U.S. Pacific Command

Pacific Environmental Security Conference

CENTER for STRATEGIC LEADERSHIP

CSL

U.S. Army War College

March 14-17, 2011
Honolulu, Hawaii

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
MAR 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
2011 Pacific Environmental Security Conference (PESC)	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **U.S. Army War College,Center for Strategic Leadership,650 Wright Avenue ,Carlisle,PA,17013-5049**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**164**	

Pacific Environmental Security Conference
Honolulu, Hawaii
March 13-15, 2011

2011 Pacific Environmental Security Conference (PESC)

March 14 – 17, 2011
Honolulu, Hawaii

March 2011 PESC
Acknowledgement Page

PESC Event Team

Mr Chris Sholes, US Pacific Command, Environmental Program Manager, Event Coordinator

Col Raymond Tsui, US Pacific Command, TCEM, ODC/Guest coordinator

LTC Mike Jelen, US Pacific Command, TCEM, Deputy Event Coordinator

LTC Kevin Thomas, US Pacific Command, TCEM, Hotel Coordinator

LTC Jonathan Ostil, US Pacific Command, TCEM, Webmaster/Registration/Ground Transport

LN1 Gabriela Guerrero, US Pacific Command, TCEM, Administration/ Logistics Cell

YN2 Suzanne Bluhm, US Pacific Command, TCEM, Administration/ Logistics Cell

ODC-Office of Defense Cooperation TCEM-Theater Contingency Engineering Management

Dr Kent Butts, Center for Strategic Leadership, Speaker and Panel Leader

Professor Bernard F. Griffard, Center for Strategic Leadership, Master of Ceremonies

Mr Todd Wheeler, Center for Strategic Leadership, Event Design and Coordination

COL Phil Jones, Center for Strategic Leadership, Proceedings Recorder

COL Doug Charney, Center for Strategic Leadership, Proceedings Recorder

PESC Report Editing Team

Mr. Todd Wheeler, Center for Strategic Leadership, Team Lead

COL Cheryl Ludwa, Center for Strategic Leadership, Lead Editor

COL John Melville, Center for Strategic Leadership, Assistant Editor

COL David Mead, Center for Strategic Leadership, Assistant Editor

LTC Tim McGowan, Center for Strategic Leadership, Assistant Editor

COL Steve Carney, Center for Strategic Leadership, Assistant Editor

Mr Brent Bankus, Center for Strategic Leadership, Assistant Editor

Ms. Jennifer Nevil, Network Enterprise Center, Desktop Publisher

Table of Contents

Forward

Environmental issues are widely recognized as contributing factors to instability and conflict. The Center for Strategic Leadership of the US Army War College has been known for its subject matter expertise in the area of environmental security for nearly two decades and in particular has had the opportunity to work with the Geographic Combatant Commands to embed environmental security in their engagement and security cooperation programs.

CSL is proud to have been able to continue our support of the US Pacific Command (PACOM) and its component command, the US Army, Pacific, as they partnered with the Defense Environmental International Cooperation program, the Asia Pacific Center for Security Studies, and the Center for Excellence in Disaster Preparedness and Response to address destabilizing environmental issues in the region. The Pacific Command has long used the concept of environmental security as an engagement vehicle to address such critical variables as combating terrorism, promoting multilateral cooperation, and building host nation capacity to prepare for and respond to devastating natural disasters.

This year's Pacific Environmental Security Conference, hosted by the Pacific Command J4, opened a new chapter in PACOM's environmental security engagement program, and addressed current internal security issues in the context of the new PACOM Commander, Admiral Willard's, vision for the region. The event brought together 15 Asia-Pacific nations to share their best practices in addressing such important security issues as disaster preparedness, climate change, and water security. The exchange of ideas that resulted, allowed all participants to learn from the experiences of regional states, such as Indonesia, in dealing with catastrophic as well as slow onset environmental threats to security and stability.

These proceedings sought to capture those ideas and experiences so that subsequent environmental security conferences may build upon the substantial base created by the sharing of ideas. CSL is honored to have been given the responsibility of preparing these proceedings and looks forward to the results of future conferences.

Douglas B Campbell, Director,
Center for Strategic Leadership.

Executive Summary

2011 Pacific Environmental Security Conference (PESC)

14-17 March 2011 Honolulu, Hawaii

Background

On March 14-17, 2011, the United States Pacific Command (USPACOM) enlisted the Center for Strategic Leadership's National Security Issues Group to develop the conference to discuss regional environmental security issues. The conference focused on broad topic areas: Environmental Security and Sustainability, Water Resources Management, Adaptation to Climate Change, and Disaster Preparedness. The primary aim of the conference series is to review the major environmental security issues facing the region and engage in a policy-oriented dialogue that examines joint civil-military environmental security efforts. Eighteen (18) countries participated in this first conference.

The PESC convened just four days following Japan's devastating earthquake and tsunami, which set the tone for the importance of the conference and exemplified the value of international, civil-military cooperation in all phases of disaster management.

The main points of discussion and findings of the conference follow:

Keynote Speaker:

Honorable Jo-Ellen Darcy, Assistant Secretary of the Army for Civil Works

- **Condolences to the Japanese people and commitment to assist in recovery.** US Corps of Engineers sent subject matter experts in structural, environmental, and contaminated debris management. Cdr, USPACOM

directed to provide humanitarian assistance, conduct search and rescue missions, damage assessment, et cetera. Secretary Darcy recognized and praised the additional support from the neighboring countries represented at PESC. She emphasized the importance of Japan as a strong and viable partner in achieving environmental security goals in the region.

- **The 2012 civil works budget reduced by about 15%, but will provide a total of $4.63 billion in new federal appropriations.** Budget reflects the Administration's priorities of targeted investments in national infrastructure that helps restore the environment and revitalize the economy, yet keeping the country on a fiscally sustainable path.

- **Three main areas of US domestic environmental investment include commercial navigation, flood and storm risk management, and aquatic system restoration.**

    - **Commercial Navigation.** $553 million budgeted for operation and maintenance of existing inland waterways infrastructure. $166 million for project construction and rehabilitation, of which $77 million is from the Inland Waterways Trust Fund. The Obama Administration intends to work with Congress to revise the laws that govern the Inland Waterways Trust Fund, to include increasing the revenue paid by commercial navigation users to meet their share of the costs of eligible projects.

    - **Flood and Storm Risk Management.** The budget provides $50 million for a comprehensive levee safety initiative, a $40 million increase from 2011. This includes $46 million in the O&M account to continue and expand activities to help ensure that federal levees are safe (considering climate change impacts). The Corps of Engineers participates with 20 other federal agencies in the Interagency Climate Change Adaptation Task Force to develop a national strategy for adapting to climate change.

- **Aquatic System Restoration.** The 2012 budget proposes funding for aquatic restoration efforts based on sound science, criteria grounded in research and development and adaptive management.

- **The Corps is revising the Economic and Environmental Principles and Guidelines for Water and Related Land Resources**, known as the P&G, written in 1983. The new P&G will include non-monetary benefits, such as public safety and environment, and will encourage a solutions-oriented, systems-based civil works program instead of the current project by project approach.

- **Corps continues to work with USPACOM humanitarian assistance projects throughout its area of responsibility.** Over 95 international humanitarian assistance projects over past 4 years.

- U.S. government goals for international water resources are to:

  - Increase access to water and sanitation to improve human health;

  - Improve the practice of water resources management and increasing water productivity; and

  - Improve water security by strengthening cooperation on shared waters.

"Today is about [building] partnerships… and leveraging knowledge from our international community."

Plenary Sessions Summary and Findings

Opening Plenary Session

- **Re-emphasis of the trans-national nature of environmental security and the critical role national militaries play in preparedness and response.**

- **Department of Defense (DoD) recognizes that climate change will impact future operating environments, mission profiles, and infrastructure.** As such, DoD must be resilient and adaptive to assure continued availability of critical resources, reducing green house gas emissions, minimizing waste and pollution, and system sustainability.

- **Exceptional partnership opportunities exist with educational institutions -** like the University of Hawaii (UH), which has nearly $500 mil in research grants. USPACOM and UH have history of joint research, and university personnel have expertise in many disciplines including quantitative modeling, natural disaster response, and international collaboration.

- **Climate change will continue to have a profound effect on regional stability and on U.S. national security.** Natural disasters have been increasing throughout the world since 1960 and the number of people affected by these natural disasters has grown along with it. Joint civil-military coordination is critical in disaster preparedness - planning, training, rehearsal, and execution. Governments, businesses and families must all also plan for disasters, not just emergencies. The U.S. Center for Excellence in Disaster Management and Humanitarian Assistance (COE) is USPACOM's principal agency to promote disaster preparedness and societal resiliency in the Asia-Pacific region. A major role the military will have in adapting to climate change will be to coordinate with governmental authorities, at all levels, in the development of vulnerability assessments and pragmatic solutions for possible disruptive events.

Panel 1: Environmental Security and Sustainability

Objective: Identify environmental threats to governmental stability and ways for the military to mitigate these and build legitimacy

- **Climate change shaping Australia's environmental security and sustainability actions.** Australia facing rising sea levels, reduced water availability and heat waves. Australian Defense Force (ADF) is largest land owner on the continent with over 3 million hectares (7.4 million acres). As such, ADF is in the forefront of environmental conservation and preservation, and joint member of national standards development organization. Military training areas are particularly venerable to brush fire and mitigation strategies are now a routine part of all exercise planning. All ADF training sites have dedicated professional environmental staffs which enforces "limits to acceptable damage" in land use decisions.

- **Food and water security, and agricultural productivity are potentially the most worrisome consequences of climate change.** Small developing states are most vulnerable to climate change. Desertification and availability of safe drinking water will stress regional resources. Governments that cannot adapt and deliver basic services will set conditions for extremists and terrorists to flourish (Rwanda classic example). Bangladesh is already experiencing impact of climate change with both droughts and floods. Military well suited for crisis support having ability to mobilize logistic transportation assets.

- **US military and US Agency for International Development successful in working hand-in-hand with Philippine counterparts for humanitarian assistance and anti-terrorism activities.** Philippines are experiencing a fast growing population, but persistent poverty, a poor investment system, poor education system, corruption and internal conflict and security issues. Threefold military strategy includes: advise and assist, upgrading capabilities, and civil-military operations/humanitarian assistance.

- **The Royal Thai Armed Forces taking more active role in promoting and preserving environment.** All levels of military are cooperating with public and private sector and state enterprises to organize and complete environmental projects. Royal Thai Armed Forces serves a central role in humanitarian assistance and disaster relief activities.

- **Singapore Armed Forces has embraced a culture of sustainability and adopted green innovative technology.** Recently named "greenest country in Asia". Country committed to assisting with humanitarian assistance and disaster relief.

Panel 2: Water Resources Management

Objective: Identify how water affects security and the civilian/military role in water resource management and disaster preparedness

- **Investment in water infrastructure, resource management, and flood management leads to both water and regional security.** 40 percent of the world's population lives on shared water basins, which creates water interdependence and opportunities for international cooperation. Concentrated urbanization will place major stress on already limited water supplies as well as place larger populations at risk to water associated natural disasters. 1.4 billion people currently lack safe water and half of those lack adequate sanitation. Water availability is a critical engine for building a platform for growth.

- **The Intergovernmental Panel on Climate Change (IPCC) expects the annual average rainfall in China to increase from five to seven percent by 2050 and for extreme weather events to increase.** Therefore, China is pursuing strategies to invest over 10 trillion Yuan in water conservancy projects over next 10 years. Areas of investment include low carbon renewable energies like hydropower and wind power, soil and water conservation projects, and an emergency water supply to the country

through water storage and a national hydrological network.

- **There are 261 trans-border rivers in the world and over 40,000 dams. Stress associated with the use of these limited resources has already resulted in conflict.** Developing intergovernmental cooperation and understanding the shared water resource concerns is essential to environmental security and regional peace.

- **South Korea engaged with a comprehensive revitalization and improvement program of their river systems (known as the Four Rivers Project).** Objective is to better coexist with nature and allow for greener development of land and cities. Actions involve storing water, protecting against flooding, improving water quality, and creating public spaces. South Korea is unique in that it gets 65 percent of its annual rainfall during typhoon season (August through September). Each year these natural disasters cost Korea approximately $5 billion in damages and recovery costs. Korea recently completed a comprehensive overhaul of their National Disaster Management System which includes a joint tracking and warning apparatus with China and Vietnam.

Panel 3: Adaptation to Climate Change

Objective: Share what militaries and other organizations are doing to adapt to climate change in order to (1) retain military resilience and (2) adapt to mission changes.

- **US military advisory board Report on National Security (April 2007) evaluated trends, indications and warnings and concluded that climate change poses a serious threat to national security.** Authored by military flag officers, the board acknowledged that climate change will act as a multiplier for instability in volatile regions, and will add tension to even stable regions. Conflict over scarce resources can cause failed states and provide a fertile breeding ground for extremism, conflict, and terrorists. Global fossil fuel dependence coupled with decreasing supplies, scarce resources, and

the destabilization generated by climate change creates an unacceptably high level of risk. Increasing energy efficiency across the board and collaboration from universities, industry, government, the research and development base, energy infrastructure and global partners cooperating, will all be required. Tomorrow's new green fleet Navy is on track to use half the fossil fuel of today's Navy. US military installations and outposts around the world are now using renewable technologies such as solar and wind.

- **US Department of Defense (DoD) is the largest consumer of energy in the U.S. and possibly the world.** DoD focused on sustaining and maintaining infrastructure while addressing the cost and availability of energy sources required to operate. DoD's Strategic Environmental Research and Development Program (SERDP) seeks to harness the latest science and technology to develop cost-effective, sustainable solutions to improve DoD's environmental performance, reduce costs, and enhance mission capabilities. The program is a partnership with the Department of Energy (DoE) and the Environmental Protection Agency (EPA) and focuses on using advanced technology for short-term needs and research for long-term solutions. DoD is studying the regional impact that climate change has on weather patterns, sea levels, storm surges and endangered species.

- **US Navy aggressively engaging energy conservation initiatives.** Goals are to reduce petroleum usage by 50% in commercial vehicles, and transition 50% of their installations to a self sufficient energy posture using alternate energy sources and their own power generation equipment. The Navy is developing new bio-fuels that will allow the Navy to be less dependent on oil. The Navy intends to deploy an entire carrier group (an aircraft carrier and all its escort ships) using bio-fuel by 2016. Other initiatives include reducing greenhouse gas emissions, reducing solid waste at sea, minimizing risk to sea animals from the use of sonar on ships, and building cooperative partnerships with environmental non-governmental organizations for environmental security.

- **US Air Force is the largest energy user in the United States military,** burning over 2.5 billion gallons of jet fuel annually. As such, the Air Force is focusing much of their environmental attention on initiatives to reduce green house gases. The Air Force has established an objective is to reduce jet fuel emissions by 50 percent by 2016 through aircraft engineering, more efficient flight management, and by exploring bio-fuel alternatives. The Air Force recognizes that climate change will have an impact upon infrastructure, and mission requirements, and to address the challenge, has implemented a framework of action around four lines of effort: mitigation, adaptation, collaboration and education.

Panel 4: Disaster Preparedness

Objective: Identify the military role in fostering resilient societies through preparation for, mitigation of and response to disasters.

- **In Haiti, the U.S. military mission focused on saving lives and reducing human suffering.** The key to disaster preparedness is building partnerships and understanding roles prior to an event (don't wait until an emergency strikes). Identify and coordinate with the many organizations involved in disaster preparedness and response (host nation, international govt's, U.N., non-governmental organizations). Recurrent joint training required for responder preparedness and to update policy and procedures.

- **The Civil Military Emergency Preparedness (CMEP) program is a US DoD sponsored full cycle planning tool assisting with for early warning planning and immediate response actions, and as well as recovery plans and clean up.** CMEP can tabletop game multiple simultaneous disasters, and factor in humanitarian response concerns such as the provisioning of food, water, energy and health planning. CMEP sponsors a number of conferences, workshops, and table-top exercises each year. CMEP also allows planners to figure out how to

work with NGOs and facilitates civil and military cooperation.

- **The Koshi, Nepal, flood disaster of 2008 impacted over 2.5 million people and resulted in the establishment of the Nepal Risk Reduction Consortium (NRRC).** The NRRC has since developed a long term disaster reduction action plan in partnership with the International Red Cross, Red Crescent and the United Nations Development Program (UNDP). NRRC also developed an early warning flood forecasting plan and an early warning system.

Conclusion - Closing Plenary Session

- **Delegations provided feedback on conference and recommendations for future conferences.**
    - 16 delegates responded. All positive remarks concerning value of conference.
    - Many responded with need to include civilian stake holders in future sessions (conference was very military centric).
    - Several requested review of case studies and best practices.
    - One recommended adding table top exercise and formal training (Mongolia).

