projects a greater frequency in droughts and floods and underscores that water-scarce areas of the world are expected to become drier and hotter. Similarly, Oxfam report *Growing a Better Future* notes that while the world's population is expected to reach 9 billion by 2050, the average growth rate in agricultural yields has almost halved since 1990. It forecasts that by 2030, the average cost of key crops could increase by 120-180%.

The worst drought in 60 years in the Horn of Africa triggered grain price increases of 30% to 80% in Kenya, and nearly 41% in Ethiopia. The drought affected more than 10 million people in Djibouti, Ethiopia, Kenya, Somalia and Uganda, and the situation continues to deteriorate, says the UN Office for the Coordination of Humanitarian Affairs (OCHA).

The OECD preliminary report on *Green Growth for Food and Agriculture* identifies three priority areas for the agricultural sector: increasing productivity in a sustainable manner; ensuring that markets provide the right signals; and establishing and enforcing well-defined property rights. Meanwhile, the Global Harvest Initiative estimates that the overall investment gap in the agricultural sector in developing countries is approaching \$90 billion annually.

The first meeting of the G20 Agriculture Ministers, from 22-23 June 2011 in Paris, France, adopted an Agriculture Ministerial Declaration and Action Plan on Food Price Volatility and Agriculture that supports initiatives on food production and information exchange. The WFP welcomed the Action Plan, noting that it will ensure that the hungry have access to food in emergencies. Further, a call for the G20 to stop promoting biofuel – policies that many believed have contributed to food price rises – was blocked by Brazil and the US, the two major ethanol producers.

#### 8.1.3 Rising Sea Levels

Present warming in the Arctic indicates that sea levels could rise by up to 5.3 feet (1.6 meters) by 2100, says the Oslo-based Arctic Monitoring and Assessment Program. Similarly, the National Oceanic and Atmospheric Administration said that Greenland's ice sheet melted at its highest rate since data recording began in 1958, while the world's alpine glaciers shrank for the 20<sup>th</sup> year in a row.

#### 8.1.4 Migration

UN Secretary-General Ban Ki-Moon states that environmental degradation and the impacts of climate change are new and important factors causing refugees, adding to the effects of armed conflict—the traditional cause of displacement.

At the Nansen Conference on Climate Change and Displacement in the 21<sup>st</sup> Century, UN High Commissioner for Refugees António Guterres stressed that natural disasters and climate change cannot be addressed in isolation from other global trends such as population growth, urbanization, and water, food, and energy insecurity. He urged countries to adopt new measures to cope with climate-induced displacement within and across borders. Guterres suggested the development of a global guiding framework for situations of cross-border displacement resulting from climate change and natural disasters.

#### 8.1.5 Post-Kyoto Negotiations

The UN Climate Change Conference for continuing negotiation for a post-Kyoto treaty took place in Bonn, Germany, June 6-17, 2011. Critics suggest that the conference did not make enough progress for an ambitious new treaty to be negotiated at the next step, in Durban, South Africa at the end of November.

#### **Military and Security 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. Gap analysis should be on-going, as new information seems to be emerging on a continuous basis. International discourse over climate change is increasing the development of international policies and strategies to mitigate and adapt to climate change.

**Sources:** (see an expanded list in the [Appendix](#))

State of the Climate: <http://www.ncdc.noaa.gov/bams-state-of-the-climate>

Worst ever carbon emissions leave climate on the brink

<http://www.guardian.co.uk/environment/2011/may/29/carbon-emissions-nuclearpower>

Earth's CO<sub>2</sub> Home Page

<http://co2now.org/>

*Climate Change, water and food security*

<http://www.fao.org/docrep/014/i2096e/i2096e.pdf>

*Growing a Better Future*, Oxfam report

<http://www.oxfam.org.uk/resources/papers/growing-better-future.html>

Rising food prices increase squeeze on poor – Oxfam

<http://www.bbc.co.uk/news/world-13597657>

UN on Horn of Africa Drought

<http://www.unmultimedia.org/tv/unifeed/d/17939.html>

OECD-FAO Agricultural Outlook 2011-2020

[http://www.oecd.org/pages/0,3417,en\\_36774715\\_36775671\\_1\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/pages/0,3417,en_36774715_36775671_1_1_1_1_1,00.html)

