The Millennium Project
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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

AUGUST 2010 REPORT

Note to Readers: Pages 1-17 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 18.

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Item 1. UN Resolution Acknowledges Access to Clean Water and Sanitation a Human Right

The UN General Assembly adopted a resolution recognizing access to clean water and sanitation as a human right, a move that might be a step forward towards a future treaty. The non-binding resolution received 122 votes in favor, no votes against, while 41 countries abstained—including Australia, Britain, Canada, and the U.S. Introducing the resolution, Bolivia's representative pointed out that more children are killed annually by lack of access to water than by AIDS, malaria and measles combined, while lack of sanitation affects 40% of the world's population.

Military and Related Security Implications:
Military-to-military personnel concerned with water-related causes of conflict should be made aware of this resolution to add justification to their continued or expanded operations. Although the resolution is voluntary, it gives a new rationale to all organizations, including peacekeeping and other military entities, to increase their efforts towards improving the water situation in the regions where they are stationed or are operating. The resolution increases the likelihood that actions by public and private security actors will be scrutinized more often and more thoroughly for their impact on water, up to and possibly including provoking charges of "aggression".

Sources:
General Assembly Adopts Resolution Recognizing Access to Clean Water, Sanitation as Human Right, by Recorded Vote of 122 in Favor, None against, 41 Abstentions
http://www.un.org/News/Press/docs/2010/ga10967.doc.htm
General Assembly declares access to clean water and sanitation is a human right
http://www.un.org/apps/news/story.asp?NewsID=35456&Cr=sanitation&Cr1

Item 2. Food Security Concerns Increase Around the World

The Food Security Risk Index 2010 reveals that the countries most at risk from shocks to food supplies are also among the countries with serious security problems. Rated at most "extreme risk" are: Afghanistan, Democratic Republic of the Congo, Burundi, Eritrea, Sudan, Ethiopia, Angola, Liberia, Chad, and Zimbabwe. The Index, assessing basic food staple risks for 163 countries using 12 criteria, is compiled by Maplecroft and developed in collaboration with the World Food Programme.

Grain prices have soared in August as Russia, the world's third wheat producer in 2009/10, banned grain exports until the end of the year as the fires and worst drought on record ravaged crops. Grain exports from Ukraine, the world's sixth largest wheat exporter, are also facing delays after the introduction of a new system of customs controls. Russia said it would also ask Belarus and Kazakhstan (also major grain exporters and co-members of a regional customs union), to enact a similar ban.

Military and Related Security Implications:
If not already done, the military should consider including the Food Security Risk Index 2010 in their security assessment processes. As food security worsens, increases in protectionism and nationalism could follow.

Source:
African nations dominate Maplecroft's new Food Security Risk Index - China and Russia will face challenges
http://www.maplecroft.com/about/news/food-security.html
Russian Export Ban Raises Global Food Fears
http://online.wsj.com/article/NA_WSJ_PUB:SB10001424052748703748904575410740617512592.html
Putin bans Russia grain exports due to drought
http://news.yahoo.com/s/afp/20100805/ts_afp/russiaheatwavefiresfarmcropscommoditiesgrain_20100805162243

Item 3. Scientists Create 20-Year Roadmap for Nuclear Energy

Scientists at University of Cambridge and Imperial College London have outlined a global plan for nuclear energy to the year 2030. The first stage would replace or extend the life of existing reactors while the second would deploy portable, more efficient reactors with replaceable parts. These scientists claim that flexible "out of the box" modular reactors and those that can be moored offshore would require less maintenance and minimal infrastructural support, have 70-year operational lives, and provide better opportunity for safe radioactive waste recycling.

Military and Related Security Implications:
Military and related security personnel should assess this nuclear roadmap for possible contributions to increasing and/or decreasing the potential for hijacking of nuclear material, as well as improved and safer recycling of nuclear waste and related security issues. A new regulation-inspection-compliance regime would be required and have to be enforced (involving national security decision-makers).

Sources:
Scientists call for a global nuclear renaissance in new study
http://www.physorg.com/news200842486.html
Experts say federal nuclear waste panel overlooks public mistrust
http://www.physorg.com/news200842407.html

Item 4. First U.S.-Russian Environmental Protection Park

The first U.S.-Russian joint environmental protection project is creating the Beringia international conservation park, which will stretch over millions of hectares of Chukotka and Alaska (the Russian side alone might be about 1.8 million hectares.)

Military and Related Security Implications:
This joint venture represents an example of how environmental concerns could improve confidence building among nations. The opening of this park within a year should be used to identify and initiate similar environmental joint projects with other nations. Increasing land areas being set aside for conservation increases the likelihood that future security operations from natural disaster mitigation to conflicts could occur on these lands; hence, new Rules of Engagement would be needed for these situations.

Source:
A breakthrough in Beringia. Russia and the US are creating a giant international park in Chukotka and Alaska
http://rt.com/Top_News/Press/eng/2010-08-25/?fullstory (article in the Appendix)

Item 5. Technological Advances with Environmental Security Implications

5.1 Nanowire Semiconductors for Nano-sensors and Nano-robotics

Zinc oxide has been used to create a transistor utilizing the piezoelectric effect (mechanical motion inducing voltage) that can process logic operations through its interface with the ambient environment. No external electric signal is required to operate the nanotech processor gate. George Institute of Technology scientists who developed it claim that the technology can be joined with sensors and energy-drawing components to create, "self-sustainable, all-nanowire-based, multifunctional self-powered autonomous intelligent nanoscale systems."

Military and Related Security Implications:
The military should follow this development for its potential applicability to hazardous material detection in a variety of situations. Security organizations should also prepare for criminal and terrorist opportunities offered by self-powered and autonomous systems. Scenarios should be written to explore who will be able to control – or deactivate - such systems in strategic, unstable, developing countries where two or more 'sides' might want to exploit such devices.

Sources:
Push-Button Logic on the Nanoscale
http://www.physorg.com/news200213686.html
Strain-Gated Piezotronic Logic Nanodevices
http://onlinelibrary.wiley.com/doi/10.1002/adma.201001925/abstract;jsessionid=3A96C84BCE895C3E76C39F13052E26FA.d02t01

5.2 New Detection and Cleanup Techniques

5.2.1 More Reliable "Kill Switch" Found for Genetically Engineered Microbes
Prof. James Collins and colleagues at Boston University claim development of a highly tunable genetic "switch" offering a high degree of control over genetically engineered microbes, lessening worries about "rogue" organisms escaping into the environment. According to a descriptive article, they have devised a "highly tunable genetic [RNA] 'switch' that … makes it possible to stop the production of a protein and restart it again. The switch, which could be used to control any gene, can also act as a 'dimmer switch' to finely tune how much protein a microbe would produce over time."

Military and Related Security Implications:
This technique should be explored for controlling genetically modified organisms, including biological threats, both intended and accidental. Security organizations should create joint training programs to practice working together with the switch in a variety of security threat situations.

Source:
A 'Kill Switch' for Rogue Microbes
http://www.technologyreview.com/biomedicine/26094

5.2.2 DNA Backbone Provides Foundation for Sensitive New Multi-material Sensor
Prof. Eric Kool of Stanford Univ., Stanford, CA, and colleagues report sticking small sets of sensitive fluorescent detector compounds onto short strands of one of the two long parallel chains of sugar and phosphate molecules forming the backbone of DNA to produce a new, highly effective sensor for organic vapors. The DNA structure provides an ideal framework in which the sensing molecules can react with the target and with each other to produce the indicative effects. Changing the identity and sequence of the attachments along the chain produced different fluorescence patterns for the test materials. This raises the possibility of combining a number of such units into a versatile sensing system for environmentally significant components.

Military and Related Security Implications:
This technique should be evaluated for simple and inexpensive environmental sensing. Security organizations should evaluate this technology in the search for innovative combinations of new and of new-old sensing systems to anticipate future missions, as well as responding to current threats.

Sources:
DNA puts Stanford chemists on scent of better artificial nose
http://news.stanford.edu/news/2010/august/newnose-082310.html
Polyfluorophores on a DNA Backbone: Sensors of Small Molecules in the Vapor Phase
http://onlinelibrary.wiley.com/doi/10.1002/anie.201002701/abstract

5.2.3 Nano-based Olfactory Sensor Offers Diversity, Extreme Miniaturization
Prof. Andrei Kolmakov, of the Physics Dept. at Southern Illinois Univ. at Carbondale, and colleagues, have announced developing a chemical sensing device (an "electronic nose") based on a wedge-like nanowire (nanobelt) of tin dioxide in a new structural configuration providing multiple sensitivities in a single wire. Ultimate sizes for the devices could be in the range of micrometers.

Military and Related Security Implications:
These devices offer the possibility of very small and inexpensive environmental sensing systems; their further development should be closely monitored.

Sources:
Single-Nanobelt Electronic Nose: Engineering and Tests of the Simplest Analytical Element
http://pubs.acs.org/doi/abs/10.1021/nn100435h
'Smart' sand: grain-sized nanotechnology electronic noses are on the horizon
http://www.nanowerk.com/spotlight/spotid=17373.php

5.2.4 New Water Purification Technologies
A new disposable filter that looks like a tea bag and fits into the neck of a bottle reportedly can clean highly polluted water. The inside of the tea bag material is coated with a thin film of

biocides, encapsulated within nanofibers, which kill pathogenic microbes. The bag is filled with active carbon granules that remove all harmful chemicals, e.g., endocrine disruptors. According to the developers, each "tea bag" filter can purify one liter of the most polluted water to the point where it is 100% safe to drink. It is discarded after use. The invention was developed by a team of scientists led by Prof. Eugene Cloete, Dean of the Faculty of Science at Stellenbosch Univ. in South Africa, and is one of the first major projects of the new Stellenbosch Univ. Water Institute.