PESC Agenda

MONDAY, 14 MARCH 2011

REGISTRATION 1000 TO 1700

1300-1700 ACADEMIC DAY

1300 **PACOM Opening Remarks**
BG Kevin O'Connell
Director of Logistics, Engineering and Security Assistance
United States Pacific Command

1310 **University of Hawaii (UH) Opening Remarks**
Dr. Gary Ostrander
Vice Chancellor, UH Manoa

1325 **Moderator**
Peter J. Mouginis-Mark
Director, Hawaii Institute of Geophysics and Planetology, SOEST and
Director, UH Manoa Sustainability Initiative

1330 **Speaker #1: Legal Aspects of Environmental Issues Relevant to SE Asia**
Maxine Burkett
Director, Center for Island Climate Adaptation and Policy

1355 **Speaker #2: Methods for the Treatment of Gray Water and its Interconnection with Soil Sustainability and Renewable Energy**
Michael Cooney
Associate Researcher, Hawaii Natural Energy Institute

1420 **Speaker #3: Environmental Issues in the Arctic over the next 5 to 50 Years**
Margo Edwards
Director, Center of Excellence for Island, Maritime, and Extreme Environment Security

1445 **Break**

1515 **Speaker #4: Assessing Seismic Risk in SE Asia**
Ian Robertson
Professor, Civil and Environmental Engineering

1540 **Speaker #5: Economic Models for Fish Resources, and Economic Methodologies to Help Solve Environmental Issues**
Denise Konan
Chair Economics Department, Senior Advisor to UH President on APEC, and Director Center for Sustainable Coastal Tourism

1605 **Speaker #6: Short-Term Prediction of Near-Shore Flooding Using Oceanographic and Meteorology Models**
Mark Merrifield
Director, UH Sea Level Center and Professor of Oceanography

1630 **Speaker #7: Arsenic Removal from Drinking Water**
Pavel Zinin
Associate Researcher, Hawaii Institute of Geophysics and Planetology

1655 **Wrap-Up/Moderator**

1700 **Ice Breaker with National Defense Industrial Association**

TUESDAY, 15 MARCH 2011

REGISTRATION 0700 TO 0900

0900-1200 OPENING PLENARY SESSION

0900 **PACOM Opening Remarks**
BG Kevin O'Connell
Director of Logistics, Engineering and Security Assistance
United States Pacific Command

0910 **MASTER OF CERMONIES**
COL Bernard F. Griffard, US Army, Retired
Professor of Strategic Military Logistics, United States Army War College

0920 **Speaker #1: International Perspective**
Mr. John Owens
Head Infrastructure Division, Department of Defence
Australia

0925 **Speaker #2: Adaptation to Climate Change**
Mr. Curtis Bowling (SES)
Director, Environmental Readiness and Safety
Chairman, Department of Defense Explosives Safety Board,
Office of the Deputy Under Secretary of Defense (Installations and Environment)
Office of the Secretary of Defense
United States

0940 **Break**

1010 **Speaker #3: Sustainability Research at the University of Hawaii at Manoa**
Dr. Gary Ostrander
Vice Chancellor
University of Hawaii at Manoa

1040 **Speaker #4: Fostering Resilient Societies**
LTG John F. Goodman, US Marine Corps, Retired (SES)
Director, Center of Excellence in Disaster Management and Humanitarian Assistance
United States Pacific Command

1130 **Event Official Photo Session**

1200 **Lunch Speaker: PACOM Environmental Security History**
Dr. Kent Butts
Director, National Security Issues Group
US Army War College, Center for Strategic Leadership

TUESDAY, 15 MARCH 2011

1330-1730 **PANEL #1: ENVIRONMENTAL SECURITY AND SUSTAINABILITY**

1330 **Panel Introduction**

Objective: Identify environmental threats to governmental stability and ways for the military to mitigate these and build legitimacy

Moderator – Dr. Kent Butts
Director, National Security Issues Group
US Army War College, Center for Strategic Leadership

1340 **Speaker #1: The Australian Perspective**
Mr. John Owens
Head Infrastructure Division, Department of Defence
Australia

1410 **Speaker #2: Security Implications in Climate Change and the Role of the Military**
MG (RET) A.N.M. Muniruzzaman
President, Bangladesh Institute of Peace and Security Studies

1440 **Speaker #3: Combating Terrorism, USAID Perspective**
LTC Eric Walker, United States Army
Deputy Commander
Joint Special Operations Task Force - Philippines

Mr. Robert Beadle
Foreign Service Officer
United States Agency for International Development – Philippines

1510 **Break**

1530 **Speaker #4: Philippines Lessons Learned**
BG Benito Antonio T De Leon
Armed Forces of the Philippines

1600 **Speaker #5: Thailand Military Development Model**
COL Phongphat Songsoontorn
Thailand

1630 **Speaker #6: The Singapore Perspective**
ME7 Daniel Chua Thian Cheong
Singapore

1700 **Q&A / Discussion**
Moderator – Dr. Butts

1730 **Adjourn**

WEDNESDAY, 16 MARCH 2011

0830-1130 PANEL #2: WATER RESOURCES MANAGEMENT

0830 **Panel Introduction**
Objective: Identify how water affects security and the civilian/military role in water resource management and disaster preparedness
Moderator –Dr. Kent Butts
Director, National Security Issues Group
US Army War College, Center for Strategic Leadership

0840 **Speaker #1: Water and Security**
Mr. Jerome Delli Priscoli, PhD
Governor, World Water Council
United States Army Corps of Engineers

0910 **Speaker #2: Adaptation Strategy to Climate Change's Impacts on Water Resources**
Mr. Qiao Shishan
Deputy Director General, Department of International Cooperation, Science and Technology, Ministry of Water Resources
People's Republic of China

0940 **Break**

1000 **Speaker #3: Water Resource Management**
Mr. Don Blackmore
Chairman of Water for a Healthy Country
Australia

1030 **Speaker #4: Water Management and Disaster Prevention**
Mr. Sang-man Jeong
Director, National Institute for Disaster Prevention
Republic of Korea

1100 **Q&A Panel Discussion: Water Panel Speakers**
Moderator – Dr. Butts

1130 ***KEYNOTE SPEAKER:*** **The Honorable Jo-Ellen Darcy**
Assistant Secretary of the Army (Civil Works)
United States

1200 **Lunch**

CHARTERED FIELD TRIP: HISTORIC DIAMOND HEAD CRATER

Wednesday, 16 March – 1300-1630

Featured Speaker: Maj Gen Darryll D.M. Wong, Adjutant General, Hawaii

Tour: Hawaii National Guard Joint Operations Center and Hawaii State Civil Defense Operations Center

---

THURSDAY, 17 MARCH 2011

0900-1200 PANEL #3: ADAPTATION TO CLIMATE CHANGE

0900 **Panel Introduction**
Objective: Share what militaries and other organizations are doing to adapt to climate change in order to (1) retain military resilience and (2) adapt to mission changes.

Moderator – Mr. Curtis M. Bowling (SES)
Director, Environmental Readiness and Safety
Chairman, Department of Defense Explosives Safety Board
Office of the Deputy Under Secretary of Defense (Installations and Environment)
Office of the Secretary of Defense
United States

0910 **Speaker #1: Climate Change and National Security**
VADM Dennis V. McGinn, U.S. Navy, Retired
Co-Chairman, CNA Military Advisory Board

0940 **Speaker #2: U.S. Department of Defense's Environmental Research, Development, Testing and Evaluation: Environment, Energy and Climate Change**
Dr. Jeffrey Marqusee (SES)
Executive Director, Strategic Environmental Research and Development Program
Director, Environmental Security Technology Certification Joint Program
(Department of Defense, Department of Energy and Environmental Protection Agency)
United States

1010 **Break**

1030 **Speaker #3: U.S. Navy Energy and Environmental Security**
Mr. John P. Quinn (SES)
Deputy Director, Energy and Environmental Readiness Division (N45)
Chief of Naval Operations
United States

1100 **Speaker #4: United States Air Force Environmental Security**
Mr. Michael McGhee (SES)
Office of the Deputy Assistant Secretary of the Air Force for
Energy, Environment, Safety and Occupational Health
United States

1130 **Q&A / Discussion**
Moderator - Mr. Bowling

1200 **Lunch Speaker**

THURSDAY, 17 MARCH 2011

1300-1700 PANEL #4: DISASTER PREPAREDNESS

1300 **Panel Introduction**
Objective: Identify the military role in fostering resilient societies through preparation for, mitigation of and response to disasters.

Moderator – Gregory J. Flick
Director, Capacity Development Division
Center of Excellence Disaster Management and Humanitarian Assistance
United States Pacific Command

1310 **Speaker #1: Regional Seismic Threats**
LTG (RET) Bambang Darmono
Indonesia

1340 **Speaker #2: Lessons from Haiti**
COL Norberto Cintron
Command Engineer
United States Southern Command

1410 **Speaker #3: Value of Civil Military Cooperation in Seismic Events**
James Ligh
Chief, Business Management
Pacific Ocean Division
United States Army Corps of Engineers

1440 **Break**

1500 **Speaker #4: The Koshi Disaster and its Aftermath**
Mahendra Bahadur Gurung
Joint Secretary
Ministry of Irrigation
Nepal

1530 **Q&A / Discussion**
Moderator - Mr. Flick

1600 **Conference Wrap Up and Way Ahead**
Facilitator – Dr. Kent Butts
Director, National Security Issues Group
US Army War College, Center for Strategic Leadership

1700 **Conclusion**

Pacific Environmental Security Conference
Honolulu, Hawaii
March 15-17, 2011

Participant Contact Information

	Name	Country	Email	Phone
1	Mr. John Owens, Head of Infrastructure, DOD, Australia	Australia		61417049440
2	Mr. Terry Weston, Australian DOD, Estate Policy and Env. Branch Infra. Div.	Australia	terry.weston@defence.gov.au	61262668051
3	Ms. Helen Blaine, Dir. Energy Efficiency and Resource Mgt. Estate Policy and Env. Branch Infra. Div.	Australia	helen.blain@defence.gov.au	61262668045
4	Mrs. Tanya Meli, Australian DOD, Estate Policy and Env. Branch Infra. Div.	Australia	tanya.meli@defence.gov.au	02 6266 8157
5	WGCDR Malcolm Harrison, Royal Australian AF, HQ Joint Operations Command	Australia	malcolm.harrison@defence.gov.au	02 6128 4154
6	Mr. Don Blackmore- Director Victoria Water Works	Australia	don@blackmoremail.com.au	61418224735
7	MG Anm Muniruzzaman (RET)	BG	muniruzzaman@gmail.com	88-01714-133199
8	BG Chau Svanh	Cambodia	svanhc@yahoo.com	(855) 979948376
9	Commodore Sam Sokha	Cambodia	satorson016@yahoo.com	(855) 0975261555
10	Mr. Qiao Shishan, General Director, Ministry of Water Resources, P.R China	P.R. China	yulingling@mwr.gov.cn	00861063202705
11	Prof. Wang Jianhua, Ministry of Water Resources, People's Republic of China	P.R. China	chenfei-1213@163.com; baosj@iwhr.com	+86-10-68781850 or +86-10-68785625
12	BG Paryanto, Ministry of Defense, Republic of Indonesia	Indonesia	porako83@yahoo.com	6281210893

13	Mr. Rasio Ridho Sani (Ministry of Environment)	Indonesia	rasiosani@live.com; rasiosani@yahoo.com	628121924434
14	Col. Tatsuo Nagai, Japan Air Self Defense Force	Japan	j5nagai@jso.mod.go.jp	03-3268-3111(Ext.30513)
15	Dr. Sangman Jeong, Republic of Korea, National Institute for Disaster Prevention	Korea	smjeong@korea.kr	82-10-5380-4759
16	Maj. Kongnoun Vongxay, Department of Chemical, Ministry of National Defense	Laos	k.noundidi@yahoo.com	(856)20 5567 9270
17	Ms. Chongchith Chantharanonh, Department of Water Resources (WREA)	Laos	chongchith@gmail.com;	(856) 20 5550 8520
18	Dr. Mahdi Che Isa, Ministry of Defense, Sr. Research Officer, STRIDE	Malaysia	mahdicheisa@gmail.com	6056817357(office); 60195414917(Mobile)
19	Mr. Mohamad Husni bin Ab Aziz	Malaysia	husni.aziz@gmailcom	603-88724270/6019-6551981
20	MG Muugun Jargal	Mongolia	drendoo@yahoo.com	(976) 99085603
21	Col. Donrov Ganbaatar, Ministry of Defense of Mongolia	Mongolia	donrovganbaatar@hotmail.com	(976) 99192727
22	Mr. Mahendra Bahadur Gurung	Nepal	mabg@wlink.com.np; mabg1954@yahoo.com	98413 13653
23	Col. Ishwar Hamal	Nepal	hamalish@hotmail.com	9851044603
24	Col. Francisco F. Mendoza Jr, ODCS for Plans, AFP J5	Philippines	chief.iad.oj5@gmail.com	(63) 9175555150
25	BG Benito Antonio T. De Leon	Philippines	deleon_bennie@yahoo.com	635078282
26	Ms. Bek Evangelista, Senate Oversight Committee on Climate Change	Philippines	mvmevangelista@gmail.com	(69)088850294
27	LTC Eric Walker, JSOTF-P	Philippines	eric.laird.walker@us.army.mil	63917-543-0126
28	ME7 Daniel Chua Thian Cheong, Singapore Armed Forces, Logistics	Singapore	tomcat0529@yahoo.com	6598262669

29	ME6 William Ong Keng Meng , Singapore Armed Forces, Logistics	Singapore	ong_keng_meng@starnet.gov.sg	97961920
30	Col Phongphicharn Phornsinthanarat, Royal Thai Armed Forces	Thailand	phongphicharn@yahoo.com	66827828738
31	Col Peerawat Promkladpanao, Royal Thai Armed Forces	Thailand	peerawataui@hotmail.com	66863333484
32	Col Phongphat Songsoontorn, Royal Thai Armed Forces	Thailand	juice2511@hotmail.com	66819069933
33	LTC Dau Xuan Hoai, Chemical Corps-Vietnam Army	Vietnam	hdx1409@yahoo.com	84983081118
34	Major Tuan Can Anh, Vietnam Ministry of Defence	Vietnam	tuanstevn@yahoo.com	84-913.318.158
35	COL Edward Kertis, USACE	USA	edward.kertis@usace.army.mil	(808) 438-1500
36	COL George Simon, USARPAC	USA	george.simon@us.army.mil	(808) 438.5788
37	CAPT Daniel McNair, COMPACFLT	USA	daniel.a.mcnair@navy.mil	(808) 471-4642
38	Col John Lohr, HQ Pacific Air Forces/A7	USA	john.lohr@us.af.mil	(808) 449-3805
39	LTC Dwayne T. Stanton (USARPAC)	USA	dwayne.stanton@us.army.mil	(808) 227-0907
40	Mr. Larry Foster, CPF, USN	USA	larry.foster@navy.mil	(808) 471-4235
41	Mr. Chris Sholes, USPACOM, J44	USA	christopher.sholes@pacom.mil	(808) 4779420
42	Mr. Bruce Fink, USPACOM, J44	USA	bruce.fink@pacom.mil	(808) 477-1555
43	CAPT John Sommer, USPACOM, J44	USA	John.Sommer@pacom.mil	(808) 477-6011
44	BG Martha Wong, USPACOM, J44	USA	Martha.Wong@pacom.mil	(808) 389-4936

45	BG Kevin O'Connell, USPACOM, J44	USA		
46	VADM Dennis V. McGinn (USN RET)	USA		
47	Dr. Jeffrey Marqusee (SES)	USA	Jeffrey.Marqusee@osd.mil	(703) 0696-2120
48	Mr. Andy Bruzewicz, USACE	USA	Andrew.J.Bruzewicz@usace.army.mil	(202) 299 7785
49	COL Norberto Cintron, Command Engineer, USSOUTHCOM	USA	norberto.cintron@hq.southcom.mil	(786) 427-7780
50	Hon. Jo-Ellen Darcy-Asst. Sec. Army (Civil Works)	USA		
51	COL (RET) Bernard Griffard, Professor U.S. Army War College	USA	bernard.griffard@us.army.mil	(717) 245-3235
52	Mr. Curtis Bowling (SES), Office of Secretary of Defense (Installations and Environment)	USA	curtis.bowling@osd.mil	(703) 604-1624
53	LTG (RET) John Goodman (SES)	USA	John.Goodman@coe-dmha.org	(808) 433-7331
54	Dr. Jerome Delli Priscoli, USACE-IWR, Governor World Water Council	USA		
55	Ms. Ninette Sadusky-OSD	USA	Ninette.Sadusky@osd.mil	(703) 604-1798
56	Col Mark Bednar (13AF/A7)	USA		
57	Mr. James Bersson, USACE, Pacific Ocean Division	USA	james.l.bersson@usace.army.mil	(808) 438-8546
58	Mr. James Ligh, USACE, Pacific Ocean Division	USA	james.K.ligh@usace.army.mil	(808) 438-9500/8380
59	Mr. Todd Wheeler, US Army War College, Center for Strategic Leadership	USA	todd.wheeler@us.army.mil	(717) 245 4941
60	Mr. Ted Gehr, USAID	USA		

61	COL Phil Jones, US Army War College, Center for Strategic Leadership	USA	philip.d.jones@us.army.mil	(908) 884-7898
62	Mr. Robert Beadle, U.S. Agency for International Development	USA	rbeadle@usaid.gov	0917-846-2026
63	COL Doug Charney, US Army War College	USA	Dougcharney@aol.com	(717) 576-9171
64	COL Dave Carstens	USA		
65	Mr. Michael McGhee, USA Environmental Security	USA	michael.mcghee@pentagon.af.mil	(703) 697-1019
66	Dr. Kent Butts, US Army War College, Center for Strategic Leadership	USA	kent.butts@us.army.mil	(717) 226-3286
67	Mr. John Quinn, Chief of Naval Operations, Deputy Director, Energy and Env. Readiness Div.	USA	John.P.Quinn@navy.mil	(703) 602-2551
68	Mr. Mark Schnabel, USPACOM, J44	USA	mark.schnabel@pacom.mil	(808) 477-0880
69	LTC Michael Jelen, USPACOM, J44	USA	michael.jelen@pacom.mil	(703) 853-7248
70	Lt Col Raymond Tsui, USPACOM J44	USA	raymond.tsui@pacom.mil	(719) 638-2756
71	Lt Col Kevin Thomas, USPACOM, J44	USA	kevin.thomas@elmendorf.af.mil	(907) 552-4112
72	LN1 Gabriela Guerrero, USPACOM, J44	USA	Gabriela.Guerrero@navy.mil	(619) 847-4678
73	BG G. Rukmal H. Dias, Sri Lanka Army	Sri Lanka	rukmal100@hotmail.com	94714254156
74	BG B. Arunandika Perera	Sri Lanka	barunandika@yahoo.com	94113133553
75	Mr. Victor Yao, NAVFACPAC	USA	victor.yao@navy.com	(808) 472-1393
76	Ms. Nicole Griffin	USA	nicole.griffin@usmc.mil	

77	Dr. Scott Hauger	USA	haugers@apcss.org	(808) 564-5036
78	LCOL Tomoaki Ooba, Ministry of Defense	Japan	oobatom@mod.go.jp	03-3268-3111(ext. 20376)
79	Ms. Fathimath Abdul Sattar	Maldives	inni91@hotmail.com	9607786552
80	BG Ahmed Mohamed, Maldives National Defence Force	Maldives	ahmed@defence.gov.mv	(960) 7771883; (960)9880889
81	Mr. Tracy Hall, U.S. Department of State, Regional Env. Officer for SA	USA	hallta@state.gov	97714007200 (ext. 4197)
82	Dr. Gary Ostrander, Vice Chancellor, University of Hawaii	USA		
83	CAPT Mike Futrell	USA		
84	YN2 Suzanne Bluhm, USPACOM J44	USA	suzanne.bluhm@navy.mil	(757) 641-3672
85	Mr. Greg Flick, USPACOM, COE	USA	flickg@coe-dmha.org	(808) 433-6343
86	Dr. Peter J. Mouginis-Mark	USA	pmm@hawaii.edu	(808) 956-8760
87	Dr. Maxine Burkett	USA	burkettm@hawaii.edu	(808) 956-2865
88	Dr. Michael Cooney	USA	mcooney@hawaii.edu	(808) 729-1433
89	Dr. Margo Edwards	USA	margo@soest.hawaii.edu	(808) 956-5232
90	Dr. Ian Robertson	USA	ianrob@hawaii.edu	(808) 956-6536
91	Dr. Denise Konan	USA	konan@hawaii.edu	(808) 956-8730
92	Dr. Mark Merrifield	USA	markm@soest.hawaii.edu	(808) 956-6161

93	Dr. Pavel Zinin	USA		
94	CAPT Tim Gallaudet	USA	timothy.gallaudet@navy.mil	(202) 762-0575
95	LTC Ferman Cepeda, US Army Pacific	USA	ferman.cepeda@us.army.mil	(808) 438-5774
96	Mr. Michael Dawson	Canada	Michael.Dawson@forces.gc.ca	6139964603
97	Ms. Kelly Busquets	USA	Kelly.Busquets@us.army.mil	(808) 438-5779
98	Mr. Stanley Louis, PACOM/J44	USA	stanley.louis@navy.mil	(808) 477-9425

Keynote Speech

The Honorable Jo-Ellen Darcy, Assistant Secretary of the Army for Civil Works

Thank you for inviting me here today.