The G20 Agriculture Ministers meeting

<http://www.g20-g8.com/g8-g20/g20/english/news/news/ministerial-meeting-agriculture.1344.html>

Greenland ice melts most in half-century: US

[http://www.google.com/hostednews/afp/article/ALeqM5jE\\_Zh3AdpeTWxC1NSCTqvugYKvPg?docId=CNG.901f10405411aeeb8554b48d4d3a7341.531](http://www.google.com/hostednews/afp/article/ALeqM5jE_Zh3AdpeTWxC1NSCTqvugYKvPg?docId=CNG.901f10405411aeeb8554b48d4d3a7341.531)

World Refugee Day: UNHCR report finds 80 per cent of world's refugees in developing countries

<http://www.unhcr.org/4dfb66ef9.html>

"People are Increasingly Fleeing their Homes because of Extreme Poverty, Environmental Degradation, Climate Change"

<http://www.unis.unvienna.org/unis/pressrels/2011/unisssgsm275.html>

UN Climate Change Conference June 2011

<http://unfccc.int/meetings/sb34/items/6060.php>

## 8.2 Water Security Strategy for the Arab Region

During the third session of the Arab Water Ministers' Council, taking place in Cairo, Egypt, Ministers agreed to adopt the water security strategy in the Arab region. The strategy will be presented at the Economic and Social Council scheduled to be held in the Arab League in December. [Related item: *Arab Post-Political Turmoil—a Time for Environmental Diplomacy* in March 2011 environmental security report.]

### Military Implications:

[Similar to previous] Relevant military personnel in CENTCOM and AFRICOM should consider plans to offer assistance to the new governing structures in the area in starting or improving environmental security efforts in their territories as part of the general peacebuilding effort.

### Sources:

Arab Water Ministers Council Approves Water Security Strategy

<http://www.sudanvisiondaily.com/modules.php?name=News&file=article&sid=76627>

Opening speech from Loïc Fauchon

[http://www.worldwatercouncil.org/fileadmin/wwc/About\\_us/Governance/President\\_statements/AMCW\\_Ouverture\\_Forum\\_final\\_GB\\_15\\_JUNE\\_2011.doc](http://www.worldwatercouncil.org/fileadmin/wwc/About_us/Governance/President_statements/AMCW_Ouverture_Forum_final_GB_15_JUNE_2011.doc)

## 8.3 New Chemicals Added to the Rotterdam Convention on Prior Informed Consent

The 5<sup>th</sup> meeting of the Conference of the Parties to the Rotterdam Convention on the Prior Informed Consent Procedure (PIC) for Certain Hazardous Chemicals and Pesticides in International Trade was held June 20-24, 2011, in Geneva, Switzerland. The 13 decisions adopted by the COP include adding aldicarb, alachlor, and endosulfan to Annex III of the Convention (chemicals subject to the PIC procedure). The amendments enter into force for all parties on October 24, 2011. No agreement was reached on non-compliance mechanisms and procedures and on the inclusion of chrysotile asbestos in Annex III. The conference also adopted the document on Enhancing Cooperation and Coordination Among The Basel, Rotterdam, and Stockholm Conventions. The document outlines mechanisms for implementing synergies, decisions, and cooperation in areas of common concern, and welcomes the establishment of the Executive Secretary of the three conventions. [Related item: *First Simultaneous ExCOPs for Improving MEAs' Synergies and Coordination* in October 2009 report.]

### Military implications:

Although the inclusion is not a ban, exporting nations should ensure prior consent of the recipient country. Relevant personnel should ensure compliance with the PIC requirements during trans-border movement of the respective substances.

**Sources:**

Fifth Meeting of the Conference of the Parties to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC COP5)

<http://www.iisd.ca/chemical/pic/cop5/>

**8.4 Europe is Negotiating a Legally Binding Agreement on Forests by 2013**

Ministers and high-level delegates participating to the Forest Europe Conference held in Oslo, Norway, June 14-16, 2011, adopted a Mandate for Negotiating a Legally Binding Agreement on Forests in Europe, as well as a decision outlining goals and targets for European forests to 2020. The negotiations are expected to begin this year and to conclude by mid-2013. [Related item: *Sixth UN Forum on Forests Agrees to Multi-Year Work Plan* in February 2006]

**Military Implications:**

The military should keep informed of the new programs and the negotiations of the new binding legal agreement and assess how they might affect the military and its contractors in Europe.