A team of researchers at Stanford University, Stanford CA, have demonstrated a new water purification technique in which water flows thru electrified (-20 V) cotton cloth dyed with ink containing bactericidal silver nanowires and carbon nanotubes. The electric potential greatly improves the effectiveness of the nanosilver. The high-speed process de-activates 80-90% of the bacteria, but multiple units could be cascaded to produce acceptable reductions, or the device could be used as a preprocessor for other purification systems, reducing their bacterial load.

The *International Journal of Nuclear Desalination* article *Nanotechnology for water purification* offers an overview of nanotech-based devises for water treatment. According to the abstract, "[n]ew sensor technology combined with micro and nanofabrication technology is expected to lead to small, portable and highly accurate sensors to detect chemical and biochemical parameters in water. Potential opportunities and risks associated with this technology are also highlighted."

Military and Related Security Implications:
These developments should be followed as potential contributions to the set of water treatment methods available for mainly remote regions. New water technologies in combination with the increasing view that water is a human right, mean that security actors need to consider water as a key issue in any operations, especially ones outside the national borders of operation participants.

Sources (see an expanded list in the Appendix)
SU scientists develop a high-tech 'tea bag' filter for cleaner water
http://blogs.sun.ac.za/news/2010/07/28/su-scientists-develop-a-high-tech-%E2%80%98tea-bag%E2%80%99-filter-for-cleaner-water/
High Speed Water Sterilization Using One-Dimensional Nanostructures
http://dx.doi.org/doi:10.1021/nl101944e
Nanotechnology for water purification. International Journal of Nuclear Desalination 2010 - Vol. 4, No.1 pp. 49 – 57 (abstract)
http://www.inderscience.com/search/index.php?action=record&rec_id=33766&prevQuery=&ps=10&m=or

5.2.5 Photocatalytic Pavement Removes Nitrogen Oxides from City Air

F. C. Nüdling Betonelemente of Fulda, Germany, has developed the "Air Clean" nitrogen oxide-reducing paving slab, which is coated with photocatalytic titanium dioxide nanoparticles that convert harmful substances such as nitrogen oxides into nitrates that are harmlessly washed away. One test, in Erfurt, indicated an average degradation rate of 20% for NO_2 and 38% for NO.

Military and Related Security Implications:
This material should be evaluated for potential use in military construction to help contribute to improving air quality. A downside is addition of nitrate nutrient to surface water runoff into rivers. Any evaluation of this and other nanoproducts, especially those to be openly exposed to becoming air or waterborne, must take into account nanomaterials' possible negative health and environmental concerns under study, as reported in this and prior environmental security reports.

Source:
Nanoparticle-coated pavement that cleans the air
http://www.nanowerk.com/news/newsid=17444.php

5.2.6 New Index Aids Characterization of Biological Reaction to Nanomaterials
Prof. Xin-Rui Xia and colleagues at NC State University have published a method for predicting how biological proteins will react with nanoparticles of given compositions. According to their paper's abstract, "The method successfully predicted the adsorption of various small molecules onto carbon nanotubes,… the nanodescriptors were also measured for 12 other nanomaterials … [and] can be used to develop pharmacokinetic and safety assessment models for nanomaterials."

Military and Related Security Implications:
This method should be assessed for possible use in nanomaterial risk assessment.

Sources:
An index for characterization of nanomaterials in biological systems. Nature Nanotechnology, 15 August 2010 | doi:10.1038/nnano.2010.164
http://www.nature.com/nnano/journal/vaop/ncurrent/abs/nnano.2010.164.html
Predicting how nanoparticles will react in the human body
http://www.physorg.com/news201094921.html

5.3. Increasing Energy Efficiency Technologies

5.3.1 Experts Say Possible Rare Earth Shortages Not A Real Problem for Electric Cars
In response to questions about the possible shortage or non-availability of the rare earth elements required for much of current electronics, in particular electric cars, experts on The Millennium Project's global-energy listserv have indicated that the problem, for electric cars at least, is, in a sense, illusory: the automotive industry need only move over to switched reluctance motors (SRM), which do not need rare earth components and work better in cars than the current permanent magnet (PM) ones; the real problem is technological inertia – a lack of demand for what is actually a better solution to propulsion. Further, there is currently no availability problem with import of rare-earth-using PM motors.

Military and Related Security Implications:
Relevant military personnel should investigate the pros and cons of the SRM to reduce dependency on rare earth elements for electric vehicles.

Source:
Millennium Project "global-energy" listserve discussion; see this specific post in the Appendix
List Archives: http://mp.cim3.net/forum/global-energy/ (ID and password required)

5.3.2 Solar Energy Conversion System Uses Both Photovoltaic and Thermal Technologies
Prof. Nick Melosh of Stanford University and colleagues have reported a new solar energy conversion technology, "photon enhanced thermionic emission," (PETE) which allows a photovoltaic cell to operate at temperatures over 200ºC, enabling the construction of a solar energy conversion system that utilizes both solar light and heat to produce electricity.

Military and Related Security Implications:
This technology could provide a major increase in the overall efficiency of solar power systems, and should be closely followed for full exploitation as available. Such a system should reduce logistical requirements and could be left behind to help post-conflict local recovery.

Source:
New solar energy conversion process could revamp solar power production
http://www.nanowerk.com/news/newsid=17454.php

5.3.3 New Supercapacitor Design Claims Large Improvements in Energy Storage

Prof. Yury Gogotsi of Drexel Univ., Philadelphia PA, and colleagues have announced the development of a supercapacitor which they describe as having more power per volume comparable to electrolytic capacitors, as well as four orders of magnitude higher capacitance, an order of magnitude higher energy per volume, and three orders of magnitude higher speed. According to the announcement and abstract, the microsupercapacitors are produced by integrating into a microdevice, without the use of organic binders and polymer separators, a component comprising a several-μm-thick layer of onion-like 6–7 nm. carbon spheres, yielding a high surface-to-volume ratio of active material.

Military and Related Security Implications:
When brought to a commercialized level, these devices could provide significant improvements in power supply performance in environmental equipment. Their further development should be followed.

Sources:
Ultrahigh-power micrometre-sized supercapacitors based on onion-like carbon. *Nature Nanotechnology Newsletter* (2010) DOI:10.1038/nnano.2010.162
http://www.nature.com/nnano/journal/vaop/ncurrent/abs/nnano.2010.162.html
International research team develops ultrahigh-power energy storage devices
http://www.physorg.com/news201272263.html

5.3.4 New Window Developments Aim at Saving, Generating Energy

Soladigm, Inc. of Milpitas, CA is working on a line of lower cost electrochromic windows which allow electronic control of the radiation passing through them, keeping out unwanted solar heat in summer and allowing it to pass during winter, thereby reducing air conditioning and heating costs. The windows contain multiple electronic control layers sandwiched between two layers of glass. The company has licensed technology to resolve problems with the idea. Its overall cost-competitiveness with conventional windows, or with low-E windows, that both passively block near-infra-red is uncertain.

EnSol AS, of Bergen, Norway, in cooperation with the Univ. of Leicester, Dept. of Physics and Astronomy, has patented a novel thin film solar cell technology that they claim could be coated as a thin transparent film (on, for example, windows in buildings) to produce power on a large scale. They hope for commercial availability by 2016.

Military and Related Security Implications:
These developments, if/when they reach a level of practical applicability, could make a definite contribution to reducing the environmental footprint of installation buildings and/or provide power to remote or mobile devices. Their progress should be monitored.

Sources:
Making Smart Windows that Are Also Cheap
http://www.technologyreview.com/energy/25989/page1/
Soladigm Company
http://soladigm.com/index.html
New technique announced to turn windows into power generators
http://www2.le.ac.uk/ebulletin/news/press-releases/2010-2019/2010/08/nparticle.2010-08-10.1427638716
EnSol Company
http://www.ensol.no/index.htm

Item 6. Updates on Previously Identified Issues

6.1 Climate Change

6.1.1 Scientific Evidence and Natural Disasters

The *2009 State of the Climate* report released by the U.S. National Oceanic and Atmospheric Administration concludes that there is no doubt that the world is warming. The past decade was the hottest on record, each of the last three decades was warmer than the one before, and the average temperature increased a little over 0.5ºC (0.9ºF) over the past 50 years. The report is based on compilation of 10 indicators, including historical data on temperatures, humidity, sea levels, sea ice, glaciers and spring snow cover going back to 1940 or 1850, depending on the type of data. The results show increases in: temperature of air over land and oceans, and of sea surface; sea level; ocean heat; humidity; and temperature in the troposphere. At the same time, there were decreases in: Arctic sea ice; glaciers; and spring snow cover in the northern hemisphere. The report is the result of collaboration among about 300 scientists from 160 research groups in 48 countries. It makes no comments about the potential causes of warming.

The World Meteorological Organization has published information on the unprecedented sequence of recent extreme weather events. A longer time range is required to determine whether an individual event is attributable to climate change, but the sequence of current events matches IPCC's projections of more frequent and more intense extreme weather events due to global warming, says the WMO. While the northern hemisphere had to deal with extreme heat waves, the southern hemisphere witnessed intense cold and record snows. There are fears that the abnormal weather triggers social and environmental problems around the world.

6.1.2 Melting Glaciers and Sea Ice

A new ice island broke from the Petermann Glacier, one of the two largest remaining glaciers in Greenland. Satellite imagery reveals that the Petermann Glacier lost about 25% of its 43-mile long floating ice-shelf. The new ice island has an area of at least 100 square miles and is 600 feet thick. As it floats towards the Atlantic, there are concerns that it might threaten Canada's offshore platforms and shipping in the area.