Last Friday's devastating earthquake, followed by the deadly tsunami, violently affected Japan's coastline. Our thoughts are with the victims' families and all of the citizens of Japan. Japan has been one of our leading partners in global water resources. Since 2003, we have had an agreement with Japan's Ministry of Lands, Infrastructure and Transport on water resources cooperation that we believe has been, not only of technical value to each side, but also has strengthened the bond of friendship between both countries.

The Commander of the United States Pacific Command has received direction from the US Secretary of State to expend funds that render humanitarian assistance, search and rescue missions, damage assistance, et cetera. This is a time when the action plan of the High Level Expert Panel on Water and Disaster can offer its international expertise to aid in this water-related crisis.

The Corps has deployed a liaison officer from our Japan District to support U.S. forces in Japan and a second liaison officer is on the way with disaster management expertise. We are preparing its potential response capabilities with respect to subject matter experts in structural, environmental, contaminated debris management and pumping. These natural disasters are inevitable, but with panels like this, hopefully the fatalities and devastation can be reduced. We must use our global community to increase resilience. The Corps of Engineers is committed to help in any way we can in Japan, in the coming months and years.

As the Assistant Secretary of the Army for Civil Works (ASA-CW), an office of the United States Department of the Army, my office is responsible for overseeing the civil works functions of the United States Army Corps of Engineers. I report to the United States Under Secretary of the Army. I oversee the civil works of

the United States Army Corps of Engineers and the foreign non-military works of the Army Corps of Engineers.

The position was created by Section 211 of the Flood Control Act of 1970 and reaffirmed in Section 501 of the Goldwater–Nichols Act of 1986. I am the eleventh Assistant Secretary of Civil Works. I will be talking about the FY 2012 budget and the latest initiatives happening in my office.

Last month President Obama released the fiscal year 2012 budget for the civil works program of the Army Corps of Engineers. This year's civil works budget reflects the Administration's priorities through targeted investments in the nation's infrastructure that help restore the environment and revitalize the economy, while also reflecting the need to make the tough choices necessary to put the country on a fiscally sustainable path.

In keeping with President Obama's commitment to constrain the overall level of nonsecurity discretionary spending, the level of funding in the 2012 budget is a reduction of $836 million, or about 15 percent, from the 2010 enacted level. However, the 2012 funding level reflects a practical, effective and sound use of the nation's financial resources.

The 2012 civil works budget provides a total of $4.63 billion in new federal appropriations. The 2012 budget includes water resources infrastructure investments that produce high economic and environmental returns to the nation and that address public safety needs.

The three main mission areas are commercial navigation, flood and storm risk management, and aquatic system restoration. For commercial navigation, the 2012 budget funds the inland waterway project construction and rehabilitation at $166 million, of which $77 million is from the Inland Waterways Trust Fund. This is the amount that is affordable under existing law and with the current level of revenue to the trust fund.

The budget also includes $553 million for operation and maintenance of the existing inland waterways infrastructure. The Obama Administration will work with Congress to revise the laws that govern the Inland Waterways Trust Fund, to include increasing the revenue paid by commercial navigation users to meet their share of the costs of eligible projects. The Administration strives for a safe, reliable, highly cost-effective and environmentally sus-

tainable inland waterways system. The budget also gives priority for funding the operation and maintenance of the infrastructure that is most important to the country. This includes the inland waterways with the most commercial use: the Mississippi and Ohio rivers, the Illinois Waterway and the major coastal harbors.

With regard to flood and storm risk management, the budget provides $50 million for a comprehensive levee safety initiative, a $40 million increase from 2011. This includes $46 million in the O&M account to continue and expand activities to help ensure that federal levees are safe, and to assist non-federal entities when addressing safety issues. The 2012 budget also proposes funding for aquatic restoration efforts based on sound science, criteria grounded in research and development and adaptive management.

It is a prudent commitment of federal resources to prioritize civil works projects and represents significant interagency collaboration on presidential initiatives to restore nationally significant ecosystems, and provides recreational opportunities consistent with the president's America's Great Outdoors initiative. It is critical that we develop practical, nationally consistent, legally justifiable and cost effective measures, both structural and non-structural, to reduce the vulnerabilities of climate change on our water resources infrastructure.

We are connected to the basic science investigations about the causes and processes involved with climate change, to help us reduce the vulnerabilities, such as the increased intensity of storm events, higher storm surges, sea level rise, reservoir operations, and changes in habitat resulting from changing water temperature.

In order to address this, the federal agencies are hard at work. The Corps works very closely with other federal agencies, through the multi-agency adaptation efforts coordinated by the Council on Environmental Quality (CEQ). On October 5, 2009, President Obama signed the Executive Order on Federal Leadership in Environmental, Energy, and Economic Performance. He asked that within one year, the federal agencies develop recommendations for adapting climate change impacts both domestically and internationally.

We participate in the Interagency Climate Change Adaptation Task Force that was formed as a result of this. Over 20 federal agencies are represented in the group. The Corps and my office attended the Council on Environmental Quality interagency working groups this summer to develop a national strategy for adapting to climate change. The interdisciplinary team will continue this external collaboration to assist in developing a strategic plan for climate change adaptation. Innovative economic, sociological and technological solutions will be required to meet the challenges of effective climate change adaptation.

To date, two interim reports have been released, both of which can be found on the CEQ website, www.whitehouse.gov/administration/eop/ceq. In the second report, the task force recommended that federal agencies establish and implement coordinated climate adaptation plans that address the challenges posed by climate change to their missions, programs and operations.

The chair of the Council on Environmental Quality will issue adaptation planning implementing instructions to agencies this spring. The implementing instructions will take a phased approach, so that the first set of instructions will contain tasks to be completed over the next nine months or so. We are taking a collaborative approach. This has required a new attitude to partnering among agencies that recognizes the value of our different perspectives and expertise so that guidance reflects the best available actionable science. President Obama's budget includes $12.3 million to increase the environmental and energy sustainability of completed Corps projects. We need to make sustainability a part of all the decisions we make. Protecting, preserving and enhancing natural and manmade resources for tomorrow's generations are something we must consider.

The Corps' sustainability efforts have resulted in a robust set of effective independent actions. Now we will bring all these actions together. We chose to pursue a unified, Corps-wide sustainability strategy that would encourage sharing of best practices across our Military Programs and Civil Works lines of operation, while taking full advantage of opportunities for transparency and accountability provided to us in the president's sustainability executive order. In support of the Administration's priorities, we have set a target of a 23 percent reduction in greenhouse gas emissions from civil works vehicles and facilities by the year

2020. We will lead the nation in energy security and safeguarding the health of the environment.

Another initiative I want to discuss with you is the existing planning guidance, the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, known as the P&G, written in 1983. The Water Resources Development Act of 2007 (WRDA 2007) directed the Secretary of the Army to revise the P&G for the Corps of Engineers. The Administration decided it was not good government to revise the P&G for just the Corps. This would lead to inconsistent treatment of water resources development projects amongst federal agencies. The P&G should apply to all agencies that do this work.

So, the Council on Environmental Quality undertook the coordination of an interagency team to draft the revision. The Corps is a major player in the development of the new P&G. The most recent draft incorporates the NAS review as well as the public comment. The adjustments being made to the P&G reduce the emphasis on national economic development alone, and more fully consider environmental benefits and social impacts. This puts economic and environmental considerations on equal footing, a clear break from the past.

The new P&G will include non-monetary benefits, such as public safety and environment, and will encourage a solutions-oriented, systems-based civil works program instead of the current project by project approach. This effort will be coupled with the transformation of the Civil Works Planning Program, an effort lead by the Corps and ASA-CW's senior leadership.

A new planning study process, with clearly defined decision points that are more predictable, more efficient and take significantly less time than the current preauthorization study process, will save time and money for both the federal government and the project sponsors. Not every study initiated by the Corps will be completed within the targeted goal of 18 months. These recommendations are not intended to eliminate detail from planning studies; rather, they are a return to relying on an appropriate level of detail for the decisions being made. Feasibility-level design will still be conducted, using the data appropriate for developing that design.

In 2011, the Corps will roll out a small number of pilots to test this approach; two have already been identified. Examination of the process, both during and after each pilot study, will be used to evaluate the effectiveness of the approach and develop guidelines for future studies.

The US Army Corps of Engineers is working with many of the countries at this conference. The Corps is sending two engineers to Australia this week to advise on flood protection at the Rockhampton Airfield, used to bring in relief supplies. This is a response to the Australian government's request to the American embassy. We wish them the best of luck in this challenge.

We assist USPACOM with construction of humanitarian assistance projects throughout its area of operations. Over the past four years this involved the construction of 95 projects in Bangladesh (44), Cambodia (23), Laos (10) and Vietnam (18). Projects consist of schools, clinics, multi-purpose cyclone shelters, roads and bridges, and a flood management operations center. Water and sanitation improvements are a part of every project.

As part of the Lower Mekong River Initiative (LMI), the Corps last year entered into a sister-river partnership with the Mekong River Commission (MeRC) (Cambodia, Laos, Thailand and Vietnam) to exchange information on the management of large river systems.

The Corps's leadership of the Mississippi River Commission offers much experience to this exchange. We have representation on the Unites States government delegation to the inaugural Lower Mekong River Initiative Regional Working Group meeting to be held in Phnom Penh later this week, and are looking forward to a Mekong River Commission delegation visit to the United States in the spring or summer. The delegation will visit either the National Great Rivers Research & Education Center (NGRRC) or the Corps Engineer Research & Development Center (ERDC). We are also looking at the possibility of a Mekong River Commission intern for a six-month assignment with the Mississippi River Commission. We appreciate our long relationship with China's Ministry of Water Resources.

We plan to attend the Fourth Yangtze River Forum next month and visit the Three Gorges Dam and the Nanjing Research Institute. I look forward to the minister's visit to the U.S. this June and future collaboration on water resources. The Corps continues its relationship with Korea on water and disaster management matters. Our Hydrologic Engineering Center plans to host a visiting engineer on an eight to twelve-month developmental assignment from Korea Water Resources Corporation, K-Water, the state-owned enterprise in South Korea operating water resources infrastructure including dams, reservoirs and waterways.

This January we conducted a Hydraulic and Hydrology Workshop for the Mongolian armed forces, the National Emergency Management Agency (NEMA), the city of Ulaanbaatar, the Institute of Hydrology-Meteorology, the Water Authority of Mongolia, the Water Research & Development Institute, and local universities. The event was funded through USPACOM and USAID. This training was the second session of training, with the inaugural session on Geographic Information Systems held last October. We are supporting the U.S. Millennium Challenge Corporation in its compact with the government of the Philippines for over 200 kilometers of road construction.

The Corps Urban Search and Rescue Cadre in San Francisco is going to enter into a telephonic consultation with the New Zealand civil defense authorities to advise on the structural stability of New Zealand's buildings. We will most likely send a team in to inspect the buildings at a later date. Finally in Nepal, and the Lower Mekong River countries of Cambodia, Vietnam, Laos and Thailand, we are involved in emergency preparedness exercises.

We must pool our knowledge to protect all of our countries. The U.S. government goals for international water resources are to:

- Increase access to water and sanitation to improve human health;
- Improve the practice of water resources management and increasing water productivity; and
- Improve water security by strengthening cooperation on shared waters.

The Corps of Engineers stands ready to support these goals through both direct support to the combatant commands (such as USPACOM) and through partnerships with other federal agencies (especially USAID and Department of State) and a wide range of international partners (including the United Nations, the World Water Council, and the World Bank) to reduce the destabilizing forces associated with poverty. Important to keep in mind is that the economic impacts caused by droughts and floods, may be exacerbated by climate change in the future.

We must enhance water and security and as partners work to:

- Improve the performance of basic infrastructure to address water scarcity and flooding problems, address poor water governance policies, or weak regulatory frameworks.

- Build capacity through education and training to reduce international instability.

- And, promote the resolution of trans-boundary water conflicts, facilitating peaceful cooperation towards resolving water scarcity challenges on a bilateral or multilateral basis.

Today is about partnerships and conferences like this one and leveraging knowledge from our international community. The United States Army calls upon the water resources, environmental, regulatory, and emergency response expertise developed through the civil works program to support reconstruction efforts at home and abroad. Thank you.

Environmental Security in the Pacific Region

By
Dr. Kent H. Butts

The concept of environmental security has been used over a decade by the US Pacific Command (PACOM) and its component commands to successfully engage the countries of the Asia-Pacific region. This concept has promoted multilateral cooperation between countries with territorial disputes and a history of war, fostered interagency cooperation, and created fora in which best practices for combating terrorism were enthusiastically shared. At the same time it has built the capacity of host nation militaries to support civil authority in maintaining their critical resource bases at a time when population is rising precipitously, and extremist ideology is wide spread in the region. This chapter relates the history of environmental security in PACOM, identifies variables in the command that allowed it to succeed, and suggests ways that it might be used to address challenges and areas of security concern among the countries of the region.

Environmental Security History

Environmental security is not a new concept to the national security community. In the late 1980s the concept of security was broadened as the national security community began to realize that the strength of the state could not be measured in military capabilities alone. A faltering economy could not sustain a powerful military; a valued ally might lose legitimacy and fall because its resource base was no longer adequate; environmental changes were weakening the health of populations and leading to destabilizing forced migration.

With the waning of the Cold War, the security studies community recognized that regional instability, no longer managed by the two superpowers, had become the chief threat to national security. Thus, the national security community began to analyze the underlying contributors to conflict and ask the question, “what could trigger conflict?” This analysis led to the frank realization that in a post-Cold War milieu state security increasingly turned on human security. Human security turned on the proper management of the resource base and the health and welfare of population. This was soon reflected in the National Security Strategy

of the United States, “Environmental threats do not heed national borders and can pose long term dangers to our security and well being. Natural resource scarcities often trigger and exacerbate conflict.” (NSS, 1997)

A country’s economic power can be sustained only if it can provide the resources necessary to guarantee production over a long period. Soil fertility, mineral resources, the presence of, or access to petroleum, and the availability of safe water underpin not only the success of the agricultural sector and the growth of industry, but also the health of the workers whose constant development is essential to a growing country. Analysis showed, however, that environmentally important resources are often harvested at an unsustainable rate, endangered by natural or man-made disasters, or threatened by the temperature and moisture changes of climate change. When these challenges manifest, governmental capacity to meet the demands placed on the political system by its population may prove inadequate and the government may fall. As a result the CIA created a state failure task force that examined the role of environmental factors on state failure, and created the Director for Central Intelligence Environmental Center in 1997 to analyze the impact of environmental issues on national security. (Esty, 1999)

In the two decades since the end of the Cold War, awareness of the link between environment and security was not limited to the United States. Regional states increasingly recognized that intrastate conflict was quite often fed by resource competition and environmental change. Without the unquestioned support of a superpower, the overexploitation of resources could result in the concentration of resulting wealth in the hands of the few and the upwelling of popular discontent sufficient to unseat governments. In the wake of the events of September 11, 2011 (9/11), it was determined by the 9/11 Commission and the National Security Council that environmental issues could create underlying conditions that terrorists or extremists could exploit to their advantage. From the Sahel of North Africa, across the Middle East into Central and Southeast Asia, Islamic populations faced environmental hardship, and natural and man-made disasters that could cause them to question the legitimacy of moderate Islamic governments as they struggled to manage environmental demands on the political system. What was necessary, argued the leaders of

several Muslim states, was a focus on sustainable development, capacity building, and a whole of government approach that enabled states to effectively deal with the environmental issues that affected state security.

Environmental security, as it framed the US interagency approach, "is a process whereby solutions to environmental problems contribute to national security objectives. It encompasses the idea of that cooperation among nations and regions to solve environmental problems can help advance the goals of political stability, economic development, and peace." (EPA, 1999) Supporting this approach has been the broader acceptance of the issues that constitute security studies. Legitimate security studies may research, "conditions that make the use of force more likely, the ways that the use of force affects individuals, states, and societies, and the specific policies that states adopt in order to prepare for, prevent, or engage in war. (Walt, 1991)

All environmental events are not security issues. A multiyear drought in an area where population and agriculture are limited has no impact on the security of the state and is not an environmental security issue. However, conflict over natural resource control or access that threatens regional stability may well be an environmental security issue. At the same time, multilateral cooperation on environmental crimes, such as illegal fishing or logging, can promote communication and cooperation and build the conditions for peace. Thus environmental security issues may positively or negatively affect national security.