**Sources:**

FOREST EUROPE Ministerial Conference, Oslo, Norway June 14-16, 2011

<http://www.foresteurope2011.org/>

*State of Europe's Forests 2011: Status and Trends in Sustainable Forest Management in Europe*

<http://www.foresteurope.org/?module=Files;action=File.getFile;ID=1613>

**8.5 European Parliament Adopted Directive on Pollution Toll for Trucks**

The European Parliament approved a directive by which EU Member States will charge vehicles of over 3.5 metric tons for air and noise pollution costs. The new Eurovignette rules have yet to be formally approved by the EU Member States. Simultaneously, China and the U.S. are opposing the EU regulation to include their flights in the EU's CO<sub>2</sub> emissions cap-and-trade program. [Related item: *EU Airline Carbon Trading to Start in 2011—a Year Earlier than Planned* in May 2008 report.]

**Military Implications:**

It is not clear at this point if the proposed EU directive applies to all vehicles of over 3.5 metric tons or if there are exemptions including the military. The military should explore impacts on its European operations and consult with allied military forces on the status of military exemptions.

**Sources:**

Charging of heavy goods vehicles (Eurovignette) – 77944

<http://www.europarl.europa.eu/en/media-professionals/content/20110607SHL30278/html/Charging-of-heavy-goods-vehicles-%28Eurovignette%29-77944>

Airline Maneuvers Intensify as E.U. Cap on Jet Emissions Looms

<http://www.nytimes.com/cwire/2011/05/31/31climatewire-airline-maneuvers-intensify-as-eu-cap-on-jet-92252.html>

EU 'won't back down' in China aviation row

<http://euobserver.com/9/32553/?rk=1>

## 8.6 Australia Likely to Adopt a Carbon Tax Soon

Although Australia's government hoped to pass a new regulation on carbon tax by the end of June 2011, the debate continues, as the proposal has yet to win the vote of climate skeptics and those who fear potential negative impacts on the job market. Reportedly, the bill will include a guarantee that the carbon tax will transition to an emissions trading scheme in 2015. [Related item: *Climate Change Issues May Have Determined Australian Election* in November 2007 report.]

### **Military Implications:**

At this point it is not known if the carbon tax would apply to all sectors, including the military. Hence, it would be wise for military contractors and coalition forces on Australian territory to plan for potential extra costs induced by a carbon tax.

### **Sources:**

Australia's Fractious Climate Debate

<http://www.theworld.org/2011/06/australia-to-impose-tax-on-greenhouse-pollution/>

PM pins hopes on climate tax switch

<http://www.smh.com.au/environment/climate-change/pm-pins-hopes-on-climate-tax-switch-20110629-1gra0.html>

## 8.7 Potential Geoengineering Governance Emerging

The UN Intergovernmental Panel on Climate Change (IPCC) convened a team of 60 climate scientists in a consultation process to assess whether or not possible geoengineering methods to address climate change were scientifically sound. The results of the consultations should be included in the IPCC Fifth Assessment Report (AR5), which is scheduled for release in 2014. [Related item: *Geoengineering May Require International Environmental Regulations* in January 2010 report.]

### **Military Implications:**

[Similar to previous on this issue] Since some geoengineering techniques might also be used as weapons, the military should be involved from the very beginning in the discussions and negotiations for writing guidelines and regulations for testing, as well as use, of geoengineering technologies.

### **Sources:**

IPCC asks scientists to assess geo-engineering climate solutions

<http://www.guardian.co.uk/environment/2011/jun/15/ipcc-geo-engineering-climate>

IPCC assesses geoengineering proposals

<http://www.scidev.net/en/news/ipcc-assesses-geoengineering-proposals.html>

We're heading into risky geo-engineering territory

[http://www.embassymag.ca/dailyupdate/view/were\\_heading\\_into\\_risky\\_geoengineering\\_territory\\_06-20-2011](http://www.embassymag.ca/dailyupdate/view/were_heading_into_risky_geoengineering_territory_06-20-2011)

## 8.8 Growing Movement of "Biohackers" Increases Concerns over Biosecurity

A small group of founders is months away from opening the 2,000-square-foot BioCurious Community Lab laboratory space in Mountain View, CA. The lab will provide advanced facilities for "biohackers", the parallel in the DNA world to the computer hackers who have created so much useful software. The ability of amateurs (essentially hobbyists) in basement labs to create, buy, manipulate, splice, and otherwise experiment with DNA offers endless possibilities for new scientific advances; but also, unfortunately, provides chances for inadvertent (or even deliberate)

and possibly catastrophic mischief. [Related item: *Biosafety Regulations Reviewed in Context of Worrying Forecasts* in October 2010 report.]