Permafrost temperatures during the International Polar Year (2007-09) were 2ºC (3.6ºF) warmer than they were 20 or 30 years ago, found scientists based on data collected from 575 boreholes located throughout North America, Russia and the Nordic region. They also noted that the rate of thawing of cold permafrost is higher than that of warmer permafrost.

6.1.3 Food and Water Security

A study by the FAO and the International Rice Research Institute (IRRI) finds that rising temperatures during the past 25 years have already cut the yield growth rate of rice by 10-20% in several locations in Asia, which currently produces more than 90% of the world's rice.

China's soil erosion has reached nearly 17% of its total land cover. If current trends continue, 40% of food production will be lost in the next 50 years, according to a study led by the Ministry of Water Resources, and science and engineering academies.

The International Center for Agricultural Research in the Dry Areas (ICARDA) released a book of abstracts from the Food Security and Climate Change in Dry Areas meeting held in February 2010, in Amman, Jordan. The abstracts are organized into themes on: scenarios for climate change in dry areas; impacts on natural resource availability, agricultural production systems and environmental degradation; impacts on food security, livelihoods and poverty; mitigation, adaptation and ecosystem resilience; and enabling environments to cope with impacts.

6.1.4 Migration

The website for the Climate Change Displaced Persons Convention Project has added a frequently asked questions (FAQ) section. It gives a comprehensive overview of issues related to climate change-caused displacement.

At the request of Marshall Islands leaders, Michael Gerrard, who leads Columbia Law School's Center for Climate Change Law, issued a call for papers and is organizing a conference on the questions related to national sovereignty of countries (or parts of countries) that might disappear due to rising sea levels; e.g., citizenship of their people, control of offshore rights, etc.

An estimated 18 million people were displaced by the floods in Pakistan—in what is considered the worst natural disaster to date attributable to climate change. In the southern Sindh province, as the Indus River was running at 40 times its normal volume of water, almost one million people were displaced in addition to some 17 million people already displaced by monsoon floods. An estimated 1.2 million homes were destroyed and 3.2 million hectares (7.9m acres) of farmland representing about 14% of Pakistan's cultivated land were damaged, triggering famine and water concerns.

6.1.5 Adaptation

The World Bank's *Synthesis Report on the Economics of Adaptation to Climate Change Study*, estimates the costs of adaptation to climate change to be between $70-100 billion per year between now and 2050. The study argues that investments in adaptation should start with low-regret options: measures that tackle existing weather risks, such as increased investment in water storage in drought-prone basins or protection against storms and flooding in coastal zones and/or urban areas.

On August 16th, the UN launched the Decade for Deserts and the Fight Against Desertification, which will run from 2010 to 2020 with the goal of raising awareness and action to improve protection and management of the world's drylands. The global launch took place in Fortaleza, Brazil, during the Second International Conference on Climate, Sustainability and Development in Semi-arid Regions (ICID 2010).

The UN Secretary-General launched a High-Level Panel on Global Sustainability to "explore approaches for building low-carbon, green and resilient economy" that can efficiently address together poverty and climate change. The High Level Panel's report, to be issued by the

end of 2011, will provide inputs into inter-governmental processes, including the Rio 2012 conference, and the annual meetings of the United Nations Framework Convention on Climate Change (UNFCCC).

The fifth Annual Meeting of the Pacific Disaster Risk Management Partnership Network took place 9-13 August 2010, in Suva, Fiji under the theme "Enhancing the Implementation of the Pacific Disaster Risk Reduction and Disaster Management Framework for Action through a Multi-stakeholder Approach." The meeting aimed to, among other goals, share preliminary findings of the regional progress review in implementing the Regional Framework for Action (RFA) and strengthen South-South Cooperation with the Caribbean community.

6.1.6 Health

The WHO, together with the Pan-American Health Organization (PAHO) and the Government of Costa Rica, organized a meeting in July 2010 to share experiences in evaluating health risks. Representatives from 16 countries discussed draft guidance for health vulnerability and adaptation assessment that was produced by PAHO, and shared their experience in carrying out national assessments. A new version of the guidance incorporating national inputs will be published later this year.

6.1.7 Post-Copenhagen Negotiations

The Bonn negotiations for a post-Kyoto protocol, held August 2-6, 2010, made progress on planning for the substance of the November-December 2010 Climate Change Conference in Mexico It also focused on the scale of emission reductions from Annex I parties to the Protocol subsequent to the 2012 commitment period. The draft text was further developed and will form the basis for negotiations in Tianjin, China, in October, with the outcomes to be considered in Cancún, Mexico, in November.

At the 41st Annual Meeting of the Pacific Islands Forum (PIF), held August 3-6, 2010 in Port Vila, Vanuatu, the leaders of Smaller Island States discussed a consolidated Pacific position for the concurrent Cancun climate change conference, as well as potential international funding mechanisms related to the Copenhagen Accord.

Military and Related Security Implications:
[Similar to previous on this issue] The military should identify all its resources and programs for reducing GHGs and responding to effects of climate change, update information continuously, forecast how it might be called upon for both mitigation and adaptation, and perform a gap analysis in anticipation of future requests. International discourse over climate change is increasing the development of international policies and strategies to mitigate and adapt to climate change. More attention should be given to "joint', 'combined', 'interagency' 'whole of government' and 'one UN' concepts and models to address future adaptation requirements.

Sources: (see an expanded list in the Appendix)
Global warming signs unmistakable: report
http://www.cbc.ca/technology/story/2010/07/29/climate-change-study-noaa.html
WMO Information on Current Extreme
Events: http://www.wmo.int/pages/mediacentre/news/extremeweathersequence_en.html
Greenland glacier calves island 4 times the size of Manhattan, UD scientist reports
http://www.udel.edu/udaily/2011/aug/greenland080610.html

Borehole network confirms, permafrost is thawing worldwide
http://thearcticsounder.com/article/1032borehole_network_confirms_permafrost_is
Hotter nights threaten food security - rice at risk
http://www.fao.org/news/story/en/item/44618/icode/
Climate Change Displaced Persons Convention Project
http://www.ccdpconvention.com/index.html (see FAQ)
If a Country Sinks Beneath the Sea, Is It Still a Country?
http://www.nytimes.com/cwire/2010/08/23/23climatewire-if-a-country-sinks-beneath-the-sea-is-it-sti-70169.html?ref=earth
Synthesis Report on the Economics of Adaptation to Climate Change Study
http://siteresources.worldbank.org/EXTCC/Resources/EACC_FinalSynthesisReport0803_2010.pdf
UN Decade for Deserts and the Fight Against Desertification Website
http://unddd.unccd.int
UN Secretary-General's High-level Panel on Global Sustainability
http://www.un.org/wcm/content/site/climatechange/pages/gsp
Country experiences of assessing health implications of climate change
http://climatehealth.wordpress.com/2010/08/04/country-experiences-on-assessing-health-implications-of-climate-change/
UNFCCC Executive Secretary: Governments make progress towards deciding shape of result at UN Climate Change Conference in Mexico, but need to narrow down number of negotiating options
http://unfccc.int/files/press/news_room/press_releases_and_advisories/application/pdf/pr_20100608_closing_awg_aug.pdf
Climate Change Dominates Pacific Island Forum Meeting
http://climate-l.org/2010/08/04/climate-change-dominates-pacific-island-forum-meeting/?referrer=climate-l.org-daily-feed

6.2 Amendments Adding Nine Chemicals to the Stockholm Convention Entered into Force

Amendments to the Stockholm Convention on persistent organic pollutants (POPs) adding nine chemicals to Annexes A, B and/or C of the Convention entered into force on August 26, 2010 for the 152 of the 170 Parties to the Stockholm Convention that have not submitted a notification or a declaration. The amendments cover the following chemicals: alpha hexachlorocyclohexane; beta hexachlorocyclohexane; chlordecone; hexabromobiphenyl; hexabromodiphenyl ether and heptabromodiphenyl ether (commercial octabromodiphenyl ether); lindane; pentachlorobenzene; perfluorooctane sulfonic acid, its salts, and perfluorooactane sulfonyl fluoride; and tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial pentabromodiphenyl ether). [Related item: *Stockholm Convention Updated with Nine New Chemicals* in May 2009 environmental security reports]

Military Implications and Security Implications:

[Similar to previous on this issue] Although the U.S. is not Party to the Stockholm Convention, since several of these POPs are widely used worldwide, it should be prepared to comply with the requirements when acting in countries Party. Thus, it should consider the military implications of the additional substance phaseouts and find replacements if necessary. Since interoperability among allies depends upon the harmony of acceptance of and compliance with international conventions, security organizations need to remain fully up-to-date on agreements on the status of chemicals, whether or not they or their state is Party to the Convention.

Sources:
Entry into Force of the Amendments adding Nine Chemicals to the Stockholm Convention on Persistent Organic Pollutants on 26 August 2010
http://chm.pops.int/default.aspx
Amendments to global treaty launched to eliminate nine toxic chemicals
http://www.pic.int/Press/Press_release_POPs_Amendment_EIF_2010.08.26_final.doc

6.3 Germany publishes criteria for substances of very high concern

The Federal Institute for Risk Assessment (BfR) has published the criteria for selecting substances of very high concern (SVHC). BfR proposes the chemicals for Germany's REACH (EU Regulation, Evaluation, Authorization and Restriction on Chemicals) candidate list. [Related items: *EU Updates the REACH System, and WEEE and RoHS Directives* in December 2008 and other chemicals-related items in previous environmental security reports.]