In addition to the intelligence community involvement, the Department of State created environmental hubs in 13 countries for the purpose of promoting cooperation on regional environmental issues and enhancing diplomatic objectives. Vice President Gore led the Clinton administration effort on environmental security, stating, "We have to move beyond Cold War definitions of the United States strategic interests. Our foreign policy must now address a broad range of threats, including damage to the world's environment, that transcend countries and continents and require international cooperation to solve," and that the world will fall short (of achieving these interests) unless people have a livable environment." (Gore, 1997) Concurrently, then Secretary of Defense William Perry promulgated the paradigm of preventive defense in which US defense resources, in addition to being able to fight and win America's wars, would be used to create the con-

ditions for peace and prevent conflict.

The Geographical Combatant Commands

This political approach quickly gained resonance with the DOD's Geographical Combatant Commands (GCCs). The GCCs were in the process of developing Theater Engagement Plans (TEP) aimed at building cooperation and capacity to address regional security issues. The concept of environmental security worked well in the TEP and promoted synergy with other agencies. From their inception, the DOS Environmental Hubs cooperated closely with the GCC's and other US agencies to address regional environmental challenges. The GCC Theater Engagement Plans established the working relationship between the environmental hubs and the GCC's when initiating and building environmental security programs in a region. The synergistic gains that resulted from this cooperative effort in regional environmental security remains today. While the GCC engagement program is now called the Theater Security Cooperation Program, the close cooperation between Environmental Hubs and the GCC's continues to encourage international cooperation and build the regional capacity to address environmental issues and promote regional stability. The activities of this interagency relationship have served as fora in which the best practices of regional states are highlighted and processes for regional cooperation are developed.

The idea that US military forces would actively seek to engage the countries of the region in order to promote stability, and diffuse tensions that could lead to conflict, was appealing, and over the years proved to be a favored engagement objective of the Combatant Commanders. The environmental security dimension of this strategic approach has similarly proved popular and continues to achieve success. Environmental security issues are shared by many countries, and are usually a benign area on which most countries can find common ground. Moreover, the sustainable development essential to economic growth and governmental legitimacy inevitably has its roots in environmental issues such as food and water security. As a result it is now widely understood that intrastate conflict frequently originates with the

perception of unequal access the natural resources.

The Pacific Command (PACOM)

The Pacific Command has long been active in what are now considered to be elements of environmental security. However, it was not until Deputy Under-Secretary of Defense for Environmental Security, Sherri Goodman, promulgated the policy that US forces would address environmental issues that could lead to instability and thus, prevent conflict, that the concept of environmental security became a focus area of GCC engagement and the PACOM Theater Engagement Program (TEP). The success of the PACOM environmental security program turned on visionary guidance from senior leaders, the presence of individual leaders within the command who saw the concept as an opportunity to further the command's objectives, and the presence of capable organizations within the command and within other U.S. agencies.

The visionary leadership was provided when the Clinton administration's Principal Assistant Deputy Under Secretary of Defense for Environmental Security, Gary Vest, and the Director of the DCI Environmental Center, Terry Flannery, visited the Pacific Command to introduce the concept of using environmental security as an engagement vehicle and to provide the support of their organizations in promoting regional environmental security engagement. The PACOM Commander agreed, and the era of Pacific Command environmental security and capacity building was begun.

The first event was the September 1996, "Asia–Pacific Defense Environmental Conference" was held in Honolulu Hawaii. The purpose of this workshop was to provide a forum where defense and environmental officials from the Asia-Pacific nations could examine the importance of defense-related environmental issues to regional stability. Participants of the Hawaii Conference requested future regional workshops, suggested topics, and asked to participate in future events.

In June of 1997, the newly formed Asia–Pacific Center for Security Studies and the Center for Strategic Leadership of the

US Army War College cosponsored the "Environmental Change and Regional Security Conference" in Honolulu. The conference brought together senior national officials, policy-makers, academics and military officers to explore the security implications of environmental change within the Asia-Pacific region and to develop a framework for further research. Thirteen nations participated, including the Peoples Republic of China. At this conference Mr. Gary Vest, Principal Assistant Deputy Under Secretary of Defense (Environmental Security), met with Dr. Ye Ruqiu, the Deputy Administrator for China's National Environmental Protection Agency, to discuss cooperation between the two countries on environmental security issues. Dr. Ye Ruqiu agreed to set up a meeting between Senior People's Liberation Army representatives and Mr. Vest on his upcoming trip to Beijing. At his meeting with the PLA representatives, a Memorandum of Agreement on environmental protection information sharing was created between the Chinese Ministry of Defense and DOD that has guided military environmental cooperation efforts between the two militaries for over a decade. (Butts, 1997)

In May 1998 the Environmental Security Trilateral Partners of Australia, Canada, and the United States Departments of Defense hosted a regional Asia-Pacific Defense Environmental Workshop in Darwin, Australia. Designed and run by the Center for Strategic Leadership, US Army War College, the conference created a forum for cooperation between defense and environmental officials on environmental issues affecting regional stability, to include the military role in climate change. The policy priority views of other countries in the region were clearly presented, a database for information exchange and research was created and cooperative methodologies aimed at reducing environmental threats to stability was begun. (Phinney, 1999) These three conferences had taken the concept of environmental security as an engagement vehicle and shared it with other partner countries in the region to get their feedback on how best to proceed.

Fortuitously, PACOM had individual leaders in key positions who recognized how environmental security could be used to accomplish the commander's objectives. Perhaps the most important individual leader was CAPT (USN) Robert Brandhuber, the J56, whose responsibility it was to craft the PACOM Theater Engagement Program. It was CAPT Brandhuber who commis-

sioned the drafting of the Environmental Security Annex to the TEP and encouraged elements of the Command to build environment security into their individual engagement programs. CAPT Brandhuber became a recognized expert in the field of environmental security engagement and was invited by the United Nation's Intergovernmental Oceanographic Commission to speak on the role of military command engagement programs in its international conference, "The Role of the Military in Protecting the Worlds Water Resources." (Smith, 1999).

PACOM earned a reputation for moving beyond large conferences to partner with regional countries in hosting regional environmental security workshops. These events allowed individual countries to share their best practices, build regional military capacity and establish cooperation and communication in addressing environmental challenges. Environmental security was found to be common ground that built multilateral cooperation and enhanced military support to civil authority in areas as diverse as resource development, consequence management, disaster preparedness, and addressing the underlying conditions the terrorists seek to exploit.

Organizations such as the J44 Engineering Division, United States Army Pacific Command, the Center for Excellence in Disaster Preparedness and Response, the Multinational Planning Augmentation Team (MPAT), the DEIC program, the Department of State Regional Environmental Offices in Kathmandu and Bangkok, the USAID Regional Mission in Manila, and CSL have been stalwarts in environmental security engagement. The assistance of partner countries such as, Singapore, the Philippines, Thailand, Mongolia, and Australia has been invaluable in assuring that regional solutions are developed for regional problems.

After 9/11, the pressing environmental security issue became how to address those underlying environmental conditions that terrorists seek to exploit? Thailand and the Philippines cosponsored four environmental security and combating terrorism conferences in the region that brought together the countries of Southeast Asia to share their best practices, and models for enhancing governmental legitimacy and defeating terrorist ideology. The conferences focused on issues as broad as WMD consequence management, maritime threats and fishery resources, reconstituting rain forests, military roles in development and disaster preparedness, and mitigating environmental problems that

are robbing governments of their legitimacy. (CSL Issues Papers 09-04, 08-04, 07-03, and 02-04)

When speaking on combating terrorism in the Asia Pacific region, government leaders frequently stressed the importance of addressing the underlying conditions that terrorists sought to exploit. President Arroyo in the Philippines and Prime Minister Badawi in Malaysia spoke extensively of the importance of sustainable development and eradicating poverty in maintaining governmental legitimacy and defeating extremist ideology. PACOM listened to this advice. In 2004 and 2005 USARPAC-CSL academic exchange visits to the Malaysian, Thailand, and Indonesian War Colleges included the topics of environmental security and homeland security. In 2005, the PACOM J5, Maj. Gen. Eikenberry, partnered with USAID, the National Intelligence Council, and CSL to conduct a symposium and workshop for the US interagency community entitled, "Addressing the Conditions that Foster Terrorism," at the US Army War College that shared the advice of the Asia Pacific leaders with US policymakers. (Butts and Reynolds, 2005 and Butts and Tussing, 2005). However, natural disasters also challenged governmental legitimacy.

The countries of Southeast Asia also worked closely to identify the technical and military resources available to support civil authority in preparing for and responding to seismic disasters. The hard-earned experiences of Indonesia, New Zeeland, Thailand and the Philippines, COE and the State Department REO Bangkok were shared with the other countries facing the inevitable seismic events that will challenge the region at the "PACOM Southeast Asia Seismic Disaster Preparedness Conference" in Honolulu. (CSL Issue Paper 02-06)

In the wake of the December 2004 tsunami that devastated large portions of Indonesia, Thailand and India's Andaman islands the countries of South Asia and China came together with USARPAC, the US Embassy Kathmandu, DEIC, CENTCOM and CSL to conduct the "South Asian Seismic Disaster Preparedness Conference." The conference brought together two star level representatives of the military and government emergency management organizations to discuss their countries' SOP's in preparing for seismic events. The conference demonstrated the power of environmental security in unifying countries with long-standing territorial in political disagreements to address a compelling hu-

man security issue. (CSL Issue Paper 05-05)).

The importance of environmental security objectives such as combating terrorism and maintaining governmental legitimacy in the wake of overwhelming seismic disasters remains. However, other elements of the environmental security equation are ascending in importance. The potential for the H1N1 and H5N1 viruses to create pandemics brought together the military and medical communities to examine gaps in preparedness and identify capabilities that must be built in military forces so that they can properly support civil authority in time of medical threat.

Changes in regional climate, from the melting ice sheet in the Arctic, to rising sea levels across the Pacific, to the devastating fires experienced in Australia, have created a sense of vulnerability among regional countries. At the 2008 and 2009 PACOM Chiefs of Defense Force (CHODS) Conferences the region's senior military leaders said that climate change was the most pressing environmental security faced issue facing the Asia-Pacific region. At the 2009 CHODS Conference, they participated in a workshop on, "The Military Implications of Climate and Energy Security," in which they identified the major security threats of climate change, such as food shortages, flooding, drought, and mass migration leading to ethnic and religious conflict. Clearly, adapting to climate change was a significant area for regional military cooperation and capacity building

In 2008 33 countries in the world had food riots; many of these were in the Asia-Pacific region. Faced with a global population that is rapidly moving from six billion to nine billion people, governments are increasingly concerned about their resource base and environmental challenges. Floods, droughts, increasingly powerful storms, and rising sea levels are now front-page headline news and a growing challenge to governments faced with satisfying the human security demands of their growing populations.

The 2011, *PACOM Environmental Security Conference* brought together an important group of nations from the region to share their concerns about the current environmental security issues of climate change, water security, and disaster prepared-

ness. They spoke frankly of the environmental challenges their countries faced, policies that have succeeded and areas where improvement is necessary. The suggestions they offered will be incorporated into upcoming Pacific Command, J44 conferences that will be cosponsored by regional partner states. As the 2011 conference made clear, environmental security is as important a security issue in the Asia-Pacific region as it has been at any previous time, and cooperation in addressing the challenges it presents will be essential in the future.

References and Endnotes

Butts, Kent, Ed, *Conference Report: Environmental Change and Regional Security, Environmental Security* Series no. 1, Center for Strategic Leadership and Asia–Pacific Center for Security Studies, Carlisle Barracks, Pennsylvania, 1997.

Butts, Kent Hughes and Bert Tussing, "Addressing the Conditions that Foster Terrorism," *CSL Issue Paper, Volume 10–05*, Center for Strategic Leadership, Carlisle Barracks, Carlisle, PA, July, 2005.http://www.csl.army.mil/usacsl/Publications/10-05.pdf

Butts, Kent and Turner, Curtis "Addressing Transnational Threats in South East Asia: Environmental Security and Counter Terrorism" *CSL Issue Paper, Volume 02-04,* Center for Strategic Leadership, Carlisle Barracks, Carlisle, PA, January 2004 http://www.csl.army.mil/usacsl/Publications/iss02-04.pdf

Butts, Kent and Curtis Turner "Environmental Security and Cooperation Workshop: Building Governmental Legitimacy and Creating Conditions Inhospitable to Terrorism," *CSL Issue Paper, Volume 08-04,* Center for Strategic Leadership, Carlisle Barracks, Carlisle, PA, September 2004 http://www.csl.army.mil/usacsl/Publications/08-04.pdf

Butts, Kent Hughes, Curtis Turner and Christopher Jasparro, "Environmental Security Cooperation: USARPAC's Defense Environmental and International Cooperation (DEIC) Conference," *CSL Issue Paper, Volume 07-03*, Center for Strategic Leadership, Carlisle Barracks, Carlisle, PA, September

2003 http://www.csl.army.mil/usacsl/Publications/CSL%20Issue%20Paper%2007-03.pdf

Butts, Kent Hughes and Jeffrey C. Reynolds, *The Struggle Against Extremist Ideology: Addressing the Conditions That Foster Terrorism,* Center for Strategic Leadership, Carlisle Barracks, Pennsylvania, 2005.http://www.csl.army.mil/usacsl/publications/SAE-TOC.pdf

Environmental Protection Agency (EPA), *Environmental Security: Strengthening National Security Through Environmental Protection*, Washington: USEPA, 1999.

Gore, Al Jr., "Letter from the Vice Pres.," *Environmental Diplomacy: The Environmental and US Foreign Policy*, Washington: Department of State, 1997, P. 1.

Griffard, B.F., Art Bradshaw, Kent Butts, "Disaster Preparedness: Anticipating The Worst Case Scenarios U.S. Pacific Command South Asia Seismic Disaster Preparedness Conference February 22-24 2005, Honolulu Hawaii, *CSL Issue Paper, Volume 05-05*, Center for Strategic Leadership, Carlisle Barracks, Carlisle, PA, March 2005 http://www.csl.army.mil/usacsl/Publications/05-05.pdf

Griffard, B.F., Kent Butts, and Art Bradshaw "Support to Civil Authority in Seismic Disasters: Regional Initiatives U.S. Pacific Command Southeast Asia Seismic Disaster Preparedness Conference" *CSL Issue Paper, Volume 02-06,* Center for Strategic Leadership, Carlisle Barracks, Carlisle, PA, February 2006 http://www.csl.army.mil/usacsl/Publications/IP02-06SEADPC.pdf

Phinney, Catherine and Kent Butts, Eds, *Proceedings: Regional Asia Pacific Defense Environmental Workshop, Environmental Security Series no. 5*, Center for Strategic Leadership, Carlisle Barracks, Pennsylvania, 1998.www.csl.army.mil/usacsl/publications/REAS.pdf

Smith, Brian D., Arthur Bradshaw and Kent Hughes Butts, *Proceedings: The Role of the Military in Protecting the Worlds Water Resources,* Center for Strategic Leadership, Carlisle

Barracks, Pennsylvania, 2000.http://www.csl.army.mil/usacsl/publications/RoMPW.pdf

Walt, Stephen M., “The Renaissance of Security Studies,” International Studies Quarterly, Vol. 35, 1991, pp. 211–239.

Wohlschlegel, Robert, Curtis W. Turner and Kent Butts “Maritime Threats Workshop,” *CSL Issue Paper, Volume 09-04,* Center for Strategic Leadership, Carlisle Barracks, Pennsylvania October 2004 http://www.csl.army.mil/usacsl/Publications/IP09-04.pdf

Plenary Session

Opening Plenary Session Speaker 1: Mr. John Owens, Australian Department of Defense

Mr. John Owens, the head of Infrastructure Division, Department of Defense, Australia, provided the introductory remarks for the conference.

Mr. Owens began his remarks by thanking the PESC for the opportunity to be the lead-off speaker for the conference. Next, he gave his respects and tribute to the victims of the three recent natural disasters in the Pacific region: the earthquakes in Japan and New Zealand, as well as the massive flooding in Australia. Each of these disasters highlights the need for conferences such as this.

Mr. Owens then reaffirmed his support of the conference aims and sharing of views and concerns in dealing with the issues at hand. We have climate change, resources issues and declining water supplies. Environmental issues do not respect natural boundaries and because of this, we must deal with them together.

Mr. Owens concluded his remarks by stating the military is uniquely poised to take the lead in environmental security, a most important issue.

Opening Plenary Session Speaker 2: Mr. Curtis Bowling, Chairman, Environmental Readiness and Safety Board

Mr. Curtis Bowling was the second plenary session speaker. He is currently a member of the Senior Executive Service, chairman of the Environmental Readiness and Safety Board, DoD Explosive Safety Board.

Mr. Bowling spoke on military adaptation to climate change. The debate about climate change is not new; however, senior leaders are discussing it more. In his remarks, he cited a quotation by the U.S. Secretary of Defense and information published in various U.S. strategic documents, such as the 2010 National Security Strategy, 2011 National Military Strategy and the 2010

Quadrennial Defense Review.

Department of Defense (DoD) now recognizes climate change as in influence to its operating environment and missions. DoD will need to adapt to the impact of climate change to be successful in the future. This will require resilience as missions change.

Mr. Bowling provided examples of the impact of climate change at U.S. military installations. He explained the arid areas of the southwest U.S. will become hotter and drier, and the southeast U.S. will experience increased weather extremes as well. Rising temperatures of water will impact cold-region installations and coastal areas will be impacted by rising sea levels and storm surges. It is important to note this in relation to the specific impact to DoD buildings and other infrastructure, which are vulnerable because most will still be in use 40 years from now. He also stressed ecosystems, including water availability, on DoD training and testing lands.