**Military Implications:**

This could create citizen help in creating safer public and military usage of synthetic biology, assisting some like DHS, EPA, and other civilian agencies to create early warning systems for misuse. It could also increase threats of bioweapons; hence, military liaison with such groups should be explored.

**Sources:**

DIY 'biopunks' want science in hands of people

[http://www.usatoday.com/tech/science/2011-06-01-science-biopunk-hacker\\_n.htm](http://www.usatoday.com/tech/science/2011-06-01-science-biopunk-hacker_n.htm)

BioCurious <http://www.meetup.com/biocurious/>

**8.9 Europe's Sentinel-1 Satellite to Monitor Agriculture and Food Production Security**

In a bid to address increasing challenges to food production, The European Space agency is investigating expanding its Sentinel-1 satellite program beyond marine applications to also deliver new methods for monitoring crops. Sentinel-1 is expected to launch in 2013 as part of Europe's Global Monitoring for Environment and Security Programme (GMES).

**Military Implications:**

This program could be a data and analysis resource for food security issues, for informing military strategy and planning.

**Sources:**

Sentinel-1 to offer new ways of monitoring crops from space

<http://environmentalresearchweb.org/cws/article/yournews/46108>

**8.10 Increasing International Efforts to Address Space Debris**

On June 28, 2011, a piece of debris passed within 335m (1,100ft) of the International Space Station, the closest ever, said NASA. The six-member crew was forced to evacuate into the two Soyuz escape capsules. NASA's Space Surveillance Network is tracking around 16,000 objects larger than 4 inches (10 centimeters). Space junk danger is increasing. Adequate international regulations and enforcement is lacking. [Related item: *Steps for an International Regime for Space Debris and Space Traffic Control System* in May 2009 environmental security report.]

**Military Implications:**

Failure to reach international agreement for updating the Outer Space Treaty triggers new regional programs and directives (with binding or no force). The military should use its alliances with European and other emerging space powers for increased collaboration and improved space regulations and surveillance capabilities.

**Sources:**

Space junk narrowly misses station

[http://www.space-travel.com/reports/Space\\_junk\\_narrowly\\_misses\\_station\\_999.html](http://www.space-travel.com/reports/Space_junk_narrowly_misses_station_999.html)

Scanning the skies for debris hazards

[http://www.esa.int/esaMI/SSA/SEM61NJ4LOG\\_0.html](http://www.esa.int/esaMI/SSA/SEM61NJ4LOG_0.html)

European Endorsement for ESA's Space Hazards Programme

<http://www.sciencedaily.com/releases/2011/06/110617124016.htm>

## 8.11 Nanotechnology Safety Issues

Descriptions of the following nanotechnology issues are in the [Appendix](#)

- White House Issues Principles for Nanotech Application Regulation ([more](#))
- FDA Publishes Proposed Guidelines on Identifying Nanotech Products ([more](#))
- Study Shows Long Carbon Nanotubes Can Be Disease Hazard ([more](#))
- Study on Nano Textiles and Façades Lists Criteria, Points Up Data Lack ([more](#))
- Nanosilver Group's Response to German Institute's Risk Assessment Statement ([more](#))
- "Challenges of Regulation and Risk Assessment of Nanomaterials" Event ([more](#))
- Conference Planned on European Code of Conduct for Nanotechnologies ([more](#))

## Item 9. Reports and Information Suggested for Review

### 9.1 Canada Creates Four Security Scenarios - Energy Security and Global Environmental Change Identified as the Most Serious and Unpredictable Factors that Could Affect Security

The *Army 2040: A First Look* scenarios exercise by the Canadian Department of National Defense found that energy security and global environmental change are the most serious and unpredictable factors that could influence societal change and the Canadian (or any) military. The team identified 12 critical issues that could affect the army over the next 30 years—including demographics, technological advancements, space and cyberspace, availability of resources, and weapons proliferation--which were assessed with respect to uncertainty and potential impact. Four scenarios were built. The dystopic scenario implied unsustainable development with increased global competition for scarce energy resources, including in the Arctic region. The other extreme scenario implies a green development with Canada a world leader in developing alternative energy sources. The global scenario depicts a world with serious environmental problems and high risks of conflicts involving ownership and access to resources—from oil to water, food, and others. The scenarios are now under review and the results will be tested through seminars and war games. The results will be used in designing the new military concept to be delivered around 2015.