Military and Related Security Implications:
The military should familiarize itself with Germany's SVHC criteria to ensure Status of Forces Agreement compliance in Germany, while also continuing to monitor the European Chemicals Agency (ECHA) REACH SVHC authorization process, including prudent military procurement and R&D for safe substitutes.

Sources:
German risk institute publishes SVHC criteria
http://chemicalwatch.com/4742
BfR criteria for the selection of candidate substances for the authorisation procedure under REACH
http://www.bfr.bund.de/cm/290/bfr_criteria_for_the_selection_of_candidate_substances_for_the_authorisation_procedure_under_reach.pdf

6.4 China to Build Support Base for Seabed Exploration

China has announced that it will build a $73 million support base at Qingdao, on the Shandong Peninsula, between Beijing and Shanghai, for its deep-diving submersible research vessel "Jiaolong", designed to dive as deep as 7,000 meters. This emphasizes the increasing role that the seabed will play in the worldwide rivalry for new resources. [Related item: *China Applies for Seabed Mining Permit in Search for New Mineral Resources* in the July 2010 environmental security report.]

Military and Related Security Implications:
Rising interest in exploitation of deep sea resources triggers new types of environmental and security concerns. While deep-sea mining is an old concept, development of technologies and economics of resource shortage now raise this to the level of an emerging national security issue worthy of study. New regulations for deep-sea activities are likely. This is an opportunity to promote collective security, sharing of future benefits, and creating an international response system for deep-sea operations, as well as a topic of resource security.

Source:
China builds base to tap deep-sea energy: state media
http://www.physorg.com/news202104598.html

6.5 CEC's Five-year Strategic Plan Increases North-American Environmental Integration

The annual meeting of the Council of the Commission for Environmental Cooperation (CEC), and consultation with the Joint Public Advisory Committee (JPAC) and the public, held in Guanajuato, presented the CEC's proposed Strategic Plan for 2010–2015. The strategy refocuses the CEC towards a results-centered collaboration between Canada, Mexico and the U.S. on three environmental priorities: 1) healthy communities and ecosystems (which includes management of chemicals of concern); 2) climate change – low-carbon economy (focusing on improving the comparability of data on greenhouse gas emissions, as well as sharing climate change information and adaptation strategies among the three countries); and 3) greening the economy in North America (that includes e-wastes movement within North America and beyond.) The Council also decided to the establish the North American Partnership for Environmental Community Action (NAPECA) as a 5-year grant program supporting partnership-building to improve environmental conditions at the community, local and regional levels. [Related item: *Canada, Mexico, and the USA Met to Strengthen Regional Environmental Regulations* in June 2009 environmental security report.]

In the meantime, Health Canada published the *Report on Human Biomonitoring of Environmental Chemicals in Canada*, an assessment of the levels of 91 chemicals in Canadians. The report presents the results of Cycle 1 of the Canadian Health Measures Survey—a monitoring and research effort assessing chemical exposure. Cycle 2 (2009-2011) is currently being implemented, and planning already began for Cycle 3 (2012-2014). On another related issue, beginning in 2011, the USEPA will require operators of large carbon-emitting operations to submit annual emissions reports for GHGs. General standards are needed for data gathering and monitoring at federal as well as continental level to fulfill CEC's program.

Military and Related Security Implications:
Relevant military personnel should keep track of the CEC's work in view of potential new regulations or directives, as well as effects on collaboration among government agencies, that might affect some military operations and on collaboration among military counterparts.

Sources:
CEC Ministerial Statement. Seventeenth Regular Session of the CEC Council
http://www.cec.org/Page.asp?PageID=122&ContentID=2968
Government of Canada Releases Biomonitoring Data from the Canadian Health Measures Survey
http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/_2010/2010_139-eng.php
Monitoring Greenhouse Gases
http://pubs.acs.org/cen/coverstory/88/8832cover.html

6.6 World's Humid Tropical Forests to Suffer Considerable Biodiversity Change by 2100

A study by Carnegie Institution's Department of Global Ecology reveals that the ecosystems of humid tropical forests will suffer profound changes due to combined effects of climate change and land use. Globally, only 18% to 45% of those forests' biodiversity might remain unchanged by the end of the century. The study identifies by region and ecosystem the combination, as well as the preponderant effect, of the different factors, thereby helping conservationists focus their efforts more efficiently. [Related items: *International Body to Monitor Biodiversity Destruction* in June 2010 and other items on similar issues in previous environmental security reports.]

Military and Related Security Implications:
The study might trigger new regional or international conservation regulations, as well as increased enforcement of the existing ones. In addition to preparedness, relevant military personnel should increasingly include biological diversity and conservation into construction, training, and operations planning and encourage military-to-military exchanges for the transfer of best practices in environmental sustainability. Security organizations, worldwide, should consider being ready to support calls for advice and assistance from countries with "humid tropical forests" which are unable to address threats to their biodiversity. Providing security aid in maintaining national sovereignty of the "forest state" may result in special challenges.

Source:
Global Tropical Forests Threatened by 2100
http://carnegiescience.edu/news/global_tropical_forests_threatened_2100

6.7 Latin American Initiatives for Environmental Security

UNDP and Ecuador have signed an agreement establishing a trust fund to partially compensate the nation for not exploiting an estimated 846 million barrels of crude oil lying under the Yasuní National Park, designated a World Biosphere Reserve in 1989. Costa Rica is also promoting several programs for sustainable energy generation and reforestation aiming to achieve "carbon neutrality" by 2021. Brazil and the U.S. arranged a debt for stewardship arrangement whereby $21 million in debt will be forgiven in exchange for Brazil protecting non-Amazonian tropical forests. A summary of the consultations across the region are presented in the UNDP LAC Regional Biodiversity Initiative Bulletin, Vol. 1 No. 7, of August 27, 2010. [Related item: *UN and Governments of Latin America and the Caribbean Met to Improve Disaster Anticipation and Response System* in September 2008, and EU, *Latin American and Caribbean Countries Environment Cooperation* in March 2008 environmental security reports.]

Military and Related Security Implications:
As part of its actions for addressing security in the region, the military with responsibility in Latin American and the Caribbean (USSOUTHCOM) should (if not already doing so) explore improvements for cooperation with international, national, and regional organizations to help the success of the environmental conservation programs as part of the region's stability strategy.

Sources:
UNDP, Ecuador sign deal to protect Amazon from oil drill
http://content.undp.org/go/newsroom/2010/july/PNUDyEcuadorsuscribenacuerdoparalainiciativaYasuni.en
Working Towards Carbon Neutrality
http://www.ipsnews.net/news.asp?idnews=52407
US converts Brazilian debt into environmental protection
http://news.malaysia.msn.com/business/article.aspx?cp-documentid=4269914
UNDP LAC Regional Biodiversity Initiative Bulletin
http://www.iisd.ca/larc/pdf/larc0107e.pdf

6.8 Possible Conflicts over National/Regional Geoengineering Projects

A study published in *Nature Geoscience* warns that conflicts are possible between those who do and those do not implement "cheap" geoengineering projects. The most likely to be at tried are solar radiation management projects using aerosols inserted into the stratosphere to increase solar

heat reflection, since the effects of such efforts cannot be entirely foreseen even for the areas directly targeted, let alone neighboring ones. Similar warnings were issued by a Science and Technology Committee earlier this year, and by the Met Office. Additionally, an international team of scientists reports that, unless involving extreme measures, geoengineering approaches would have little efficiency in curbing sea levels rising. The findings, assessing five geoengineering approaches were summarized in the paper *Efficacy of geoengineering to limit 21st century sea-level rise*, published by the NAS. [Related item: *Geoengineering May Require International Environmental Regulations* in January 2010 environmental security reports.]

Military and Related Security Implications:
Environmental security personnel should be on the alert for news of any geoengineering projects, and consider possible responses. Geoengineering could have potentially massively disruptive, if not destructive, unintended consequences. Therefore, every security organization should be at least aware of and considering response options to all geoengineering proposals that might be proposed by any parties. Geoengineering could be deliberately weaponized against specific targets and spill over to unintended victims.

Sources:
Regional climate response to solar-radiation management
http://www.nature.com/ngeo/journal/v3/n8/full/ngeo915.html
'Cheap' solar geoengineering plans may have unintended consequences
http://www.theecologist.org/News/news_round_up/562566/cheap_solar_geoengineering_plans_may_have_unintended_consequences.html
Efficacy of geoengineering to limit 21st century sea-level rise
http://www.pnas.org/content/early/2010/08/20/1008153107
Geoengineering won't curb sea-level rise
http://www.nature.com/news/2010/100823/full/news.2010.426.html#B1

6.9 New Forms of Air Conditioning Assuming Larger Role

Restrictions on appliance energy requirements and energy usage are forcing a trend away from the conventional refrigeration-based units and toward other means, such as radiant cooling and evaporative coolers. [Related item: *Only Very Low-Energy Buildings to Be Built in EU after 2020* in May 2010, and *Increasing Energy Efficiency* in July-August 2008 reports.]

Military and Related Security Implications:
Centers such as the Western Cooling Efficiency Center at the University of California at Davis and the National Renewable Energy Laboratory should be consulted and their work monitored so that plans for outfitting new or remodeled buildings can take these important trends and innovations into account.