Mr. Bowling went on to describe DoD's changing and expanding mission requirements, and how they have been influenced by climate change. Two emerging missions are humanitarian assistance/disaster relief and peacekeeping. Last year, DoD participated in 120 domestic missions related to climate change and ten percent of the worldwide disasters, including the disasters in Japan, New Zealand and Australia mentioned by Mr. John Owens, the first speaker.

The change in the operational environment has highlighted equipment limitations and the need to make modifications. Additionally, force protection measures must be updated because of new diseases and health threats. There are also logistic challenges to delivery systems.

Mr. Bowling pointed out that resilience and adaptation are required to meet our new challenges. He introduced four objectives, each with its own goals.

- Objective 1 - Continued Availability of Critical Resources
    - Goal 1 - Use of Fossil Fuels Reduced
    - Goal 2 - Water Resources Management Improved
- Objective 2 - DoD is U.S. Government Leader in Reducing GHGs
    - Goal 3 - Scope 1 and Scope 2 GHG Emissions Reduced by 34 percent by 2020, relative to fiscal year2008
- Objective 3 - Minimize Waste and Pollution
    - Goal 4 - Solid Waste Minimized and Optimally Managed
    - Goal 5 - Chemical of Environmental Concern Minimized
- Objective 4 - Management of Practices Built on Sustainability and Community
    - Goal 6 - Sustainability Practices Become the Norm
    - Goal 7 - Sustainability Built into DoD Management Systems

Mr. Bowling went on to express that speakers will cover each of these objectives and goals in more detail in the coming days.

Regarding adaption, Mr. Bowling briefly discussed that DoD first must understand its vulnerabilities and develop strategies to address them as another way to deal with environmental issues. Furthermore, he added, DoD must integrate the strategies it develops into all business planning and operations, and complete cost/risk benefit analysis to prioritize efforts.

DoD is not the US government lead on climate change; in fact, he explained, there is no lead agency, only organizations working together to reduce emissions, share data and solutions, and adjust mission capability.

Currently, DoD partners with the departments of Energy, Homeland Security and State, as well as the U.S. Agency for International Development, USAID. DoD also partners with other militaries around the world through regional and multilateral relationships, sharing training, capacity and capabilities.

Mr. Bowling concluded his remarks by stating that partnering is good and that is why we are here this week, to learn from each other today, to be prepared for tomorrow.

Discussion:

Is the military overstepping its bounds in countries by being so involved in environmental security?

- Since DoD is not the lead agency, no it's not a concern. DoD support must be requested by civilian authorities in order to respond to natural disasters. For international incidents the State Department requests military assistance, if required.

How can we share the knowledge, skills and abilities with other militaries and countries around the globe?

- To start out with conferences such as this is a great way to start. We want to continue the dialogue on mitigation and assessment strategies.

Opening Plenary Session Speaker #3: Dr. Peter Mouginis-Mark, Hawaii Institute of geophysics and plantology, School of ocean earth sciences and technology, uhm, sustainability initiative office of vice chancellor research and graduate education, university of Hawaii

Dr. Mouginis-Mark's topic was Sustainability Research at the University of Hawaii at Manoa. He stated that the University of Hawaii (UH) could bring a lot to the table for USPACOM and the Pacific region. He wanted to highlight the many areas where UH can add to USPACOM's mission. UH and USPACOM have worked together on many projects in the past, and UH would like to continue to build on that relationship. Dr. Mouginis-Mark went on to point out a couple of key points that UH could bring to the table:

- The UH can provide a quantitative modeling of the future environment. The modeling can show the changes in the Asia-Pacific region. This modeling has relevance for transnational security.

- UH has a detailed field experience of natural disasters and the physical process which are involved. The UH's field experience provides relevance to humanitarian assistance.

- Hawaii is midway between Asia and the United States. The UH has a better understanding of international relationships through protracted collaborations in the Asia-Pacific Region and its East West Center, a facility for research of Asian countries like Korea and China. The UH's understanding of international cultures is relevant in business, disaster relief and so many different areas.

This briefing will give an overview of the research being done by UH. The UH is organized into the following research units:

- Institute for Astronomy
- Cancer Research
- Hawaii Institute of Geophysics and Planetlogy
- Hawaii Institute of Marine Biology
- Hawaii Natural Energy Institute
- Pacific Bioscience Research Center
- Water Resources Research Center

The following academic units also comprise the university:

- College of Natural Science
- College of Social Sciences

- College of Arts and Humanities
- College of Language, Linguistics and Literature
- College of Tropical Agriculture and Human Resources
- College of Engineering
- College of Business Administration
- College of Education
- School of Architecture
- School of Hawaiian, Asian and Pacific Studies
- School of Travel Industry Management
- School of Social Work
- School of Ocean Earth Sciences and Technology
- School of Medicine
- School of Nursing and Dental Hygiene
- Richardson School of Law

Research funding at the UH:

- UH does research currently for such organizations as the National Science Foundation and NASA, to name a couple.
- In fiscal year 2010 UH received $452,408,669 for research.
- Right now UH is on pace to do well over $500 million in research.
- Every UH academic department does research with different nations of the world. Currently UH is doing research with 39 nations, mainly throughout the Pacific region.

Astronomy research:

The Big Island is probably the best place on Earth to do astronomy research. It attracts some of the best in the fields of math, engineering, and physics, to name just a few areas of studies. Mauna Kea and Haleakala facilities are where the astronomy research is conducted. Currently the UH is working on two new telescope projects:

- Pan-STARRS (Panoramic Survey Telescope and Rapid Response System)
- Advanced technology solar telescope (ATST)

Oceanography:

The UH's School of Ocean Earth Science and Technology operates two submarines and the R/V Kilo Moana. The Moana is a general purpose oceanographic research ship designed to operate in coastal and blue water areas. Its unique small waterplane area twin (SWATH) hull form provides a comfortable, stable platform in high sea conditions. The UH deploys its submarines and the Kilo Moana all around the world doing important oceanographic research. UH's Center of Microbial Oceanography: Research and Education (C-MORE) studies microbial oceanography, which is the scientific discipline concerned with the biology and ecology of microorganisms that inhabit the sea.

The UH's Institute of Geophysics and Planetlogy is currently conducting research on planetary remote sensing. There are seven facilities involved with on-going planetary missions to Mercury, the moon and Mars. This department is also conducting a Hawaiian mapping research project that is exploring the ocean floor, using image sonar. The UH's Raman Spectroscopy Lab is developing standoff remote sensing tools for chemical signature identification, while the Pacific GPS facility is conducting major efforts in the study of the 2010 Chilean earthquake. This department is also developing new instruments in the areas of:

- Volcano monitoring
- Aerosols

- Thermal imaging
- Global Positioning System (GPS)
- Radar

The UH Medical Center is doing important research on a cure for malaria.

Sandra Chang is a JABSOM researcher who studies the mechanism of immunity to infection with Plasmodium falciparum through field studies in Papua New Guinea and Columbia. The future success in malaria control will rise from the collective successes of small, diversified, sustained skirmishes in which issues of culture and ecology figure as prominently as parasite chemistry.

Cultural misconceptions can lead to policies that have a disastrous consequence for companies and governments working overseas. UH's Dr. Sun-Ki Chai has teamed up with a private firm to develop software which captures the critical role culture plays in the way people think and act in different situations. The U.S. Navy has funded a project to work on these cultural differences because of what has occurred in world crises such as Afghanistan and Iraq. Currently UH is working with over 60 nations throughout the Pacific region dealing with such cultural differences.

UH has been doing research dealing with the projected changes in annual rainfall in 2050. The UH's International Pacific Research Center is in the forefront of climate modeling. This climate modeling not only looks at the changes in rainfall throughout the world, but also how ocean currents will change over the next 50 years. The future changes in rainfall throughout the world can potentially lead to:

- Greater uncertainty in drinking water supply throughout the world
- Greater risk to agriculture
- Higher incidences of fires
- More flash flooding

The Hawaii Institute of Marine Biology and the Kewalo Marine Laboratory are doing extensive research in the changes in the world's coral reefs. The institute does extensive research at Coconut Island (Coconut Island was made famous in the filming of the TV show *Gilligan's Island*). The island is surrounded by 64 acres of coral reef. Coconut Island has been designated by the state of Hawaii as the Hawaii Marine Laboratory Refuge. Research done by the Hawaii Institute shows that as the ocean's temperature increases the ocean becomes more acidic. The high acid contact of the ocean stresses the reefs, leading to coral bleaching. Increasing ocean acidification threatens both Hawaii's reefs, as well as reefs around the world. UH is predicting that three-quarters of all of the world's reefs will be stressed by 2050 due to the increase of the oceans acid level. The economic impact to the world's fishing and coastal tourism will be great. The Hawaii Institute of Marine Biology is also studying the following areas:

- Coral diseases of Hawaii
- Evolutionary biology
- Sequencing of the coral genome
- Coral reef biogeochemistry

The UH has also been doing research in the implications of the rising of the sea level due to climate change. UH has discovered that just a 1.5 meter rise in the sea level can affect 17 million people. Rising in sea level will have a major impact on low-level countries like Bangladesh and many island nations. Already Hawaii has been impacted by the higher sea level; for example:

- Flooding has occurred on Oahu at Mapunapuna.
- Storm drains in Honolulu are already backing up and flooding with seawater. The seawater in storm drains will lead to corrosion of the underground infrastructure.
- Sometime in the not too distant future, access to this Hilton Hotel will be impossible, due to flooding caused by the higher sea level.

UH has been doing research on natural hazard mitigation in four key areas:

- Tsunami risk and recovery: A UH team visited Sri Lanka to identify areas of match between UH expertise and the needs of Sri Lanka. UH worked with the Sri Lankan government in aiding disaster recovery and mitigation
- Volcanic hazards: Field and theoretical analysis of explosive eruptions and surface flows. Volcanoes are a daily threat to people, houses and travel throughout the world. Last summer we saw Europe's air travel impacted by volcanic eruptions
- Forest fires: UH monitors the daily global distribution of fires using NASA satellites and maintains a near real-time web-based display

UH is a pioneer in the new technology of infrasonics, the study of ultra sound that travels through the ocean. This science endeavors to understand how geophysics of the earth generate sound. Infrasonics are used to track tsunamis as they cross oceans and may someday predict disasters like earthquakes and tsunamis before they cause damage and loss of life.

In summary:

- The University of Hawaii's diverse skill sets can contribute to:
    - Improving health risks in Southeast Asia
    - Understanding cultural differences across the region
    - Quantitative predictions of site-specific sea-level rise
    - Biological understanding of the changing coral reef health

- A broad understanding of natural hazards:
    - Tsunamis
    - Volcanic eruptions
    - Fires
    - Earthquakes
    - Hurricanes
- USPACOM and UH can both benefit by working together. This conference should be the beginning of a long and mutual partnership between USPACOM and the University of Hawaii.

Opening Plenary Session Speaker #4: Lieutenant General (Ret.) John F. Goodman, Center for excellence for disaster management and humanitarian assistance

LTG Goodman, now a member of the Senior Executive Service, is the Director for the Center of Excellence in Disaster Management & Humanitarian Assistance, U.S. Pacific Command, and his topic discussion was Fostering Resilient Societies. The purpose of the presentation was to discuss the military's role in responding to environmental threats to regional security. The military has the ability to address and act on these environmental threats.

The U.S. Center for Excellence in Disaster Management and Humanitarian Assistance (COE) educates, trains, researches, and assists in disaster management and human development operations:

- Department of Defense organization with a global mandate
- Established in 1994
- U. S. government funded
- Reports to the U.S. regional combatant commands and comes directly under Admiral Willard

Climate change will continue to have a profound effect on regional stability and on U.S. national security. Global climate change is most commonly defined as any significant change in climate lasting for an extended period (decades or even longer). Sometimes climate change is defined as “abrupt climate change” which includes the possibility of a tipping point which takes the Earth’s climate past a relatively stable state. Climate change is often used interchangeably with the term global warming. Global warming refers to an average increase in the temperature of the atmosphere near the Earth’s surface, which can contribute to changes in global climate patterns. Rising temperatures, however, is only one aspect of climate change. Man has had an effect on the climate, but how much mankind has caused global warming cannot be determined. Greenhouse gases have increased. Current levels of greenhouse gases are the highest recorded in thousands of years, even accounting for natural fluctuations.

Natural disasters have been increasing throughout the world since 1960 and the number of people affected by these natural disasters has also been increasing. Disasters cause serious disruption to the functioning of society or community, causing widespread human, material, or environmental losses that exceed the ability of the affected society or community to cope.

Disaster planning by society or community needs to be done. All societies and communities have emergency plans, but none of them truly have disaster plans. Another issue is with societies and communities that do have emergency plans, but do not keep their plans up to date. These plans must be updated and then maintained on a regular basis.

Governments need to plan for disasters from the local level up to the national level. They should prepare for many different scenarios and then test for each of these scenarios. Governments also need to promote understanding, particularly when an event is anticipated to exceed its capabilities. The first capacity lost in a disaster is communication. Governments often don’t realize that communications, like phone service, radio communications, et cetera, will not exist after a disaster. They never plan for multiple events to occur at the same time, as just happened in Japan (earthquake, tsunami and nuclear disaster all at the same time). Governments also need to be able to operate with integrated planning among different levels (national, regional and local).

Likewise, businesses and families need to be prepared for disasters. They need to plan for all types of emergencies and disasters. Businesses should safe guard records and have back up records stored outside the local area. They need to plan on losing operational capabilities and not being open for business for many days, or even months. Family records should be backed up and money kept on hand until banks are functional again. In the past, families have not been a part of any emergency or disaster plans, but families make up the communities.

Governments, businesses, communities and families are clearly not prepared for disasters. Their lack of planning has been going on since 1950 and it is still ignored today. There are few-to-no building codes or proper hazard protection for infrastructure. Response plans at all levels are inadequate. Massive communication failures will undermine coordination. Lack of training, communication and situational awareness will greatly diminish command and control. Military assistance is invaluable, but it will be uncoordinated. The military has proven to be a great asset and provided great assistance when called upon; however, it can be unwieldy and difficult upon activation because of differences in cultures.

The military is involved mainly with disaster management. They will not take the lead, but have the skills to help support after a disaster occurs. The military has the resources to provide generators, restore communication, et cetera. Civil-civil and civil-military elements need to engage in disaster planning. After the disaster occurs is no time to start passing out business cards. The civilian and military need to know, coordinate and plan with each other and to coordinate with one another before the disaster occurs. The military can assist a community in recovering when a disaster occurs, but must have a plan for a transition to civilian authorities after the disaster recovery is maturing.

The differences between emergencies and disasters are the magnitude and degree of disruption. Local emergencies all have these common factors:

- Interaction with familiar persons
- Familiar tasks and procedures

- Intra-organizational coordination needed
- Roads and telephones and facilities intact
- Communications frequencies adequate for radio traffic
- Use of familiar terminology in communication
- Management structure adequate to coordinate resources involved

Major disasters have these common features:

- Interaction with unfamiliar persons
- Unfamiliar tasks and procedures
- Intra-organizational and inter-organizational coordination needed
- Roads, telephones and facilities are damaged or destroyed totally
- Communications frequencies overload for radio traffic
- Use of unfamiliar terminology in communicating
- Management structure inadequate to coordinate resources involved

What will be the military's role in adapting to climate change? The military's role will most likely be the framework or method in assisting communities to make credible preparations for future disruptive events. It will have to help establish a national plan that includes assisting local and state governments when their capabilities have been exceeded. Both the military and the national government must know infrastructure capacities, and when those capacities are exceeded, know how to assist local and state governments. There must be regional coordination that enables local citizens to assist the local and state governments when requested.

The military does support other nations when disasters occur and must plan and prepare the essential support requirements needed to aptly assist in an international crisis. A status of forces agreement should be established before a military goes into a host nation and before a disaster occurs. Host nation fees and customs requirements also need to be addressed, as well as landing aircraft rights requirements:

- Will the aircraft be allowed to come in duty free?
- What about fuel?
- What about weapons and security issues?

Many issues need to be worked out and planned for beforehand. Operational considerations like the local security situation need attention. What are the community coordination framework and required critical emergency services?

Coordination guidelines and mechanisms:

- International
    - Oslo guidelines (is not written for the military)
    - New humanitarian architecture (cluster approach)
- Regional
    - Asia-Pacific Conference on Military Assistance to Disaster Relief Operations (APC MADRO)
    - ARF strategic guidance for HA/DR
    - ASEAN agreement on disaster management and emergency response
    - Multi-national forces (MNF-SOP)
- National
    - International humanitarian laws – International Federation of the Red Cross (IFRC)

- Regional actors
    - Association of Southeast Asian Nations (ASEAN)
    - South Asian Association for Regional Cooperation (SAARC).
    - Pacific Islands Forum (PIF) / Pacific Islands Applied Geosciences Commissions (SOPAC).
    - North Atlantic Treaty Organization (NATO)

There are three key time periods that come into play after the hazard event occurs:

- Emergency
- Recovery
- Revitalization

International response coordination and collaboration mechanisms

- Host nation
- Host nation coordination mechanism
- UN clusters meeting coordinates with the host nation in the following key areas:
    - Early recovery
    - Camp coordination and management
    - Water sanitation and hygiene
    - Protection
    - Nutrition
    - Logistics
    - Health

- Emergency telecommunications
- Emergency shelters

In civil-military coordination the most common understanding is current reality (current situational awareness). The common view is determining what is broken and what is really working in the host nation. There must be unity of effort and the host nation is expected to ensure that all the supporting nations are working together. Additional coordination needs to be conducted between all the supporting nations and NGOs, including who is doing what in each sector. Finally, all agencies and organizations need to have an agreement on progress of the recovery.

In summary:

- The assumptions within most community emergency plans are not sufficient during disasters.
- Disasters disrupt infrastructure, business, communities and families when they occur.
- Civil-military coordination is more than talking or exchanging LNOs.
- Disaster preparedness and training should involve the whole of the community from the family up.
- Managing the media message and public information is vital to a community's mental profile.
- Exaggerations or distortions of the disaster can be extremely harmful.
- Individual stories do not equate to the disaster's impact.
- Planning, preparedness and rehearsal really matter.