#### **Military Implications:**

Military personnel with planning and environmental security responsibilities should review the Canadian security scenarios for input to their own planning.

#### **Sources:**

Alternate futures: Imagining the army of 2040

<http://www.vanguardcanada.com/ImaginingTheArmyOf2040DLCD>

Exclusive: Oil, water shortages, climate change could provoke wars: Report

<http://www.canada.com/technology/Exclusive+water+shortages+climate+change+could+provoke+wars+Report/5019945/story.html>

### 9.2 InforMEA Webportal a One-Stop Shop for Multilateral Environmental Agreements

The "InforMEA" <<http://informea.org>> webportal is designed to give access to multilateral environmental agreements from one location. Launched and managed by the UN Environment

Programme, it now includes 17 MEAs, providing information on the respective MEAs as well as updates and related relevant information (e.g. latest resolutions and upcoming events), as well as national focal points for MEAs states party.

**Military Implications:**

Relevant military personnel and contractors should consult InforMEA on a regular basis for information related to MEAs and eventual developments specific to their area of activity or geographic region.

**Sources:**

"InforMEA" <<http://informea.org>>

UN launches new information portal on Multilateral Environmental Agreements

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=2645&ArticleID=8781&l=en>

**9.3 EU Member States Cooperate to Monitor Geo-hazards**

The 27 EU member states have united under a new project, PANGEO, which will pool European geological data to form a free, online geohazard information portal for public policy makers. The open project will enable access to data on geohazards and their potential socio-economic impacts. The project is funded under the “Space” theme of the Seventh Framework Programme and led by UK mapping specialists Furgo NPA, in support of the European Global Monitoring for Environment & Security (GMES) program. GMES works in partnership with the European Space Agency, European Environment Agency, and Member States.

**Military Implications:**

This program will provide an analysis resource of geohazards that could inform military strategy and planning, as well as support the forecasting of European strategies that allied nations may devise based on the data.

**Sources:**

EU Members unite to research the impact of Geohazards

<http://www.balkans.com/open-news.php?uniquenumber=104458>

Furgo NPA, U.K. company, website

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

**9.4 UN-Energy Newsletter Launched**

The UN-Energy knowledge network has published in June 2011 the first issue of its newsletter. Since UN-Energy Newsletter is the UN mechanism for fostering inter-agency collaboration in the field of energy, the newsletter will feature the latest developments in this sector, with special focus on energy needs and resources, renewable energy, and relevant developments for addressing sustainable energy supply, and alleviation of energy poverty.

**Military Implications:**

Given its authoritative level, it is fair to expect that the UN-Energy Newsletter will provide information on potential new programs and developments in the domain of energy, including trends for new regulations. Relevant military personnel and contractors should consult the Newsletter on a regular basis for such information and assess how it might impact their areas of activity.

**Sources:**

"InforMEA" <<http://informea.org>>

UN launches new information portal on Multilateral Environmental Agreements

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=2645&ArticleID=8781&l=en>

**9.5 Interactive Service Allows Mapping of Population and Climate Change**

Population Action International is offering an interactive service that allows users to generate maps based on data sets such as water supplies, temperature change, agricultural output, reproductive trends, and population increases, and to project how these variables will relate over time. The maps allow for present, short-term (year 2035), and long-term (year 2090) forecasts. They can be regional or global in scope, and are based on UN estimates of population growth.

**Military Implications:**

This analysis and visualization resource may enable military planners to project how countries will adapt and respond to increasing population and related pressures over time.

**Sources:**

Population Action International Interactive Mapping, website

[http://www.populationaction.org/Publications/Interactive\\_Databases/climate\\_map.shtml](http://www.populationaction.org/Publications/Interactive_Databases/climate_map.shtml)

**9.6 Global Reservoir and Dam Database Available**

A worldwide team, coordinated by the Global Water System Project has spent five years constructing the Global Reservoir and Dam database (GRanD), a unique, geographically explicit, high-resolution global database of almost 6900 large dams and reservoirs.