Source:
Seeking to Cool Air Conditioning Costs
http://news.nationalgeographic.com/news/2010/08/100812-energy-evaporative-air-conditioner/
Air conditioning: Cold comfort
http://www.independent.co.uk/environment/air-conditioning-cold-comfort-2041647.html

6.10 Nanotechnology Safety Issues

More detailed descriptions of the following nanotechnology issues are in the Appendix

- New report shows toxicity of silver nanoparticles increases during storage (more)
- Study shows that single-walled carboxylated nanotubes dispersed in water and exposed to sunlight produce a variety of cell-damaging reactive oxygen species (ROS). (more)
- Pakistan has established a National Commission on Nano-Science and Technology (NCNST) (more)
- ISO TC229 published *Nanotechnologies – Methodology for the classification and categorization of nanomaterials* (more)
- EPA 45-day public comment period for the draft document "Nanomaterial Case Study: Nanoscale Silver in Disinfectant Spray" (more)
- *Nanotechnology Law*, 2010 ed. published (more)
- Encyclopedia of Nanoscience and Society (more)
- Australia publishes two reports on nanotechnology-related safety: *Engineered Nanomaterials: Feasibility of establishing exposure standards and using control banding in Australia* and *Engineered Nanomaterials: Investigating substitution and modification options to reduce potential hazards* (more)
- Mouse model shows reversible reproductive damage from nanotubes (more)
- Buckyball Discovery Conference 10-13 October 2010 (more)

Item 7. Reports and Information Suggested for Review

7.1 NRC Committee Recommends Sequence-based Tracking of Possible Pathogens

The *Sequence-Based Classification of Select Agents: A Brighter Line* report by the National Research Council (NRC) recommends moving to a DNA-sequence-based classification system for the regulation of dangerous pathogens. "The US regulates a list of 82 pathogens and toxins … deemed to pose a biosecurity threat, …[b]ut currently, nothing identifies them beyond taxonomic labels, such as Bacillus anthracis for anthrax.… The report also describes a 'yellow flag' biosafety system that would address sequences of concern — snippets of DNA that are not in themselves select agents, but could be part of one or otherwise used to produce a bioweapon," writes *Nature News.*

Military and Related Security Implications:

Those organizations with biological counter-warfare responsibilities should review this report for potential to improve policy and procedures.

Sources:

Sequence-Based Classification of Select Agents: A Brighter Line
http://www.nap.edu/catalog.php?record_id=12970
US report pins down future biosecurity. Committee recommends a sequence-based system for identifying pathogens
http://www.nature.com/news/2010/100803/full/466678a.html

7.2 Reports Assessing Several Nations' S&T Advances

S&T Strategies of Six Countries: Implications for the United States outlines the S&T infrastructure of Japan, Brazil, Russia, India, China, and Singapore with details of each nation's priorities, weaknesses and areas of expertise, with predictions for each nation's medium term (3- to 5-year) implementation success, including economic and military outcomes. The study finds that the transinstitutional globalization of ST&I networks in conjunction with S&T's centrality to JBRICS economic-security agendas creates a unique challenge to U.S. competitive advantage in information, intelligence and economics. The report recommends the U.S. create better models for international monitoring of S&T while simultaneously creating the alliances, policies and culture that will stimulate U.S. education and investment in innovation and still protect national assets. The report notes that while certain standard indicators of S&T accurately measure some elements of S&T advancement across nations, new country-specific indicators are needed that more succinctly measure nuances of individual country environments.

Ranking the Nations on Nanotech: Hidden Havens and False Threats, a report by Lux Research, assesses 19 nations and ranks them according to the potential of their nanotechnology capabilities using conventional indicators. The authors state that in 2009 some nations significantly increased their spending and commitment to nanotech, while others have surpassed the U.S. in nanotechnology commercialization.

Military and Related Security Implications:
As the DIA requested and sponsored the NRC report, they should ensure it is widely disseminated throughout the military community, particularly to personnel with environmentally-specific, S&T or JBRICS duties.

Sources:
S&T Strategies of Six Countries: Implications for the United States
http://www.nap.edu/catalog.php?record_id=12920
U.S. Risks Losing Global Leadership in Nanotech
http://www.kurzweilai.net/u-s-risks-losing-global-leadership-in-nanotech

7.3 Project on National Security Reform (PNSR) Vision Working Group Report

The "Project on National Security Reform Vision Working Group" is a 3-year study with over 300 national security experts. It assesses the U.S. national security system, recommending a comprehensive reform agenda to prepare the system to meet the challenges of the 21st century. A central recommendation was to introduce foresight into the Executive Branch and into the National Security System via the establishment of a Center for Strategic Analysis and Assessment within the Executive Office of the President.

Military and Related Security Implications:
Military personnel with foresight responsibilities should review this report as to potential impacts on their organizations, budgets, opportunities, and effectiveness. They should also consider how to participate in shaping, establishing, and collaborating with such a center.

Sources:
Project on National Security Reform
http://www.pnsr.org/index.asp
Vision working group Report and Scenarios
http://pnsr.org/data/files/project_on_national_security_reform_vwg.pdf

APPENDIX

Reference Details

This Appendix contains expanded background information on some items.

Item 5. Technological Advances with Environmental Security Implications

5.2 New Detection and Cleanup Techniques

5.2.4 New Water Purification Technologies

Sources (an expanded list)
SU scientists develop a high-tech 'tea bag' filter for cleaner water
http://blogs.sun.ac.za/news/2010/07/28/su-scientists-develop-a-high-tech-%e2%80%98tea-bag%e2%80%99-filter-for-cleaner-water/
Stellenbosch Univ Faculty of Science
http://www.sun.ac.za/science
High Speed Water Sterilization Using One-Dimensional Nanostructures
http://dx.doi.org/doi:10.1021/nl101944e
Nanotechnology membrane for high-speed water sterilization
http://www.nanowerk.com/spotlight/spotid=17790.php
Nanotechnology for water purification. International Journal of Nuclear Desalination 2010 - Vol. 4, No.1 pp. 49 – 57 (abstract)
http://www.inderscience.com/search/index.php?action=record&rec_id=33766&prevQuery=&ps=10&m=or
Nanotechnology for water purification
http://www.eurekalert.org/pub_releases/2010-07/ip-nfw072810.php

5.3. Increasing Energy Efficiency Technologies

5.3.1 Experts Say Possible Rare Earth Shortages Not A Real Problem for Electric Cars

Date: Fri, 27 Aug 2010 11:10:53 -0400
From: Paul Werbos <werbos@ieee.org>
To: Global Energy Network global-energy@mp.cim3.net
Subject: [global-energy] rare earths versus plug-in or electric cars
Address of this specific post: http://mp.cim3.net/forum/global-energy/2010-08/msg00023.html

Last year, I heard some oil company people press very hard on the theme that rare earth shortages
might be a show-stopper to the widespread use of plug-in or electric cars. At the TREM conference of
front-line experts organized by Gal Luft and Anne Korin earlier this year, I heard that the problems

with rare earths and lithium are not nearly as serious as the
doomsayers claimed (because there are
many options on the supply side), but still important.

This still leaves open the question: how much do we have to lose, for
national security or for electric vehicles,
if we lose our access to rare earths?

Two days ago, at IEEE urging, I posed the relevant questions in more
concrete technical terms to
one of the world's leading front-line experts "on the demand side,"
the side of knowing what we actually
need in plug-in and electric cars. First, his answer, and then a
simplified summary of what it implies:

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HIS ANSWER:

Dear Dr. Werbos,

Thanks for your email. The answers to your questions can be long and
detailed and I will be pleased to talk with you or your meetings on
this topic. However, below are the short answers.

1- It is in general true that SRM is better suited for traction than
any other motor. My group at A&M was the first one to report that
after years of theoretical and experimental studies many years ago.
These can be found in papers in my name in IEEE and SAE and also in my
book on EV/HEV/PHEV/FCV. Further, the technical problems of using SRM
to take advantage of its efficiency, etc. have long been solved. For
example I have a series of papers and patents on the control of SRM to
over come these issues. So, that is not the problem. However, the
fact of the matter is that there are still no good suppliers of SRM
for traction or any other application. This in tern inhibits the
manufacturers to use them in their EV/HEV designs. It is a game of
"chicken and egg": no demand no supply, no supply no demand.
Therefore, for these reasons, we cannot compare the SRM with PM
machines for traction. SRM simply is not available. Emerson Electric
tried to produce SRM for users but is backing away due to low volume.

2- For wrong or right reasons PM machines are favored for traction in
the US and abroad. This is a fact. Of course rare earths are
essential for the PM machines for practical reasons. So, this makes
rare earths strategic for vehicles as well as many other applications,
such as disk drives, appliances, etc. HOWEVER, by and large, we do
not produce the PM machines in this country and we just buy them form

foreign manufactures of motors. These manufacturers are in China, Taiwan, Korea, Singapore, etc. So, does this make rare earth magnets strategic to our products? We do not need the materials, we need the components that use the material and the suppliers of components have the materials and would love to sell us the components. These are facts, just like the SRM facts. Here is the "chicken and egg" dilemma again. Can we make the domestic manufacturers of PM motors produce these motors? will they be competitive with the foreign suppliers? Will they do it? if so, then, rare earth magnets are strategic to our country. But, this is not the fact on the ground. Therefore, the problem of rare earth shortage is a theoretical one and not a practical one, just like the SRM problem.

Twenty three years ago I designed an electric propulsion system for a secret Navy smart torpedo. To meet their specifications I had to use foreign produced parts, including rare earth magnets. I reported this to my client and told them that they have to relax the specs so that I can use domestic parts. The answer came down not to worry about the foreign parts! SO, the complexity of the issue is not just limited the commercial world.