Panel 1: Environmental Security and Sustainability

Speaker 1: Mr. John Owens, Australian Department of Defense

Mr. John Owens, head of Infrastructure Division, Department of Defense for Australia, spoke on the Australian perspective of environmental security and sustainability.

Australia is a small population and a large land mass country. The military is the largest landowner, over three million hectares and 25,000 buildings. Because of this, the Australian Defense Forces (ADF) must be in the forefront and the leadership of environmental issues.

The recent Australian defense white paper specifically requires ADF forces to plan, train and participate in humanitarian assistance missions. This is in addition to the military missions the ADF is deployed in at present all over the Pacific, Asia and Africa.

Mr. Owens then noted how climate change is affecting Australia now with the rising sea levels, reduced water availability and heat waves. ADF training areas are extremely venerable to brush fire and mitigation strategies are a routine part of all exercise planning. Rising sea level forecasts coupled with storm surges indicate Royal Australian Air Force Base Williamtown will become beachfront property between 2040 and 2100, if current trends continue. Mr. Owens summed up how the severe storms and floods coupled with out of country missions fully taxes the ADF in its response capability to crisis.

Mr. Owens then shifted his remarks to efficient use of resources. One response to climate change has been the building of energy efficient “five star” buildings. In fact the ADF was a founding member of the organization charged with developing standards.

In addition to energy efficient new buildings, the ADF uses renewable energy, simulation, and behavior modification. Solar power is the primary alternative energy.

Simulation is used to supplement full up field training when possible to preserve and protect training lands from overuse and the effects of erosion. All ADF training sites have dedicated professional environmental staffs. The "limits to acceptable damage" philosophy guides land use decisions.

Recently a poster advertisement information campaign reduced electricity use by eight percent and water use by 34 percent.

Mr. Owens described some environmental security and sustainability problems the ADF faces. Ground water and pollution seeping from military equipment buried during World War II, as well as troops accidentally crushing coral reefs in East Timor.

One problem or challenge the ADF has faced and is quite successful in dealing with is preserving heritage sites on military lands. From keeping buildings exteriors original with modern interiors to making tactical level commanders respectful of terrain with religious or historical significance and avoiding maneuver damaging in it.

Mr. Owens concluded by remarking, "the ADF sees its environmental awareness and sustainability as a normal mission and part of a whole of government approach."

Speaker 2: Major General (Ret.) A.N.M. Muniruzzaman, President, Bangladesh Institute of Peace and Security Studies.

MG Muniruzzaman currently serves as the president and CEO of the Bangladesh Institute of Peace and Security Studies (BIPSS). He spoke on the security implications in climate change and the role of the military.

MG Muniruzzaman began his presentation with a quote from former Secretary-General to the United Nations Kofi A. Annan: "Climate change is an all encompassing threat, directly affecting the environment, the economy, health and safety. Millions of people are uprooted or permanently on the move as a result; many more millions will follow."

Climate change is serious and is recognized as a major security threat internationally that affects aspects of politics, economics and human rights. With reports stating natural disasters may double in the next 10 to 15 years, imagine the loss created by doubling the 2,852 disasters that killed 780,000, at a cost of $960 billion over the last 10 years.

U.N. reports indicate that there will be a global temperature rise of two to six degrees Celsius by the year 2100 and a resultant rise in sea level of .6 to 1.9 feet. These reports further indicated this might cause up to 50 million environmental refugees by 2100.

MG Muniruzzaman asserted that climate change and desertification are two sides of the same coin and must be tackled together. He identified two dimensions: human/nontraditional security and hard security. The most vulnerable countries to climate change are small developing states, African continent, the mega-delta regions of Asia and polar regions.

MG Muniruzzaman pointed out the water crisis either makes water scarce or unfit for human consumption and is exacerbated by unsustainable irrigation practices. Climate warming can change the nature of precipitation and its patterns. Current estimates put the number of people without safe drinking water at 1.1 billion and increasing rapidly with the growing population.

Food security and agricultural productivity are potentially the most worrisome consequences of climate change. If global warming raises the temperature three degrees Celsius, it's likely the number of people suffering from hunger will double to 550 million worldwide. Desertification and soil erosion will lead to a decrease in available of farmland and reductions of yields. Rain fed agricultural could fall by about 50 percent by 2020.

Health security, clean air water, food, shelter and the degradation cause by climate change affects the health of 235 million worldwide. It's also projected to cause over 150,000 deaths annually, with 45 million malnourished.

Former Secretary-General to the United Nations Kofi Annan warned the humanitarian impact of climate change is likely to be among the biggest humanitarian challenges of the years to come.

In addition to the human Costs, Oxfam International estimates developing countries around the globe will require $50 billion to adapt to unavoidable climate change.

Energy security and the decline of hydroelectric power generation may reinforce competition for fossil fuel energy sources. MG Muniruzzaman suggested a term the shocks created from the increasing climatic disasters, calling them “climate Pearl Harbors.”

MG Muniruzzaman went on to describe the hard security dimensions of climate change. These include radicalization, terrorism and marginalization, resources competition, inter- and intrastate conflict, state collapse and regional destabilization. When governments can’t deliver basic services to its people, conditions become ripe for extremists and terrorist to flourish. The 1994 Rwanda genocide, 1974 Nigerian coup and the current situation in Darfur, all had roots in conflicts over resources.

MG Muniruzzaman then introduced a case study on climate change in Bangladesh. The results prove climate change is no longer a theory, but something that is already happening. The erratic weather patterns of climate change have cause droughts and floods creating all the problems described in the presentation. The most severe of these would be a displacement of 20 to 30 million people, if sea levels rise.

MG Muniruzzaman discussed the roles of the military in climate change. He asserted they are the best available forces in most of the world due to crisis mobilization ability, for instance its lift capacity, as well as organization and training.

MG Muniruzzaman concluded his presentation with the statement, “the crisis is upon us and I hope our militaries and societies rise up to meet the challenge.”

Speakers 3 and 4: Lieutenant Colonel Eric Walker, U.S. Army, and Mr. Robert Beadle, Foreign Service Officer

LTC Eric Walker currently serves as the deputy commander of the Joint Special Operations Task Force—Philippines (JSOTF-P). Mr. Robert Beadle is a Foreign Service officer with the United States Agency for International Development (USAID) and serves as liaison to the U.S. military in the Philippines.

LTC Walker began the presentation outlining how JSOTF-P and USAID work hand-in-hand with the government of the Philippines. The three Ds of diplomacy, development and defense describe their program. Their cooperation is more than "brochure" deep, but an efficient whole of government collaboration effectively spending money and executing projects in support of the shared goal of a more prosperous well governed and stable democracy that meets the needs of the people, especially the poor.

Mr. Beadle continued the presentation stating the U.S. is largest donor to the Philippines, but Japan, the World Bank, the Asia Development Bank, China, Germany and Australia also make significant contributions. The Philippines is a country of persistent poverty, despite a massive increase in per capita income over the years. Despite abundant resources, the Philippines lag behind their neighbors because of a fast growing population, poor investment system, poor education system, corruption and conflict and security issues.

Mindanao Island has the highest level of poverty and one-third the land mass of the Philippines. However, it receives 60 percent of USAID's country budget. Infrastructure development is the largest program in USAID's growth with equity in Mindanao program.

LTC Walker then went on to describe the security situation in Mindanao starting with the arrival of Middle East terrorists groups in the early 1990s and the creation of the Abu Syyaf Group. He emphasized the "safe havens" in Mindanao have been the planning grounds for terrorist attacks from the 1993 World Trade Center bombing to the recent Bali night club attacks.

Since 2002, the U.S. has embedded military advisors who work alongside their Philippine counterparts in non-direct combat role. This is called Kapit Bisig, or hand-in-hand. The military advisors have a threefold mission: advise and assist, upgrade capabilities, and civil military operations/humanitarian assistance. U.S. Pacific Command has graded the program "very successful."

Mr. Beadle pointed out that the success of the program is based on the joint partnership between USAID and the military.

This includes the exchange of liaison officers, information sharing and project cooperation.

American Embassy Manila operates on a one-team, one-mission basis, epitomizing the whole of government approach. One goal is working to solve the root causes of terrorism, increasing job growth and keeping transnational terrorism out of the Philippines. One of the unique ways this is done is through a joint civil-military standard operating procedure (SOP). One a key component is an update interactive database that is update by team members using smart phone technology. When team members see a reportable item, they enter it into the smart phone and the database is updated real time.

LTC Walker and Mr. Beadle concluded their talk with praise for each other's organization and the spirit of Kapit Bisig, or hand-in-hand.

Speaker 5: Colonel Phongphat Songsoontorn, The Royal Thai Armed Forces, Thailand

COL Songsoontorn discussed the Thailand Military Development Model. National security means sovereignty of the nation or safety for people including maintaining democracy under Thai constitution. The military organization's role has changed greatly since the end of the Cold War. In fact, the Thai military has changed in so many dimensions that some academics call it "Revolution in Military Affairs." The Thai military's role has changed the greatest in the area of the environment. The role of the military in the environment was not of much interest to the military in the past, but today the environment is very important. COL Songsoontorn's briefing showed the changes that the Thai military made in regards to climate change and the environment.

Climate change is a global trend. Tsunamis, earthquakes and other natural disasters result in damage to the nation's infrastructure and tourism industry. The military and government realized that problems with the environment affect societies and humans as a whole. Therefore the Thai military is now addressing issues that affect:

- Global warming
- Water contamination

- Air pollution
- Garbage problems

The Commander Council of the Royal Thai Armed Forces received guidance for a mission of civil affairs. Every level of military organization is to convert policy into practice including cooperating with the private sectors, state enterprises and public sector to organize projects, for example: The Royal Thai armed forces took part in promoting and preserving environmental quality in terms of creating a good environment, and it leads in the protection of the environment in the following areas:

- Artificial coral reefs and coral conservation
- The Royal Navy working with families in planting mangroves (2,769 acres have been planted since 2008) and working on preserving marine species
- The Royal Air Force developing and building a high efficiency wastewater treatment plant
- Military training for all services that does not destroy the environment: firing ranges being restricted to very controlled and low impact areas
- Civil affairs units used to promote environmental issues especially after training has been conducted
- Military personnel working with the forest department to be used to protection and reforest the countries forest through conservation seeding (33,000 acres have been reforested since 2008). Reforesting absorbs carbon dioxide and reduces global warming.
- Military areas developed for restructuring the environment. Launching of vetiver grass and water hyacinth cultivation are all projects done on military areas.
- Training of army personnel about wildfire protection and fire fighting
- The Royal Thai Navy Sea Turtle Protection Project

The Royal Thai military also has disaster relief missions. In an effort to prepare for these relief missions a military workshop on multilateral cooperation in humanitarian assistance and disaster relief (HA/DR) was held to develop plans on how to deal with disasters. The Royal Thai Armed Forces HQ Disaster Relief Center (RTARFHQDRC) runs the disaster relief mission, directing the army, navy and air force disaster relief centers. The military is used for disaster relief such as bridge construction equipment, field kitchens and water supply systems.

The U.S. and Asia Pacific cooperate to solve problems dealing with disasters and environmental issues. We all must cooperate to solve these very pressing issues in the Pacific region and the world. It must be our mission to preserve the world environment. We hope that cooperation will occur on every continent and every government and the private sector to bring peace to humankind and enable it to live with nature.

Speaker 6: Mr. Daniel Chua Thian Cheong, Singapore Armed Forces, Senior Project Officer Combat Service Support

The topic of this discussion was The Singapore Perspective. Singapore is a small island, less of less than 700 square kilometers, limited water supplies and no natural resources. Yet, Singapore has overcome its constraints, and grown and developed into a modern city. In fact, a recent study concluded Singapore is the “greenest country in Asia.” Singapore achieved this through a four-prong strategy that includes the armed forces taking a balanced, practical and prudent approach on environmental security. The Singapore Armed Forces (SAF) has improved resource efficiency, adopted green innovative technology, and embraced a culture of sustainability. In addition to successful proactive measures, the SAF has battled climate change in humanitarian assistance and disaster relief (HADR) support, contributing to the 2004 tsunami, 2009 West Sumatra earthquake, and 2011 Christchurch, New Zealand earthquake. Through foresight and planning, a small nation with no natural resources has developed into a clean, green, and safe haven.

Panel Questions and Answers

Q: What is the role of the military and civilians in regards to climate change?

A: The military has to be involved with all branches of the government. The military cannot solve the problem, but it must be in the forefront. There are people who don't trust the military in the role of managing and evaluating climate change. They believe that the military is involved, so it can buy more "toys" like weapons and vehicles. The military is not in involved for that reason; it is involved for the welfare of its nation, region and other nations.

Q: How can pollution be stopped in regards of the use of the military?

A: (Australia) The military needs to clean up after itself after every training exercise. Environmental management cannot only be done during peacetime in Australia. It must also, be done when the Australian military is outside of Australia.

When the Australian military is reducing its footprint or closing a base it needs to clean up and decontaminate to civilian standards. These decontamination clean ups can be very expensive. For example, they recently cleaned up a military ammo site that cost over $300 million to clean up. This needs to be done for any base or military area that has been around since World War II. However, when there is a need to clean up a military site that goes back to World War II, then it is an issue of the whole of government, not just the military. The reason is that these sites were created during a period when the whole country was just trying to survive and get through the war.

Just an additional comment: It is good for recruiting for the military to be environmentally sound. Young people today want to be a part of a military that has strong values and is concerned about the environment.

Q: We need to re-think national security to include environmental issues. How do we do this?

A: The military is no longer only for protecting the homeland and its people. It must look at all the threats to its nation. Envi-

ronmental threats are big threats to every country. National policy must also be rewritten to address the threat of the environment to each nation. Many believe that when the military is involved in an important environmental issue that it is “dulling the tip of the spear.” This is far from the truth. Every military of the world must deal with threats from the environment as part of its mission.

Q: The Australian military has made great progress in dealing with environmental issues. How can other nations gain from Australia’s advances in the environmental areas?

A: (Australia) The Australian army has all their environmental work published on the internet. Every nation or individual is invited to look at these websites to share and learn how to improve on their environmental issues.

A: (Thailand) Thailand is very serious about its environmental issues. It is very willing to work with everyone on improving the environment.

Panel 2: Water Resources Management

Speaker 1: Dr. Jerome Delli Priscoli, Governor of the World Water Council

In addition to his role as governor of the World Water Council, Dr. Priscoli is a civilian member of the U.S. Army Corps of Engineer’s Water Resource Institute and the editor-in-chief of Water Policy, the official journal of World Water Council.

Dr. Priscoli began his presentation by quoting world leaders who stated the common theme that water is one of the few things that would lead them to war. He then contrasted this with the comment of a senior Israeli defense official’s contradictory statement “the cost of a week’s war would build five desalinization plants with no loss of life or political pressures.” The final quote by former Secretary-General to the United Nations Kofi Annan stated that water problems “can also be a catalyst for cooperation.”

Dr. Priscoli then defined water and security. The Big “S” refers to conflict war, large scale violence, and the small ”s”, water -- a means to other social ends.

U.S. water policy first appeared in 1808 with the Gallatin report. The report policy aims share the common tenants of today's policies: building unity and the nation, national defense, and economic development. Understanding water security Issues is fundamental to the understanding the transformation of the U.S. and North America.

Internationally, 40 percent of the world's population lives on shared water basins and this creates virtual water interdependence as water is used for everything. However, water can be a venue for dialog vice conflict.

Dr. Priscoli then presented his main thesis of water actions as key societal adaption tools. Investment in water infrastructure (IWRM), flood management leads to water security, small "s", which in turn leads to internal security and stability -- Big "S." This culminates in strategic security. Focus on balance of key elements with risk and uncertainty.

If water is viewed differently, not just as a resource to be gained, but instead as an opportunity for cooperation, great things can happen. Dr. Priscoli cited examples such as the Middle East table talks, multilateral water talks in the Middle East, Indus River arbitration in the 1950s, and the recent Istanbul conference and Tigris and Euphrates rivers.

Dr. Priscoli introduced the idea that international rivers are an element of regional security that is as yet, largely unexplored. Using a chart titled an adaptive security matrix, he showed how national security was not solely dependent on a high gross domestic product (GDP) or water, but a combination of both.

Dr. Priscoli then introduced some "gloomy arithmetic" of water, noting that the most serious problem was safe drinking water, as 1.4 billion people lack safe water, 50 percent lack adequate sanitation, losing irrigated land losses are projected to increase 50 percent by 2040, and over two-thirds of the world population lives in areas where 80 percent of the rainfall occurs in 20 percent of the year. Additionally, the poor of the world pay a higher percent of their income for clean water than do non-poor.

Dr. Priscoli pointed out the fiscal challenges emphatically stating all sources of financing for water are decreasing. There is

a resources mismatch as world water managers fight over $300-400 million when in reality it would take many times more to make a dent in the problem.

Mega cities are projected to increase from 30 percent of the world's population in 1950 to an estimated 60 percent by 2030. This concentrated urbanization will place major stress on already limited water supplies as well as place larger populations at risk to water associated natural disasters.

Reimbursement for flood damage in developed nations ranges 50 to 70 percent, whereas in poor countries it's near zero percent. This mismatch causes poor nations to cycle deeper and deeper into debt and poverty. A March 2009 U.N. panel looked at methodologies to mitigate this cycle. Recommendations included: galvanize and mobilize before disasters strike, improve disaster response, provide safe water and toilets quickly when disaster strikes, and prioritize systems to forecast, inform, alert and evacuate.

Dr. Priscoli expressed that the greatest reasons people should fear climate change are water related. Four out of six fears about climate change are based on fears associated with water. These include droughts and floods, sea level rise, access and scarcity and the quality or health issues.

Dr. Priscoli questioned the accuracy of global climate models. Current models do not always cover regional trends and extreme events adequately. Furthermore, models must distinguish between deficiencies in models themselves and natural variation. However, factoring in resiliency in water resources systems design and planning is still the safest approach. The question of accuracy is additionally associated with the media and politicians' explanations of water. For example, a recent headline read: "the 2010 Indus flood reminds us that climate change is here." When in reality, this was normal flood pattern.