**Military Implications:**

This is a new tool likely to be of interest to military planners and environmental managers. The *physorg.com* review of this work stated, "A close assessment of critical environmental and social tradeoffs associated with dams and reservoirs within the global river network has been impossible because the data describing their location, size and purpose have been incomplete and inadequate. – That is, until now."

**Source:**

Building a better dam map

<http://www.physorg.com/news/2011-06-building-a-better-dam-map.html>

Global Reservoir and Dam Database 1.1:

<http://www.gwsp.org/85.html>

## APPENDIX

### Reference Details

This Appendix contains expanded background information on some items.

### Item 8. Updates on Previously Identified Issues

#### 8.1 Climate Change

**Sources:** (a more expanded list)

##### 8.1.1 Scientific Evidence and Natural Disasters

State of the Climatet: <http://www.ncdc.noaa.gov/bams-state-of-the-climate>

Global Warming Continues as Greenhouse Gas Grows

<http://abcnews.go.com/Technology/wireStory?id=13949844>

Worst ever carbon emissions leave climate on the brink

<http://www.guardian.co.uk/environment/2011/may/29/carbon-emissions-nuclearpower>

##### 8.1.2 Food and Water Security

*Climate Change, water and food security*

<http://www.fao.org/docrep/014/i2096e/i2096e.pdf>

Climate change-related water scarcity to affect global food production – UN

<http://www.un.org/apps/news/story.asp?NewsID=38673&Cr=agriculture&Cr1=>

*Growing a Better Future*, Oxfam report

<http://www.oxfam.org.uk/resources/papers/growing-better-future.html>

Rising food prices increase squeeze on poor – Oxfam

<http://www.bbc.co.uk/news/world-13597657>

Drought in the Horn of Africa

[http://www.unog.ch/unog/website/news\\_media.nsf/%28httpNewsByYear\\_en%29/2A5D86A55FEAC6CFC12578BD004A6757?OpenDocument](http://www.unog.ch/unog/website/news_media.nsf/%28httpNewsByYear_en%29/2A5D86A55FEAC6CFC12578BD004A6757?OpenDocument)

UN on Horn of Africa Drought

<http://www.unmultimedia.org/tv/unifeed/d/17939.html>

Food Insecurity Looms in Parched Horn of Africa

<http://www.nytimes.com/gwire/2011/04/25/25greenwire-food-insecurity-looms-in-parched-horn-of-afric-85405.html?pagewanted=2>

Agriculture: Higher prices here to stay, says OECD-FAO report

[http://www.oecd.org/document/31/0,3746,en\\_2649\\_37401\\_48182047\\_1\\_1\\_1\\_37401,00.html](http://www.oecd.org/document/31/0,3746,en_2649_37401_48182047_1_1_1_37401,00.html)

OECD-FAO Agricultural Outlook 2011-2020

[http://www.oecd.org/pages/0,3417,en\\_36774715\\_36775671\\_1\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/pages/0,3417,en_36774715_36775671_1_1_1_1_1,00.html)

Climate change: major impacts on water for farming

<http://www.fao.org/news/story/en/item/79964/icode/>

Food crisis affects over 10 million in East Africa

[http://news.xinhuanet.com/english2010/world/2011-06/28/c\\_13954839.htm](http://news.xinhuanet.com/english2010/world/2011-06/28/c_13954839.htm)

Annan calls for united action on food security

[http://www.straitstimes.com/BreakingNews/World/Story/STIStory\\_683875.html](http://www.straitstimes.com/BreakingNews/World/Story/STIStory_683875.html)

OECD Preliminary Report on A Green Growth Strategy for Food and Agriculture

<http://www.oecd.org/dataoecd/38/10/48224529.pdf>

GHG Policy Brief

[http://globalharvestinitiative.org/Policy/Private\\_Sector\\_Rural\\_Development.htm](http://globalharvestinitiative.org/Policy/Private_Sector_Rural_Development.htm)

The G20 Agriculture Ministers meeting

<http://www.g20-g8.com/g8-g20/g20/english/news/news/ministerial-meeting-agriculture.1344.html>