Sorry that the answer did not come out tidy and simple. I could have stopped with the simple technical answer. But then that would be misleading and useless. I have been around long enough to know better.
==========

Bottom line -- we know how to produce motors (SRM) to "move the wheels" of plug-ins and electrics which actually work BETTER than the ones which need rare earths (PM), at an affordable cost, but we aren't actually doing it yet because of market failure and myopia. The "cost of substitution" away from rare earths
is not a cost and does not reduce efficiency. It is profit, and an enhancer of efficiency. We should be doing it ANYWAY!!! Looks like a case where action is needed.
And also a case where switching from imports to American jobs would make a lot of sense.

But even if we do keep using the rare earths kind (PM), it doesn't matter much whether the US has access to the rare earths, because we already
buy the motors from overseas anyway. Certainly China sells them. (One major supplier is in Yantai, where I happened to be
on August 6 or so, though for a university-based event.) I wonder if this could be another factor in BYD's ability to make a good plug-in much

cheaper than the Volt is scheduled to be this fall. (There are several other likely factors, of course -- including a desire to make extra initial profit and
to ration an initially limited supply in the face of higher demand.)

Of course, I am not saying anything in this email about the need for rare earths in areas other than cars. I did previously note that photonic fibers may be an upgrade from today's erbium (rare earth) fiber optics, and that new PM-based offshore wind operations may have some difficulties in competing on price with solar farms plus storage. Some of the other applications I know of which require powerful magnets are more suited for superconductors. But small motors which operate at a fixed torque would be more a little more efficient as PM than as SRM. (High efficiency Stirling would work better in some of those applications, but that's another key opportunity the US is squandering right now.)

I have gotten some clarification in the meantime on which groups I met in Changsha have the rare earth extraction technology.

Bottom line: there really shouldn't be a problem here, but an opportunity... but we are presently squandering our opportunities.

All for now.

Best of luck,

Paul

Item 6. Updates on Previously Identified Issues

6.1 Climate Change

Sources: (an expanded list)

6.1.1 Scientific Evidence and Natural Disasters
Global warming signs unmistakable: report
http://www.cbc.ca/technology/story/2010/07/29/climate-change-study-noaa.html
WMO Information on Current Extreme
Events: http://www.wmo.int/pages/mediacentre/news/extremeweathersequence_en.html
Climate change responsible for floods: experts
http://www.dawn.com/wps/wcm/connect/dawn-content-library/dawn/the-newspaper/front-page/climate-change-responsible-for-floods-experts-380
China's Heavy Rains Blamed on Unusual Climate Patterns
http://www.voanews.com/english/news/Chinas-Heavy-Rains-Blamed-on-Unusual-Climate-Patterns--101458654.html

Extreme hot, cold waves torturing world
http://english.peopledaily.com.cn/90001/90777/90852/7088455.html

6.1.2 Melting Glaciers and Sea Ice
Greenland glacier calves island 4 times the size of Manhattan, UD scientist reports
http://www.udel.edu/udaily/2011/aug/greenland080610.html
Greenland's giant island of ice could pose threat to offshore platforms, shipping
http://www.winnipegfreepress.com/world/breakingnews/greenlands-giant-island-of-ice-could-pose-threat-to-offshore-platforms-shipping-100369689.html
Borehole network confirms, permafrost is thawing worldwide
http://thearcticsounder.com/article/1032borehole_network_confirms_permafrost_is

6.1.3 Food and Water Security
Hotter nights threaten food security - rice at risk
http://www.fao.org/news/story/en/item/44618/icode/
Chinese soil experts warn of massive threat to food security
http://www.scidev.net/en/news/chinese-soil-experts-warn-of-massive-threat-to-food-security.html
The Food Security and Climate Change in Dry Areas meeting
http://www.icarda.org/Announcement/2009/IntlConfrnc_FoodSecurity/FoodSecurityAndClimateChangeInDryAreas_2009.htm
Food security and climate change in dry areas: Abstracts (En)
http://icardablog.wordpress.com/2010/07/20/food-security-and-climate-change-in-dry-areas-abstracts-en/

6.1.4 Migration
Climate Change Displaced Persons Convention Project
http://www.ccdpconvention.com/index.html (see FAQ)
If a Country Sinks Beneath the Sea, Is It Still a Country?
http://www.nytimes.com/cwire/2010/08/23/23climatewire-if-a-country-sinks-beneath-the-sea-is-it-sti-70169.html?ref=earth
South Pakistan floods displace a million in 48 hours
http://www.bbc.co.uk/news/world-south-asia-11105661
Pakistan -- a Sad New Benchmark in Climate-Related Disasters
http://www.nytimes.com/cwire/2010/08/18/18climatewire-pakistan----a-sad-new-benchmark-in-climate-re-4283.html (article accessible free for a limited time; full text in the Appendix)

6.1.5 Adaptation
Economics of Adaptation to Climate Change
http://beta.worldbank.org/content/economics-adaptation-climate-change-study-homepage
Synthesis Report on the Economics of Adaptation to Climate Change Study
http://siteresources.worldbank.org/EXTCC/Resources/EACC_FinalSynthesisReport0803_2010.pdf
UN Decade for Deserts and the Fight Against Desertification Website
http://unddd.unccd.int
UN launches decade-long drive to combat desertification
http://www.un.org/apps/news/story.asp?NewsID=35633&Cr=desert&Cr1=

UN Secretary-General's High-level Panel on Global Sustainability
http://www.un.org/wcm/content/site/climatechange/pages/gsp
Pacific Platform 2010
http://www.pacificdisaster.net:8080/Plone/pacific-platform-2010#section-2
UNDP Pacific Centre Press Release
http://www.undppc.org.fj/pages.cfm/newsroom/press-releases/2010/pacific-partnering-with-caribbean-better-mitigation-of-natural-disasters-climate-change-.html

6.1.6 Health
Country experiences of assessing health implications of climate change
http://climatehealth.wordpress.com/2010/08/04/country-experiences-on-assessing-health-implications-of-climate-change/

6.1.7 Post-Copenhagen Negotiations
UNFCCC Executive Secretary: Governments make progress towards deciding shape of result at UN Climate Change Conference in Mexico, but need to narrow down number of negotiating options
http://unfccc.int/files/press/news_room/press_releases_and_advisories/application/pdf/pr_20100608_closing_awg_aug.pdf
Climate Change Dominates Pacific Island Forum Meeting
http://climate-l.org/2010/08/04/climate-change-dominates-pacific-island-forum-meeting/?referrer=climate-l.org-daily-feed

6.10 Nanotechnology Safety Issues
More detailed descriptions of the nanotechnology issues

6.10.1 Toxicity of Silver Nanoparticles Increases During Storage
A new report, co-authored by Prof. Matthias Epple, of the University of Duisburg-Essen, Essen, Germany, shows that the toxicity of silver nanoparticles increases during storage because of their slow dissolution and the consequent release of silver ions. Further quantitative details of the process, e.g. behavior when a containing material is washed, still remain to be investigated.

Military and Related Security Implications:
This line of research needs to be closely followed because of its consequences for the accuracy of nanotech risk assessment.

Sources:
Toxicity of Silver Nanoparticles Increases during Storage Because of Slow Dissolution under Release of Silver Ions
http://pubs.acs.org/doi/abs/10.1021/cm100023p
Toxicity of silver nanoparticles increases during storage
http://www.nanowerk.com/spotlight/spotid=17687.php

6.10.2 Some Types of Nanotubes Produce Harmful Oxygen in Sunlit Water

A study by Chia-Ying Chen and Chad T. Jafvert of the Purdue University School of Civil Engineering, West Lafayette IN, has shown that single-walled carboxylated nanotubes dispersed in water and exposed to sunlight produce a variety of cell-damaging reactive oxygen species (ROS). This generation had been known in the presence of laser light, but not for natural illumination.

Military and Related Security Implications:

These findings need to be taken into account in risk assessment of SWNTs, especially if there is a possibility of their appearance in sunlit aqueous environments.

Sources:

Photoreactivity of Carboxylated Single-Walled Carbon Nanotubes in Sunlight: Reactive Oxygen Species Production in Water
http://pubs.acs.org/doi/abs/10.1021/es101073p (Abstract; full text by subscription)
Shining A Light On Nanotoxicity
http://pubs.acs.org/cen/news/88/i33/8833news5.html

6.10.3 Pakistan Establishes National Nanotech Commission; Environment a Focus

The government of Pakistan has established a National Commission on Nano-Science and Technology (NCNST) with a mandate to help universities and research centers set up nanotech laboratories. Dr. Aftab Ahmed, President of the National Academy of Young Scientists, pointed out that one of the most important applications of nanotechnology is the environment, where nanoparticles significantly increase the efficiency of groundwater pollutants filtration.

Military and Related Security Implications:

This new initiative by the government of Pakistan may offer opportunities for military-to-military cooperation in methods for the management of applying new technology to environmental security.

Source:

Pakistan is striving to grow in Nano technology field
http://regionaltimes.com/06aug2010/moneynews/pakistan.htm

6.10.4 ISO Publishes Methodology for Nanomaterials Classification

The International Organization for Standardization has published a technical report, *ISO/TR 11360:2010, Nanotechnologies – Methodology for the classification and categorization of nanomaterials*, which offers a comprehensive, globally harmonized methodology for classifying nanomaterials. According to *Nanowerk News*, it "introduces a system called the 'nano-tree', which places nanotechnology concepts into a logical context by indicating relationships among them as a branching out tree. The most basic and common elements are defined as the main trunk of the tree, and nanomaterials are then differentiated in terms of structure, chemical nature and other properties."

Military and Related Security Implications:

Personnel concerned with nanotechnology should become familiar with this work, as it will presumably become a standard for communications in the field.