Dr. Priscoli asked the question: why focus on water actions as macro societal adaptations? He emphasized the ethical dilemma of climate change and water policy debates suggesting they raise anxiety about change while inadvertently denying adaptive means to cope, thus raising questions about ethics versus mitigation

Investment in water infrastructure matters because there is a strong correlation between public capital investment and private sector opportunity. Gandhi further stated “Poverty is the worst polluter.” In India, areas with less than ten percent irrigated land, 69 percent of the population were below the poverty line as opposed to areas with greater than 50 percent irrigated land, 26 percent of the population below poverty line. In Ethiopia, the limited ability to cope with droughts and floods are estimated to cost the economy one-third of its growth potential.

Countries with the largest reservoir capacity are among the richest in the world. For example, the U.S. and Australia have some of the largest reservoir capacities in the world. When damages from water related disasters are plotted against GDP, the richest nations’ losses amount to four percent whereas poor nations’ losses total upwards of 14 percent.

Dr. Priscoli discussed the changing terms of discourse on world water. Developed countries are more likely to think of global security in terms of global environmental changes and developing countries more with the human security implications of local and regional problems.

The role of water is different for different socio-economic circumstances of people. Water is critical engine for building a platform for growth. Therefore, structuring water based on the experiences of one nation for another is dangerous and likely to produce negative effects. How we make decisions about risk and water are central to the health of democratic political culture and individual freedom.

Dr. Priscoli concluded his remarks by the following stating the following points:

- Identifying priority U.S. security concerns and asking how can water actions can be used as a means to achieve security ends in each priority area, not just war or conflict.
- Move beyond humanitarian assistance, ask: how can we work to prevent or reduce vulnerability to disasters?
- Change the terms of discourse on world water; be careful our rhetoric does not create the conflict.

- Move beyond environment alone and ask: How to use water to create a platform for growth while designing in mitigation cost to the environment?
- Water actions are key societal adaption tools. Investment in water infrastructure, resource management, and flood management leads to water security, small ”s” which in turn leads to internal security and stability Big ”S.” This culminates in strategic security.
- Water talk grows, but funding shrinks.
- We have become more urban and vulnerable to large-scale disasters.
- Most of the population lives in areas that have the water for only a small percentage of the year.
- We have made progress on water access but little on sanitation.
- Water decisions equal ethical decisions. Water debates mirror debates of social ethics. With this in mind water is symbol of reconciliation healing and regeneration.

Speaker 2: Dr. Qiao Shishan, Deputy Director General, Department of International Cooperation, Science and Technology Ministry of Water Resources (MWR) of China

Dr. Qiao Shishan’s topic relates the impact of climate change on China’s water resources and adaptation strategies. He began his presentation by expressing his gratitude for the opportunity to present and describe the challenges that China faces with regards to climate change and water. Next, he gave an in depth overview of water resources in China.

Rainfall in China is mainly affected by the East Asia monsoon climate, and the topography of three tiers: the high altitude Qinghai-Tibet Plateau, Central Plateau and Basin and the Eastern Plain.

China's annual rainfall averages 649 millimeters. By region, the breakdown is northwest 161 millimeters, northeast 537 millimeters, and south 1,213 millimeters. The country is further divided into areas of humidity that don't quite correlate to rainfall. These are the arid or semi-arid northwest, the humid or semi-humid center, and humid southeast. Together these areas roughly equate to the north and south of China.

China's water resources are a combined sixth largest in the world. However, when ranked by per capita volume, China ranks, 126th. The north has 19 percent of the annual rainfall, and the south, 81 percent.

The mismatches of north and south are as follows.

- Population: north 60 percent, south 40 percent
- Land area: north 64 percent, south, 36 percent
- GDP: north 44 percent, south 56 percent
- Cultivated fields: north 46 percent, south 54 percent.

Average temperatures in China have increased over the last few years. Data from 1998 onward shows a warming trend of almost two degrees Celsius greater than average. Additionally, there was a notable temperature rises in the north and part of the Qinghai-Tibet Plateau.

Over the last 50 years China has had little increase in rainfall but the trend has been upward in the west and south, and downward in northeast and north. Extreme rain storms in the northwest and south, and a decline of rainfall in the northeast and north. Additionally, since 2000, there have been frequent droughts in the north and more serious seasonal droughts in the south.

Dr. Qiao Shishan summed up this section of his presentation with the Intergovernmental Panel on Climate Change (IPCC) assessment report that stated global warming would continue, sea levels will rise and snow-covered areas will shrink. Furthermore, rainfall will increase in the middle and high latitudes of the Northern Hemisphere, and that extreme weather events will continue to increase.

Dr. Qiao Shishan transitioned to part two of his presentation, relating to the impact of climate change on China's resources, by discussing possible temperature scenarios during the next 100 years. Research indicates by 2020, China will have a 1.1 to 2.1 degree Celsius change to a 2.5 to five degree Celsius increase in average temperatures by the end of the century. This includes a notable rise in winter temperatures and progressive increases in temperatures from southern to northern China. Also forecast, is major evaporation of the river basins. Glacier area will significantly decrease along with corresponding temperature increase.

According the National Center for Atmospheric Research, the annual average rainfall in China will increase from five to seven percent by 2050 and 11 to 17 percent by the end of the century. The research also predicts water policy redlines: water consumption, water use efficiency, and pollutant load control.

China will develop and implement more storage facilities and water source projects, particularly where there are significant spatial variations in the areas with increased rain. Some good news in climate change is that irrigation water will increase five to 10 percent with the increases in temperature and rainfall increase. However, industry and domestic water use increases approximately one percent for every one degree Celsius of temperature increase. Sea levels have been rising at 2.5 millimeter faster than the global average over the last 30 years. In the coming 30 years, models predict a rise of 80 to 130 millimeters. Droughts have significantly increased since 1991 resulting in a seven percent decrease in national grain harvests. On the other hand, floods have also increased, especially flash floods in mountainous areas. As temperatures increases in water bodies, oxygen content decreases. This has in turn caused an increase in the growth of algae.

Dr. Qiao Shishan finished his presentation by addressing strategies to cope with climate change. The first area to combat climate change is by developing low carbon renewable energies like hydropower and wind power.

The government of China accelerated reform of its water conservancy policy early this year and has made it a top priority investing four trillion yuan over the next decade. Beijing has established projects, such as recycle brackish seawater and drought resistant farmland irrigation.

At the policy level, Beijing has made changes to water resources allocation and regulations at the basin level. In addition, a new national information system of water resource management has been implemented.

Soil and water conservation measures along with developing small hydropower facilities are other important conservancy measures. Finally, policy ensures an emergency water supply to the country through a national hydrological network, planning, and water storage.

Dr. Qiao Shishan concluded his presentation by thanking the audience and U.S. Pacific Command for the opportunity to share China's successes in overcoming its water resource challenges.

Speaker 3: Mr. Don Blackmore, Chairman of Water for a Healthy Country, Australia

Water management is about people and how people interact with water. It is the way that people work with water and manage water resources.

There are currently well over 40,000 dams in the world. There is a new dam built somewhere in the world every two days. China is the largest owner of dams in the world. We will not be able to continue to build dams to solve our ever-increasing need for water. China has already run out of its ability to harvest more water from dams. We all have to share in the use of water.

In the world there are 261 trans-border rivers. These rivers affect over 145 nations, cover 45.3 percent of the land surface of the earth, and provide 80 percent of all the available freshwater on earth.

There are 3,600 water-related treaties in the world since 805 CE. Already there have been seven water-related skirmishes. While nations may be very good at writing water treaties, there is a clash between perception and fact when it comes to water. During this briefing Mr. Blackmore said he would cover all the major river basins of the world and then he would address several key upcoming water shortage issues.

The Murray-Darling Basin is as large as France or Spain in land area and is located on the continent of Australia. The driving philosophy of this basin is that you can't manage what you can't describe and measure. Australia must move from perception to fact, in regards to this basin. The government of Australia is currently buying water back from farmers and returning the water back to the basin in an effort to keep the rivers in the basin healthy. The biggest problem with this basin is that the states of Australia fight over water just like some nations do.

The perception about the Nile River Basin is that there is not enough water, so the nations that are a part of this river basin are in constant conflict. There is, however enough water for all reasonable purposes. Ethiopia in fact is one of the Earth's wealthiest water countries. Total water availability in Egypt is only 15 percent of that in Ethiopia. Mr. Blackmore posed the question: if Ethiopia is one of the water-wealthiest countries, than why does it have such a big problem feeding its people? Agriculture in the Nile River Basin remains the engine of the region's economy, but like the rest of world agriculture, it is declining as a share of the GDP of this region. There is also a perception that the Aswan will run dry. The fact, however, is that the Aswan will operate at a lower level, which will be closer to its design. In the past Egypt has had the lion's share of the resources. That could change in the near future because the southern Nile countries just signed a water treaty that did not include Egypt or Sudan.

The Euphrates River Basin's water flows from Iraq to Turkey, Syria and Iran. Mr. Blackmore stated that the salinity has been increasing at an alarming rate in this basin. He stated that back in 1980, the Euphrates was at 1,080 parts-per-million salinity; however, by 2000 the Euphrates was up to 4,500 parts-per-million. For reference, the upper drinking limit of water is 600 parts-per-million. The belief is that the salinity problem for Iraq cannot be corrected without trading off water. Salinity is a "do or die" situa-

tion for Iraq. The perception of this region is that Iraq must solve its own water problem without help from its neighbors; however, the fact is that the salinity problem can be managed with the help from its neighbors and does not need a water tradeoff.

The Indus River Basin is governed by a treaty between India and Pakistan, which is enforced by the World Bank and was established in 1960. There is a perception in the region that all its water problems can be solved by managing surface water better. It is believed that if you increase the surface water storage you will have enough water to take care of the ever-increasing population. The fact is that this river basin is badly mismanaged and there is a great deal of water lost to evaporation. Increasing surface water by building more dams will not work. Right now there are $12 billion dam projects underway, which when done will only yield 1.5 percent more water to the region. Meanwhile the western end of the Himalayas is likely to see a 30 percent reduction in water flow over the next 30 years, due to climate change.

The Ganges River Basin is a non-regulated river basin. This region believes that more major dams will deliver multiple benefits, including the control of Ganges flood system. It is believed that the best use of the water is for irrigation and that is good for the region. The reality is that the next 20-plus dams will have little impact on mainstream Ganges floods and surface irrigation is of low value return. This region has a big concern over climate change and what will be the impact. Currently the global circulation models have not agreed on the outcome of climate change.

The Mekong Basin is 4,500 kilometers long and runs from an elevation of 5,000 meters above sea level down to sea level. It is mainly an un-regulated river basin. The basin is divided into two regions: the Upper Mekong Basin, which is totally controlled by China, and the Lower Mekong Basin, which is controlled by Burma, Laos, Thailand, Cambodia and Vietnam.

China is building dams and is currently the largest owner of dams of any country in the world. China would like the image of being the “battery” of the region. Five of its newest dams are for electricity production only. The fear is that these dams will divert water away from the Lower Mekong Basin; however China’s new dams will not divert water from the Mekong Basin. Mr. Blackmore pointed out that China’s dams have empowered the Lower Basin

for proper development. He went on to state that the press is very misinformed about the Mekong Basin.

For the Lower Mekong Basin nations, it is mainly a fish story. The Mekong Basin produces two percent of the entire world's fish production. Millions of poor people rely on the Mekong Basin for fish and food. Thailand is focused on the northeast region of the Mekong Basin. Right now, Thailand is working to drought proof the whole region with water from the Mekong. Thailand will need access to the Mekong for water to be able to work on this project. Vietnam has a different problem than the rest of the region. It has a major problem with seawater coming into its agricultural areas. Vietnam has built structures that allow fresh water in and yet keeps salt water out.

Speaker 4: Mr. Sangman Jeong, Director, National Institute for Disaster Prevention, Republic of Korea

Natural disasters in Korea (2000-2009) have cost South Korea more than $1.8 billion per year due to water-related damage and well over $3 billion per year in annual recovery costs. For Korea the recovery costs are much higher than the actual damage. The primary cause of the damage is due to typhoons that mainly strike during late summer (August through September). In addition, Korea gets 65 percent of all of its rainfall between the months of July and September. The rest of the year is comparatively dry.

Water management

Korea is currently working to revive its river system for a New Korea. There are four rivers that these projects will concentrate on and they are:

- Han River
- Geum River
- Nakdong River
- Yeongsan River

These river projects will help Korea deal with climate change. They will also help Korea be able to better coexist with nature, allow for greener development of land and cities, and re-create natural lands. The four major river restoration projects have five main tasks which are:

- Storing water
- Protecting against flooding
- Improving water quality and restoring ecology.
- Creating public spaces for residents.
- Developing riverside communities.

The Four Rivers Project is expected to improve Korea's economy by creating more jobs and businesses, which will be set up around the new recreational areas. It will reduce the risk of flooding by increasing the flood level from 100 years to 200 year level and reducing the cost of flood damage. Ecologically, the Four Rivers Project will improve water resource technology, improve water supply and quality. Overall the project will improve the quality of life for the nation of Korea.

Dr. Jeong then detailed the amount of construction that will go into the Four Rivers Project. There will be more than 5.7 billion meters of dredging, building weirs (small overflow dam) in 16 places, two dams constructed, and elevating reservoir bank in 96 places. He then explained that ecological areas would also be improved by restoring 929 kilometers of streams, 135 wetlands restored, 33 fish-ways, and well over 1,300 environmental facilities constructed. Recreation areas will be constructed which will include 1,728 kilometers of bicycle lanes, promoting cultural and ecotourism, and creation of new areas for leisure activities.

The Four Rivers Project will improve water quality. The following improvements will take Korea's river water quality biochemistry oxygen demand (BOD) from 2.6 parts-per-million in 2006 down to 2.1 parts-per-million by 2012 (a 20 percent improvement in water quality):

- Sewage treatment facilities: 644
- T-P treatment facilities: 237
- Wastewater management facilities: 226
- Livestock manure treatment facilities: 19
- Non-point pollution treatment facilities: 21
- Aquatic ecology restoration: 120
- Buffer retention: 10
- Industrial wastewater treatment facilities: 37

Dr. Jeong gave an example of one of the more successful projects that was the Cheonggye stream. The stream was actually covered by a highway. The highway was rerouted and the Cheonggye stream was uncovered and now adds great charm and beauty to the city. Ecological improvements re-established fish, birds, insects and plants which had been lost when the stream was covered.

Disaster Management

The purpose of the National Disaster Management System (NDMS) is to establish a network of emergency management professionals before an emergency occurs. There will be a streamlining of general public services and a consolidation of field oriented disaster response. Additionally, Korea wants improvement of its disaster information analysis system. An expansion of local oriented disaster management professionals will be established. The major focus will be prevention and disaster preparedness.

The NDMS is striving for the best worldwide high-tech disaster management system. A strategic planning conference was held in 2004 to develop a long-term national disaster plan. The strategic plan focused on three major areas:

- Response
- Rescue
- Support

The foundation of the disaster information network was created between the years of 2005 and 2006. During this time frame a disaster information sharing system was created and the first national disaster information analysis centers were established. The focus of the foundation phase was done at the local and small government level.

Enhancement to the NDMS was done during 2007. During this period, the disaster information sharing system was completed, which allowed for the sharing of information between 34 different agencies. A network of CCTVs were established all through Korea that allows for the monitoring of area conditions and assisting the emergency professionals in making informed and timely supporting decisions. These CCTVs help with early warning of possible up-coming disasters.

The final phase of the NDMS was completed 2008 to 2011. Advancement of scientific disaster management has allowed Korea to develop a state of the art disaster warning system. Mr. Jeong went on to high light some of these new disaster management systems.

The first such technology is the establishment of a wire/wireless early warning system that can issue early warning alerts through 19 million cell phone users. These warnings are issued by the Disaster Information Management Center and sent to the wireless communication network that sends the alerts to cellular users that are located in the warning area. This cellular warning system is especially effective with the smart phones because the warnings can actually broadcast the areas to be affected on a map that can be seen on the phone. An example of this type of warning would be a map showing possible flash flood areas, created by heavy rainfall.

Korea has established a geographical information system (GIS) based disaster management system. It uses real-time monitoring of rainfall in concentrated areas based on the GIS. It analyses risky areas using three-hour rainfall forecast data from

KMA and satellite images that are used in conjunction with the rainfall forecast to assess possible flash flood risk areas. All of the gathered data is then compiled and plotted on a risk map. The result is an early warning; disaster response and recovery plan being executed as fast as possible.

The Damage Investigation System (DIS) uses wireless communication, satellite images and photogrammetry all together to investigate damaged areas from any specific disaster. It uses two cameras and one PC as a mobile GIS base to assess the damage. The system uses the cameras to produce a stereo image that is used to estimate the damage. The images are then sent wirelessly to NEMA to be used to determine damage and to gage the needed support for the affected areas. Satellite images are combined with the photo images to better gage the damage. The information is then super imposed onto GIS disaster maps. Using GPS this DIS allows emergency first responders to be activated to the damaged areas quickly and gives accurate information for better decision-making.

The UN Typhoon Committee Disaster Information System (TCDIS) was established in 2007. The TCDIS works with Korea, Vietnam and Hong Kong (China) in determining the typhoon's trajectory, possible damage and precipitation information. The GIS-based system searches for typhoons in the region and then projects the storm's track and possible damage based on a database of similar typhoons that have occurred earlier.

In summary:

- Asia and the Pacific region are impacted by 38 percent of all the disasters in the world, but 90 percent of all the causalities in the world due to disasters.
- The economic losses in the Pacific region, due to natural disasters have increased by 70 percent over the last ten years.
- The Asia and Pacific region has had the largest mortality rates due to cyclones and floods compared to the rest of the world.
- Climate change has created an alarming increase in disasters in the region.

Panel Questions and Answers

Q: How might the military help with water management and disaster prevention?