G20 agriculture ministers dodge the big questions on food prices

<http://www.guardian.co.uk/global-development/poverty-matters/2011/jun/23/g20-ministers-dodge-big-questions-food>

G20 Ministers Meet To Tackle Surging Food Prices

<http://planetark.org/wen/62389>

### 8.1.3 Rising Sea Levels

Greenland ice melts most in half-century: US

[http://www.google.com/hostednews/afp/article/ALeqM5jE\\_Zh3AdpeTWxC1NSCTqvugYKvPg?docId=CNG.901f10405411aeeb8554b48d4d3a7341.531](http://www.google.com/hostednews/afp/article/ALeqM5jE_Zh3AdpeTWxC1NSCTqvugYKvPg?docId=CNG.901f10405411aeeb8554b48d4d3a7341.531)

State of the Climatet: <http://www.ncdc.noaa.gov/bams-state-of-the-climate>

Global Warming Continues as Greenhouse Gas Grows

<http://abcnews.go.com/Technology/wireStory?id=13949844>

### 8.1.4 Migration

World Refugee Day: UNHCR report finds 80 per cent of world's refugees in developing countries

<http://www.unhcr.org/4dfb66ef9.html>

"People are Increasingly Fleeing their Homes because of Extreme Poverty, Environmental Degradation, Climate Change"

<http://www.unis.unvienna.org/unis/pressrels/2011/unissgsm275.html>

World Refugee Day: UNHCR report finds 80 per cent of world's refugees in developing countries

<http://www.unhcr.org/4dfb66ef9.html>

UNHCR urges states to redefine response to climate-induced displacement

<http://www.unhcr.org/4decc5276.html>

Nansen Conference on Climate Change and Displacement in the 21<sup>st</sup> Century

<http://www.nansenconference.no/>

### 8.1.5 Post-Kyoto Negotiations

Policy Update #9. What Can a Deal in Durban Deliver?

<http://climate-l.iisd.org/policy-updates/what-can-a-deal-in-durban-deliver/>

UN Climate Change Conference June 2011

<http://unfccc.int/meetings/sb34/items/6060.php>

## 8.11 Nanotechnology Safety Issues

Detailed descriptions of the nanotechnology issues

### 8.11.1 White House Issues Principles for Nanotech Application Regulation

The White House Emerging Technologies Interagency Policy Coordination Committee (ETIPC) has developed a set of principles specific to the regulation and oversight of applications of nanotechnology, to guide the development and implementation of policies at the agency level. These principles reinforce an earlier set of overarching principles for the regulation and oversight of emerging technologies and reflect recommendations from a report on nanotechnology by the President's Council of Advisors on Science and Technology.

#### **Military Implications:**

Personnel concerned with nanotech regulation should review this latest guidance, and follow the principles set forth in it.

#### **Sources:**

Responsible realization of nanotechnology's full potential

<http://www.nanowerk.com/news/newsid=21694.php>

Principles for Nanotech Application Regulation

<http://www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/nanotechnology-regulation-and-oversight-principles.pdf>

### 8.11.2 FDA Publishes Proposed Guidelines on Identifying Nanotech Products

The Food and Drug Administration has published Draft Guidance for Industry, Considering Whether an FDA-Regulated Product Involves the Application of Nanotechnology. The agency is inviting comments, and participation in further development.

#### **Military Implications:**

Military personnel concerned with nanotech regulation should read the Guidance's introductory material, and consider further participation in its development.

#### **Sources:**

FDA opens dialogue on nanotechnology regulation

<http://www.nanowerk.com/news/newsid=21755.php>

Considering Whether an FDA-Regulated Product Involves the Application of Nanotechnology

<http://www.fda.gov/RegulatoryInformation/Guidances/ucm257698.htm>

### 8.11.3 Study Shows Long Carbon Nanotubes Can Be Disease Hazard

A study done by Prof. Ken Donaldson and colleagues at the Univ. of Edinburgh in a mouse model has shown that longer carbon nanotubes can get stuck in the lung and cause inflammatory processes and ultimately such diseases as mesothelioma. The scientists are now looking at assessing the level of risk involved, for instance, the distribution of nanofiber length in nanotech workplaces.

#### **Military Implications:**

Personnel concerned with nanotech risk evaluation should take these and future findings from this project into account in risk assessment.