Source:
New ISO methodology demystifies nanomaterials
http://www.nanowerk.com/news/newsid=17691.php

6.10.5 EPA Calls for Comments on Case Study: Nanoscale Silver in Disinfectant Spray
EPA has announced a 45-day public comment period for the draft document *Nanomaterial Case Study: Nanoscale Silver in Disinfectant Spray*. The draft is intended to serve as part of a process to help identify and prioritize scientific and technical information that could be used in conducting comprehensive environmental assessments of selected nanomaterials. It does not attempt to draw conclusions regarding potential environmental risks of nanoscale silver; rather, it aims to identify what is known and unknown about nanoscale silver to support future assessment efforts.

Military and Related Security Implications:
This document covers a wide range of topics, some extending beyond this specific product. Appropriate personnel should review it to determine if comments should be submitted; the deadline is 27 September 2010.

Sources:
EPA releases draft document of silver nanomaterial case study
http://www.nanowerk.com/news/newsid=17642.php
Nanomaterial Case Study: Nanoscale Silver in Disinfectant Spray (Federal Register Notice)
http://www.gpo.gov/fdsys/pkg/FR-2010-08-13/html/2010-20083.htm

6.10.6 Nanotechnology Law, 2010 Edition Published
Nanotechnology Law, 2010 ed., by John C. Monica, "provides a comprehensive treatment of the law related to nanotechnology, with an emphasis on the environment, health, and safety."

Military and Related Security Implications:
The book could be a good source of information for those working in the nanotech domain—from research to production and legal issues—concerning the current state of affairs, as well as trends.

Source:
Nanotechnology Law, 2010 ed., by John C. Monica
http://west.thomson.com/productdetail/160712/40630354/productdetail.aspx

6.10.7 Encyclopedia of Nanoscience and Society
This two-volume work, intended for the general public, provides comprehensive coverage of nanoscience and society issues via some 425 signed entries (with cross-references and suggestions for further readings) that examine the implications of emerging nanotechnologies. A thematic "Reader's Guide" in the front matter groups related entries by broad, general topic areas, such as ethical issues; social issues; environmental issues, etc.. It includes a Chronology, Resource Guide, and Glossary, as well as a detailed index and an online version.

Military and Related Security Implications:
The book could be a good source of information for those working in the nanotech domain, from research to production and legal issues, concerning current the state of affairs, as well as trends.

Source:
Encyclopedia of Nanoscience and Society
http://www.sagepub.com/booksProdDesc.nav?prodId=Book233289&#tabview=features

6.10.8 Australia publishes two reports on nanotechnology-related safety:

According to *Nanowerk News*, the focus of the report *Engineered Nanomaterials: Feasibility of establishing exposure standards and using control banding* in Australia* "is to investigate the feasibility of:
– establishing group-based Australian National Exposure Standards for engineered nanomaterials
– using control banding for engineered nanomaterials in Australia."
[*"Control banding" is a workplace risk assessment technique]
Its discussion begins with a detailed analysis of a similar study done earlier by the British Standards Institution.

Engineered Nanomaterials: Investigating substitution and modification options to reduce potential hazards provides a review of the current state in Australia of nanotech risk assessment and mitigation. The 81-page report presents the results of a "survey of the current substitution/modification practices used in Australian nanotechnology-related activities and a literature review in order to determine the potential substitution/modification options that may reduce the toxicity of engineered nanomaterials used in Australia," says *Nanowerk*. The study was commissioned by Safe Work Australia and conducted by RMIT University, Melbourne.

Military and Related Security Implications:
These reports can provide valuable input to further work on development of nanomaterials exposure standards.

Sources:
Engineered Nanomaterials: Feasibility of establishing exposure standards and using control banding in Australia
http://www.safeworkaustralia.gov.au/NR/rdonlyres/CFEFDBA0-2BD5-4110-A49F-04A4C9032C18/0/Engineered_Nanomaterials_feasibility_establishing_exposure_standards_August_2010.pdf
New Safe Work Australia report investigates feasibility of exposure standards for nanomaterials
http://www.nanowerk.com/news/newsid=17524.php
Engineered Nanomaterials: Investigating substitution and modification options to reduce potential hazards
http://www.safeworkaustralia.gov.au/NR/rdonlyres/A47FBE60-DC28-44A1-A601-653B6EBD3890/0/Investigating_substitution_modification_options_reduce_potential_hazards.pdf
Safe Work Australia publishes reports on methods to reduce the risk of exposure to nanomaterials
http://www.nanowerk.com/news/newsid=17525.php

6.10.9 Mouse Model Shows Reversible Reproductive Damage from Nanotubes
Bing Yan, Director of the High-Throughput Analytical Chemistry Facility at St. Jude Children's Research Hospital, Memphis TN, and colleagues conducted a nanotoxicology study on the impact of carbon nanotubes on male reproductive health in a mouse model. Although the ill effects found were reversible and did not affect the hormonal levels, sperm health, or male mice fertility, the authors emphasize that further studies are urgently needed.

Military and Related Security Implications:
The further research necessary in this area of nanotech EHS should be strongly encouraged.

Source:
No nanotube fertility risk
http://www.rsc.org/chemistryworld/News/2010/August/08081002.asp

6.10.10 Buckyball Discovery Conference to Review Past, Present, and Future of Nanotech
Rice Univ. in Houston, Texas will hold the Buckyball Discovery Conference 10-13 October 2010 in honor of the 25th anniversary of the Nobel Prize-winning discovery of the carbon-60 molecule, the buckminsterfullerene, at Rice. Presentations by leading experts will address all aspects of nanotech development and application, including environmental health and safety.

Military and Related Security Implications:
This conference will offer concerned personnel an opportunity to learn the latest views on questions of nanotech development and EHS and to contribute their own findings..

Source:
Nano's brightest coming to Rice
http://www.media.rice.edu/media/NewsBot.asp?MODE=VIEW&ID=14553

Full text of Articles

A breakthrough in Beringia
Russia and the US are creating a giant international park in Chukotka and Alaska
By Vladimir Solovyev
http://rt.com/Top_News/Press/eng/2010-08-25/?fullstory
(original article in Russian: http://www.kommersant.ru/doc.aspx?DocsID=1492684)

Moscow and Washington have launched a joint environmental mega-project, the first-ever in the history of bilateral relations. Kommersant learned that the two sides have begun creating an international conservation park, Beringia, on the territory of western Chukotka and Alaska.

Currently the park is undergoing interagency co-ordination in Russia and the United States. Russia’s Ministry of Protection of the Environment and Natural Resources (Minprirody) predicts it will be completed as soon as the end of this year. The Russian side of the park alone could take up 1.8 million hectares. At the same time, Moscow has made a proposal to the US to introduce a

visa-free regime for all residents of Chukotka and Alaska, which currently applies only to the indigenous population of these regions.

The warming in US-Russian relations, which began in 2009, has affected not only the sphere of nuclear disarmament, but also the environment. Kommersant learned that Moscow and Washington returned to a long-standing idea to create the international park, Beringia, on the territory of western Chukotka and Alaska, which will stretch over millions of hectares. The proposal to establish the Beringian Heritage Park was endorsed in June 1990 by presidents of the USSR and the US, Mikhail Gorbachev and George H. W. Bush. It was planned that this wildlife reserve will contribute to the protection of the unique regional ecosystem, in particular: aquatic mammals, brown bears, and various types of colonial birds. However, after the collapse of the Soviet Union, Moscow was occupied with other issues, setting protection of biodiversity aside. Now, as reported to Kommersant by Russia's Deputy Foreign Affairs Minister Sergey Ryabkov, the presidents of Russia and the US, Dmitry Medvedev and Barack Obama, have decided to revive the 20-year-old idea and complete the environmental mega-project. "The creation of the Beringia National Park on the territory of Russia and the United States is a project that, with little investment, will make it possible to turn the region into an ecological tourism zone. There are plans to establish flight connections, as well as the necessary transport infrastructure," Mr. Ryabkov told Kommersant. "Recently, Russian Ambassador to the United States Sergey Kislyak visited Alaska to address these issues. We, along with the Americans, are currently at the stage of interagency co-ordination. The project has political support. Thus, we are forming a humanitarian-cultural agenda with the United States."

Russian agencies involved in the project are: Minprirody, Ministry of Economy (Minekonomiki), Ministry of Regional Development (Minregion), and Ministry of Foreign Affairs. Moreover, the project involves the Environment Working Group, focusing on ecological problems and environmental protection, which is part of the US-Russia Bilateral Presidential Commission that was created in 2009 (the group is chaired by Deputy Head of Minprirody Igor Maidanov).

Amirkhan Amirkhanov, deputy director of Minprirody's Department for State Environmental Policy and Protection, told Kommersant yesterday that, within the framework of the joint project, a national park on the territory of Chukotka should first be created, which currently does not exist there. "Today, we are working on creating a Russian national park. The technical drawings are ready, and have already undergone numerous examinations, including ecological. A final decision regarding its area and borders has been made," Mr. Amirkhanov explained to Kommersant. "Now, it's important to come to an agreement with the Defense Ministry and border authorities. America's willingness to do this has been a long-known fact. We have spoken to them and discussed everything".

Initially, the national park in Chukotka was supposed to cover a territory of 3,053 million hectares. However, Amirkhan Amirkhanov says that, for now, it was decided to avoid "gigantomania". However, the preliminary agreements on the size of the future park of federal significance are also impressive. According to the Minprirody official, its total area will cover 1.8 million hectares. As for the scheduled date of completion of creation of the Chukotka park, Mr. Amirkhanov believes that the bureaucratic procedures could be completed by the end of this year: "We need to complete two more stages. First, we need to see an instruction from the

government to create the park. Second, turn the land into protected areas and form a federal agency. With the consideration of the time it will take to coordinate the project, this could be achieved by the end of this year." According to Amirkhan Amirkhanov, the costs for the development of the park are by far "not out-of-the-limit."

W could only start talking about a joint international park with the US only after a Russian park was created. Meanwhile, non-governmental organizations are approving ahead of time the idea of a shared wildlife reserve on the territory of Chukotka and Alaska. "The wording itself – cross-border nature reserve – underlines the unity of nature. Joint monitoring programs, working with the US, that track changes in the environment, could start to operate," Vladimir Krever, co-ordinator of the Biodiversity Program at the World Wildlife Fund, told Kommersant. "It cannot be said that status will drastically change the volumes of financing. It emphasises the global importance of this park all the more so." However, Mr. Krever is not as optimistic when it comes to the timetable for the development of the park: "I hope that our park will open in the middle of 2011, as for the assignment of an international status – that's a prerogative of the Foreign Affairs Ministry".

The practice of creating joint parks with its neighbors is not new for Russia. To date, the trans-border nature reserve with China on Lake Khanka, international nature reserve Dauria with China and Mongolia, as well as the Russian-Finnish nature reserve Druzhba (Friendship) have all been created. Meanwhile, the park in Alaska and Chukotka, for which the US has already selected four districts (Russia's Foreign Affairs Ministry could not name them), will be the first Russian-American project of its kind. Moreover, officials of the Russian Ministry of Foreign Affairs have already addressed a proposal to their American colleagues to introduce a visa-free regime for all the residents of Chukotka and Alaska, without exception. Currently, such regime applies to only the indigenous population of these regions. "We agree in principle to make such concessions. Given the population density there, local authorities and border guards will be able to ensure that no outsiders pass the borders. There, they know the people by name," a source from the Russian Foreign Affairs Ministry told Kommersant. However, according to the diplomat, the US has yet to respond to the proposal.

Pakistan -- a Sad New Benchmark in Climate-Related Disasters
By NATHANIAL GRONEWOLD of ClimateWire
http://www.nytimes.com/cwire/2010/08/18/18climatewire-pakistan----a-sad-new-benchmark-in-climate-re-4283.html

UNITED NATIONS -- Devastating flooding that has swamped one-fifth of Pakistan and left millions homeless is likely the worst natural disaster to date attributable to climate change, U.N. officials and climatologists are now openly saying.

Most experts are still cautioning against tying any specific event directly to emissions of greenhouse gases. But scientists at the World Meteorological Organization (WMO) in Geneva say there's no doubt that higher Atlantic Ocean temperatures contributed to the disaster begun late last month.

Atmospheric anomalies that led to the floods are also directly related to the same weather phenomena that a caused the record heat wave in Russia and flooding and mudslides in western China, said Ghassem Asrar, director of the World Climate Research Programme and WMO. And if the forecasts by the Intergovernmental Panel on Climate Change (IPCC) are correct, then Pakistan's misery is just a sign of more to come, said Asrar.

"There's no doubt that clearly the climate change is contributing, a major contributing factor," Asrar said in an interview. "We cannot definitely use one case to kind of establish precedents, but there are a few facts that point towards climate change as having to do with this."

There's also no doubt that the Pakistan flooding will join the ranks of the worst natural disasters in recorded history.

The flooding started slowly at the end of July and gradually accelerated over the past two weeks. Disaster assessment maps show that almost the entire northern part of Pakistan and most of its central region have been hit.

During the most intense storms, about a foot of rain fell over a 36-hour period. Parts of the affected areas, in particular Khyber-Pakhtunkhwa province (formerly Northwest Frontier province) received 180 percent of the precipitation expected in a normal monsoon cycle. More rain is expected in the days ahead.

Records show that the famed Indus River is at its highest water level ever recorded in the 110 years since regular record-keeping began. Estimates put the number of displaced people at somewhere between 15 million and 20 million, and the government believes about 1,600 are confirmed dead.

6.5 million need food, drinking water and medicine

The International Organization for Migration says the greatest immediate need is in Punjab, where roughly 500,000 families pushed out by the floods are awaiting assistance. All told, agencies guess that about 6.5 million Pakistanis need shelter, food, potable water and medicine.

"This is a disaster which has affected many more people than I have ever seen," said John Holmes, head of the U.N. Office for the Coordination of Humanitarian Affairs, who also leads relief efforts in Haiti.

Zamir Akram, Pakistani ambassador to the U.N. center in Geneva, said floodwaters now cover an area roughly the size of England. Satellite surveys show about 160,000 square kilometers (62,000 square miles) is underwater, or about one-fifth of Pakistan's landmass and roughly equivalent to the areas of Austria, Belgium and Switzerland combined.

Asrar at the WMO says higher-than-average Atlantic temperatures and conditions made ripe by the La Niña cycle of lower temperatures in the central Pacific Ocean created the perfect conditions for the rains. Experts acknowledge that the scale of this disaster has been made worse by a history of deforestation and land-use changes in the affected areas, but Asrar insists that the

sheer volume of precipitation absorbed by clouds and then dumped on Pakistan is chiefly to blame.

Climate scientists at WMO and elsewhere, including those with the U.S. National Oceanic and Atmospheric Administration, say this year's summer is one of the hottest ever, with high temperatures breaking records across the United States, Europe and Central Asia. Consequently, the surface of the Atlantic has also been much warmer than usual.

The IPCC assessment reports note that higher ocean temperatures lead to more water vapor entering the atmosphere. This fact, Asrar said, already pointed toward a stronger than usual monsoon season in store for South Asia.

Abnormal airflow dumps supersaturated air

Normal air patterns would have dispersed this precipitation over as wide an area as possible. But an abnormal airflow caused by La Niña created a ridge of pressure that blocked the warm, saturated air from moving west to east normally, Arar said.

This same ridge prevented the rains from reaching western Russia, where a severe drought has been blamed for raging wildfires and the destruction of 20 percent of the wheat crop there. And with nowhere else to go, Pakistan and China's far west bore the brunt when the clouds became too saturated with moisture and opened up.

"Basically, this rift that was forming blocked the warm air moving from west to east, and then, on the other side, this air that was super saturated with water vapor had to precipitate all this excess water that was in the atmosphere, which created this unprecedented amount of rain in short period of time," Asrar explained. "The connecting factor is that clearly the warming is a driver for all these events."

The United Nations says that $459 million is need for international and nongovernmental relief agencies to respond to the disaster. About 35 percent of that appeal is now funded, mostly by contributions from the U.S. and U.K. governments.

Donations from other corners and the private sector have been slow in coming, though aid officials are reporting an uptick in contributions in recent days.

"The response has been a bit slower than perhaps with other disasters but definitely donations are starting to come now," said Airlie Taylor at the London offices of ActionAid International. "I think the world is now starting to wake up to the magnitude of the crisis."

The International Federation of Red Cross and Red Crescent Societies (IFRC) is asking for $16 million in donations to buffer the emergency relief activities of the Pakistan Red Crescent Society.

Though more rain is expected and the southern reaches of the country can expect further flooding as the rivers drain out, rumors that India might release even more water from dams

upstream are causing a panic in some areas. Pakistani authorities say the rumors are baseless and are desperately trying to get the word out to prevent a spread of disorder.

"The data collected about the Indian dams on Ravi, Sutlej and Beaus Rivers indicate that these dams are not yet filled to their capacity and further no flood producing strong monsoon rainy system is in sight," said Qamar-uz-Zaman Chaudry, head of the Pakistan Meteorological Department, in a release. "As such we may not expect that India would release sudden flood water in these rivers in the next five to ten days at least."

Hundreds of thousands of homes lost

Hundreds of thousands of homes have been completely swept away all over the country, and several communities have been cut off from the outside world as floodwaters washed bridges and roads away. Officials don't yet know what the full cost of recovery will be, but all expect it to be tremendous -- Akram in Geneva told reporters that the cost to rebuild Khyber-Pakhtunkhwa province, one of the hardest hit, would be at least $2.5 billion.

"The needs on the ground require a massive response," said IFRC chief Bekele Geleta. "It's not just about saving people's lives today; we need to plan for their long-term recovery tomorrow."

The litany of weather incidents during the summer of 2010 reads like the latest Hollywood global disaster movie.

The hottest summer ever recorded in 130 years has sparked thousands of wildfires in Russia, burning some entire villages to the ground, killing 53 and leaving 3,500 homeless, according to Russian state media. Cooler temperatures are finally bringing some relief, shrinking the extent of the flames from more than 100,000 acres down to about 54,000 acres.

Next to Pakistan, record rainfall and subsequent flooding and mudslides in western China are estimated to have left roughly 1,200 dead and scores more homeless. China's government has been handling that crisis on its own and has yet to appeal for international support.

Russia's drought has reduced its wheat crop by 20 percent, and droughts in Canada are anticipated to reduce the crop there by an equal proportion. Though the Food and Agriculture Organization says the United States alone has enough grain in storage to meet the gap, the U.S. Department of Agriculture put out a warning last week that reduced yields from droughts in Europe and Africa have lowered food stores to levels close to those seen just before the onset of the 2007 food crisis in the developing world.

Less reported, on Aug. 5, a sensor on a NASA satellite recorded a massive chunk of ice breaking off a glacier in Greenland. The huge block measures more than 77 square miles in size and is one of the largest calving incidents witnessed in the Northern Hemisphere.

Asrar and other WMO officials argue that the evidence linking all these events to climate change is strong.

"The occurrence of all these events at almost the same time raises questions about their possible linkages to the predicted increase in intensity and frequency of extreme events, for example, as stipulated in the IPCC Fourth Assessment Report published in 2007," WMO says in a report.