**Sources:**

Nanotubes pose health risk, study shows

<http://www.physorg.com/news/2011-06-nanotubes-pose-health.html>

Length-Dependent Retention of Carbon Nanotubes in the Pleural Space of Mice Initiates Sustained Inflammation and Progressive Fibrosis on the Parietal Pleura

<http://www.journals.elsevierhealth.com/periodicals/ajpa/article/S0002-9440%2811%2900274-4/abstract>

**8.11.4 Study on Nano Textiles and Façades Lists Criteria, Points Up Data Lack**

An in-depth study at the Swiss Federal Laboratories for Materials Science and Technology at St. Gallen concentrated on the risk assessment of engineered nanomaterials in textiles and building façade coatings. It has laid out eight criteria that should be useful in systematically analyzing and interpreting the state of the art on the effects of ENM. The authors point out the grievous lack of data in the field, especially in light of the rapid growth of nanotech usage.

**Military Implications:**

Military personnel involved with nanotech risk evaluation should review the news story, as well as the paper or at least the abstract, for insight into the authors' assessment plan.

**Sources:**

Towards responsible nanotextiles and coatings: a new risk approach

<http://www.nanowerk.com/news/newsid=21858.php>

Environmental and health effects of nanomaterials in nanotextiles and façade coatings

<http://www.sciencedirect.com/science/article/pii/S0160412011000444> (Abstract; purchase or subscription required for full access)

**8.11.5 Nanosilver Group's Response to German Institute's Risk Assessment Statement**

The Silver Nanotechnology Working Group (SNWG) has prepared a statement regarding the German Federal Institute for Risk Assessment (BfR)'s April declaration concerning consumer products containing nanosilver. SNWG claims that BfR ignored presented facts, and lays out rebuttals to BfR's criticisms.

**Military Implications:**

Personnel concerned with nanotech risk assessment should review this rejoinder. (See related item, 9.8.6 German Agency Continues Negative View of Nanosilver in Consumer Goods, in the April 2011 issue of this report.)

**Sources:**

SNWG Responds to BfR's Statement Concerning Nanosilver

<http://nanotech.lawbc.com/2011/05/articles/international/snwg-responds-to-bfrs-statement-concerning-nanosilver/>

SNWG comments on BfR & nanosilver

<http://nanotech.lawbc.com/uploads/file/00076915.PDF>

**8.11.6 "Challenges of Regulation and Risk Assessment of Nanomaterials" Event**

Presentations from the above workshop, held by EC FP7 Project ENPRA (Engineered NanoParticle Risk Assessment), are now online. According to Nanowerk News, "34 experts from

26 different organizations informed the participants on the latest scientific progress in the field of nanoparticles risk assessment produced within national and European projects, and first results of ENPRA ... were presented in detail ... [as well as] recent developments concerning legislation in the EU and beyond".

**Military Implications:**

Personnel concerned with nanotech risk assessment should review the presentations for a view of current work in Europe.

**Sources:**

Presentations now online for "Challenges of Regulation and Risk Assessment of Nanomaterials" event

<http://www.nanowerk.com/news/newsid=21704.php>

Presentations: [http://ihcp.jrc.ec.europa.eu/events\\_workshops/joint-jrc-nano-enpra-2011/program/presentations](http://ihcp.jrc.ec.europa.eu/events_workshops/joint-jrc-nano-enpra-2011/program/presentations)

8.11.7 Conference Planned on European Code of Conduct for Nanotechnologies

The EC FP7 Nanocode Project is planning the Nanocode International Conference, Promoting Responsible Innovation: The Future Of The European Code Of Conduct For Nanotechnologies, September 29th 2011, Hotel Silken Berlaymont, Brussels. According to the announcement, "The Conference will give interested parties a first-hand opportunity to shape the definitive version of the Master Plan and CodeMeter, the tools developed for the further implementation of the Code, and influence the revision of the Code by the European Commission (EC). ... It will also provide insight on practices and policies at international level to figure out a global framework for responsible innovation."

**Military Implications:**

European Theater personnel concerned with nanotech regulation should consider attending the Conference.

**Source:**

Nanocode International Conference

[http://www.nanocode.eu/eventsreg/NANOCODE\\_%20Int\\_Conf\\_Flyer\\_2011\\_Fin.pdf](http://www.nanocode.eu/eventsreg/NANOCODE_%20Int_Conf_Flyer_2011_Fin.pdf)