A: (China) The military is in charge of construction of flood control and working with the building of dams. Part of the military can also help during periods of disaster from flooding. They can also work with local people in flood prevention.

A: (Australia) In Australia there is a much more strategic issue as far as the military helping. The military is very influential it does not care about water management very much. The government is trying to get the military to start teaching courses on water management. The Ganges River Basin authority in India would not give access to any river data; however, we are able to get the information on this river basin by satellite and computers. There are no secrets as far as water usage of rivers anymore. The military today is focused on disaster assistance, but in addition, it needs to be more focused on water management.

A: (Korea) North and South Korea had an issue two years ago. North Korea opened the gate on one of its dams without telling South Korea. Many South Korean civilians were killed. The North Korean military needs to communicate with the South Korean civilians, so that they can be prepared for what might be happening.

Q: What will the ice that is retracting in the Himalayan Mountains do to the water shed for countries like Bangladesh?

A: (Australia) The watershed that the ice flows into provides one-third of the Earth's water supply. Currently no country owns this watershed. There is a South Asia organization, not supported by any government, which is working on this important watershed issue. China can actually divert the water away from Bangladesh. The snow story is actually a bigger story than the ice story. Both the snow and ice will go away within our lifetime. It is probably the single biggest issue worldwide as far as water management goes.

Q: What is our solution to minimize hydropower occupying so much land? What is the solution to reduce conflict over the Mekong River?

A: (China) Hydropower is very important for electric production, and it does not pollute like coal power plants. We must look at the surrounding area and how these dams will affect the area. China has established dialog with the Mekong River community to exchange ideas. We are concerned with the Lower Basin. We provide information to the Lower Basin, like a possible flood or other problems in the High River Basin.

Comment: Water resource management of the river is not really management. Mekong River Basin is very an interesting river basin. It produces food for Thailand, Cambodia and Vietnam. It isn't just for water use. Water can increase production of food. We are able to use the river for free. Why are we not charging for the use of the river? How can we do better with the use of water? We share data on the Mekong River. Dams are being made that produce electricity, help improve food production and give us drinking water.

Q: What is the role of the military on the use of river water?

A: The military should help people after floods. Does the military have the skills and training in river management? I question if they have these skills or abilities.

A: (Australia) There are many technological choices to improve our use and management of water. The art form is putting the technology into use to maximize the use of water management. Probes that communicate to smart phones to maximize the use of water can manage soil moisture. Climate change is so great in certain regions of the world; for example China, Australia, Vietnam and India are all being affected by climate change. There are no secrets left in water usage due to technology.

Q: How do we do better as a military at coordinating with NGOs? Who are the other actors in water management?

A: (China) The NGOs are not just for disaster periods, but also for climate change issues. The military can work with people in training in normal times on how to handle disaster and flooding.

A: (Australia) The military needs to understand the rate of climate change. They need to rise to the rapid change. The military in many areas are the only ones who have the information on real time, and they are not giving that out to the civilians. The military seems to feel that this information needs to be kept a secret. For example: during a recent flood in Australia the military had the information that they were not giving out to the civilian authorities. It would have really helped in working with the flood. The military has much more information like mapping technology that they need to give out to the civilian side.

Panel 3: Adaptation to Climate Change

Speaker 1: Vice Admiral (Ret.) Dennis B. McGinn, US Navy

VADM McGinn serves as the vice chairman of the Center for Naval Analysis Advisory Board, a director for the National Conference on Citizenship, as a senior policy advisor the American Council on Renewable Energy, and as an international security senior fellow at the Rocky Mountain Institute.

VADM McGinn started his presentation, Climate Change and National Security; Strategic Imperatives, by describing the Report of the military advisory board April 2007, *National Security and the Threat of Climate Change*. This report was a "new voice" for climate change because national security professionals authored it, whereas, previous reports were authored by environmentalist and business interests. Fifteen former general and flag officers, using a risk management approach, worked for fifteen months on the report. Because there was never 100 percent certainty, the board evaluated trends, indications and warnings so prudent recommendations and actions could be taken. The report findings included:

- Climate change poses a serious threat to national security
- Climate change acts as a multiplier for instability in volatile regions
- Projected climate change will add tension to even stable regions

Interestingly, the report did not say climate change would cause war. However, it did state pressure and tensions could cause fragile states and societies to fail with the resulting power vacuum filled by bad actors.

VADM McGinn expressed a key concern, that climate change is a threat multiplier of instability. The world's most troubled regions are the least capable to cope with extreme events. Conflict over scarce resources can cause failed states when people are in need of basic human services, such as food, water, shelter, health, safety and energy. Desperation and hopelessness provides a fertile breeding ground for extremism, conflict, and terrorists.

He further suggested that climate change, energy and national security are a related set of challenges. To this end, Center for Naval Analysis (CNA) published a report in 2009 titled *Energy and the Risks to National Security*. America's current energy posture constitutes a serious and urgent threat to national security—militarily, diplomatically and economically. U.S. current dependency on oil, weakens international leverage, cripples foreign policy, puts the U.S. military in harm's way, exacts a huge price in blood and treasure, and entangles the world with less than stellar regimes. Furthermore it undermines U.S. economic stability to the price of $1 billion per day outside the economy to pay for foreign oil.

While most U.S. oil is imported from Canada and Mexico, an increasing quantity comes from Nigeria. The gulf between the haves and have nots in Nigeria, fueled by oil revenues, creates a fault line of instability. Homegrown terrorists attack the oil infrastructure both on land and sea causing destruction death and sometimes the ransoming of hostages. Similarly, convoys flowing through the Khyber Pass, mostly transporting oil, put contractors and service members at grave risk daily; many personnel have died.

VADM McGinn then introduced the interlinked challenges of energy dependence, climate change, national security and homeland security. He likened each to a sphere and suggested that they all converge, and thus are all interrelated. Global fossil fuel dependence coupled with decreasing supplies, scares resources, and the destabilization by generated by climate change creates an unacceptably high level of risk for those seeking the status quo.

VADM McGinn then expressed that prior to each recession of the last 40 years was preceded by a period of volatility and price hikes in oil. This finding drove another CNA report in June of 2010 titled *Powering America's Economy: Energy Innovation at the Crossroads of National Security Challenges.* Key findings of this report include the idea that our energy choices are linked to national and economic security. Furthermore clean energy technology is a challenge to develop and implement. Business as usual is not a viable option for the U.S. Department of Defense (DoD) with regards to energy; however, DoD can be a powerful catalyst for energy innovation.

DoD has undertaken many initiatives including memoranda of understanding with the Department of Energy and a new green fleet Navy that is on track to use half the fossil fuel of today's Navy. Marine and Army installations, both in garrison and forward deployed, including tactical outposts now use renewable technologies such as solar and wind. The Air Force is leading the push for alternative, or "drop-in fuels" to power its aircraft.

Clean energy technology is a great opportunity for success. Increasing energy efficiency across the board and developing a smart planned infrastructure is our way ahead. Sources like plug-in hybrids, renewable energy wind, solar, bio fuel, transitional energies, such as natural gas coupled with a future of ocean and geothermal, could power our future.

The solution to the security imperative of "our future stability is at risk" has many components. Collaboration from universities, industry, government, the research and development base, energy infrastructure and global partners cooperating, will all be required for success.

VADM McGinn concluded his remarks by stating the clean energy revolution with the Hopi India proverb, “We are the people we are waiting for.” We know what to do; the time to act is now. Our future generations need us to do the right things now.

Speaker 2: Dr. Jeffery Marqusee, manages the Strategic Environmental Research and Development and the Environmental Security Technology Certification Programs

Dr. Marqusee, a member of the Senior Executive Service, began his presentation, United States Department of Defense (DoD) Environmental RDT&E Environment, Energy, and Climate Change, by talking about how DoD thinks about its investments in two large areas, environmental drivers and environmental energy drivers. Environmental drivers are the contamination of the environment from our past practices as well as pollution prevention to control life cycle costs. He acknowledged that unfortunately DoD has a legacy of poor, shortsighted policies when dealing with environmental contamination issues. However, DoD is now clearly focused on preventing future environmental problems. The second main area is environmental and energy drivers. These encompass sustainability of ranges, facilities and operations.

Next, Dr. Marqusee spoke about the Strategic Environmental Research and Development Program (SERDP). He explained that this program identifies high priority environmental science and technology investment opportunities that address DoD requirements. The program is a partnership with the Department of Energy (DoE) and the Environmental Protection Agency (EPA) and focuses on using advanced technology for short-term needs and research for long-term solutions. He then spoke about the Environmental Security Technology Certification Program (ESTCP). This program demonstrates environmental technology that is innovative and cost effective for the needs of the defense department user community. He further indicated that both SERDP and ESTCP were mentioned in the Quadrennial Defense Review of February 2011.

Dr. Marqusee then pointed out that DoD is concerned about climate change for many reasons and how it affects our national security. However, sustaining and maintaining DoD’s training base of built and natural infrastructure is the first priority closely

followed by the cost and availability of energy sources required by DoD to operate.

Dr. Marqusee went on to describe how all DoD lands are under stress, but now there is another stressor, climate change. Climate change negatively affects U.S. military installations. For example, southwest DoD installations will experience hotter and drier weather patterns. Increased temperatures in the southeast, as well as rising temperatures, will impact costal area installations with rising sea levels and storm surges. The stress on ecosystems, increased costs for energy, as well as damage to structures negatively impact mission readiness.

DoD has been actively involved in studying regional impacts in the following areas, rising sea levels, threatened and endangered species, installations in south and southwest, as well as defense assets in Alaska.

Sea level impact studies clearly show a rise in levels but also, a very uncertain future. For example by 2100, models predict anywhere from a .5 to 2 meter rise in overall sea levels. The question for DoD is what is the effect on our mission and training. Some of the geographic areas that have a large concentration of DoD installations that are at risk include the Hampton Road area, San Diego (CA), Gulf coast, and mid-Atlantic region.

In the southwest, climate change with hotter and drier weather patterns the focus becomes fire regimes, invasive species and ephemeral streams. Further to the north in Alaska, the warming trends and the thawing of the permafrost and the effects on training lands and controlling ground water become the focus.

Future plans on climate change will concentrate on decision tools for DoD installations. What are the dialogues and how will they impact on the mission?

Dr. Marques then shifted the presentation to energy usage at DoD installations. He pointed out that DoD is the largest consumer of energy in the U.S. and maybe even the world. DoD energy use is consistent with the top 40 energy-using countries of the world. Currently DoD relies on the fragile commercial electrical grid that place critical missions at a serious and growing risk. What DoD needs is energy self-sufficiency.

Reducing energy costs, lowering the carbon footprint and improving security is what ESTCP is doing by using DoD installations as energy test beds. By using DoD facilities, ESTCP has been able to validate performance, cost and environmental impacts, as well as transfer lessons learned to other facilities. In addition, the program has reached out to the private sector for innovations to meet needs.

Dr. Marqusee finished his presentation by inviting all participants to visit his web site, www.serdp-estcp.org. This is an unclassified open source that describes what his organization is doing as well as impacts and the results of their work.

Speaker 3: Mr. John P. Quinn (SES), Deputy Director, Energy and Environmental Readiness Division (N45), United States

Mr. Quinn stated that the U.S. Navy has some very big goals as far as environmental and energy issues go. It plans to use 50 percent alternative energy for ships by 2020. Also, by 2015, the Navy will use 50 percent less petroleum in commercial vehicles. Even more aggressively, the Navy has set a goal of having 50 percent of all its installations and bases be set up as “net zero” installations. Net zero means that the installation will produce all of its own power and not use any of the power grids. The way the installation would produce this energy would be by way of alternative energy only (e.g., solar, wind). Currently the Navy base at China Lake is at net zero.

Earlier VADM McGinn mention the great green fleet. By 2012, the Navy will use bio-fuel to fuel a carrier group. Then in 2016, the Navy will deploy a carrier group (the air-craft carrier and all its escort ships) using bio-fuel. Mr. Quinn explained that the Navy is working at making ships more efficient by doing the following:

- Installing LED lights that use less electricity
- Improved hydrodynamics that reduce the water drag of the ship
- Working on a hybrid electric ship (DDG-51) that should save $250 million in fuel using this technology

In aviation, the Navy will reduce its carbon footprint by doing the following:

- Airplanes will carry lighter loads when possible
- Use better paint, which is lighter
- Flight planning that uses the wind and weather to the best possible efficiency
- Use better and more efficient engines

Finally the Navy is developing new bio-fuels that will allow the Navy to be less dependent on oil. The Navy believes that bio-fuels are the best way to reach their energy goals. The Navy does not want to re-engineer all of its platforms, but rather re-engineer the fuel that all of the platforms use. There are several key issues that the bio-fuels must meet. First, the bio-fuels must not cost more than petroleum. These fuels must be sustainable. Currently these bio-fuels come from plants, coal or other sustainable sources. These fuels must not compete with the production of food. Additionally, U.S. law states that any fuel that the military uses must pollute less that currently used fuels. The Navy is already flying F-18 Super Hornets using fuel made from plants and sea going RCB-Xs using fuel made from algae.

The Navy is studying its buildings on its installations to determine how to make them more energy efficient. For example, the Navy is building new buildings with green roofs and solar panels. They are conducting annual energy audits to uncover ways to either build new more efficient buildings or restoring older buildings with more efficient systems. The goals being the following:

- Better energy use
- Better insulation
- Better heating and AC systems

Mr. Quinn explained that currently in Hawaii there is a program being used in the Navy housing that gives money to families that use less energy and charges money to families that use a large amount of energy.

The federal government has mandated that the Navy will reduce its greenhouse gas emissions by 34 percent by 2028. This reduction will be done in three scopes. Scope 1 will reduce greenhouse gas emissions from sources that are owned or controlled by a federal agency. Scope 2 is reduction of greenhouse gas generated by electricity, heat or steam purchased by a federal agency. Then under Scope 3, the Navy will reduce its greenhouse gases by 13.5 percent by 2020. Under Scope 3 the greenhouse gases will be reduced from sources not owned or directly controlled by a federal agency but related to agency activities. Under all of these programs the Navy will concentrate on, not just the standard greenhouse gases, but also the hydroflourocarbons (HFCs). HFCs are many times worse at affecting global warming.

He went on to explain that at sea the Navy is reducing garbage. Solid waste is being processed differently than before. Plastics are being melted and being returned back to shore for disposal. Pulp products, discharge paper products and cardboard is being shredded and sunk. Oily waste is first filtered using a parallel plate oil water separator and then treated even further by ultra membrane polishers. Ozone at sea is recovered and recycled and the Navy has developed new energy efficient non-ozone-depleted substance equipment. Currently the Navy is setting the standards for all U.S. ships as far as handling garbage at sea. It is working to develop uniform national discharge standards to protect coastal waters in partnership with the Environmental Protection Agency and the U.S. Coast Guard.

In the past the Navy has had lawsuits brought against it due to the misuse of sonar on ships. The Navy is now spear heading research on marine mammals and their protection. The Navy is doing this marine mammal research through the use of aircraft surveillance, passive sonar buoys and safety zones. Navy personnel have been trained in spotting techniques using “big eye” binoculars and night vision devices, then identifying and reporting marine mammals to the appropriate authorities.

Mr. Quinn went on to state that the Navy is working hard with NGOs, industry and the media on environmental issues. The Navy is working with environmental NGOs in every area to try to build bridges with these organizations. Some of these NGOs are the National Ocean Council, The Earth's Own Best Defense, World Wildlife Fund, Woods Hole Oceanographic Institute, Sustainable Oils and the general public. As far as climate change goes, the Navy will first concentrate on the Arctic region. There are many challenges in the Arctic region due to increased maritime activities, ever increasing water scarcity, and the impact of the rising sea level. The Navy also sees many opportunities in the Arctic region through cooperative partnerships, energy security initiatives and infrastructure recapitalization.

He concluded with the Navy's new recruiting slogan. "America's Navy: A Global Force for Good," isn't just a good recruiting slogan, but is now a part of the Navy's ethos.

Speaker 4: Mr. Michael McGhee (SES), Office of the Deputy Assistant Secretary of the Air Force for Energy, Environment, Safety and Occupational Health, United States

Mr. McGhee started off by stating that his briefing will be more directed towards climate change. He has many more slides in this briefing that cover other important environmental issues, but with the amount of time for this briefing he will focus on only one area. He said that he will be talking about how the Air Force is dealing with climate change today and how it will attack the problem in the future. He went on to state that the Air Force has moved climate change down to the lowest level.

The Air Force has set up a framework as a planning tool. The framework is focused on four key areas: mitigation, adaptation, collaboration and education. The most emphasis for the Air Force will be on reducing greenhouse gases (GHG), reduction in the use of energy (because these two areas are so closely connected) and where the Air Force can have the biggest impact. Given that the Air Force is the biggest energy user in the United States military, planning for climate change impacts in three broad areas:

- Installations
- Roles, mission and operating environment
- Natural environment and stewardship responsibilities

During October 2009 President Obama signed a Presidential Order (EO-13514, Federal Leadership in Environmental, Energy, and Economic Performance Order) that made GHG emissions reductions a priority among all federal agencies and established a strategy towards sustainability. The order reduces GHG in three targeted scopes. Scope 1 and 2 reduces GHG by 34 percent through the reduction of GHG produced by federal agencies or generated by other companies, but purchased by federal agencies. Scope 3 is a reduction of GHG by 13.5 percent produced by sources not owned by the federal government, but used by the federal agencies. An example would be an airline that the federal government contracts with to fly military members.

Energy use makes up 98 percent of the GHG for Scopes 1 and 2, while energy use makes up 93 percent of Scopes 3's GHG production. Out of all the federal government's energy uses, aviation constitutes 72 percent of the total GHG emissions. As goes energy, so goes GHG.

The average American household mainly uses electricity for its house and petro for their vehicles. For the Air Force the key energy use is jet fuel for the airplanes. He stated that the Air Force currently uses 2.5 billion gallons of jet fuel annually. Their large use of jet fuel is a great motivator for the Air Force to develop bio-fuels. The Air Force can use these bio-fuels as long as the fuels do not produce more GHG than the current jet fuel. It must be able to be used with no modifications to the aircraft or their engines, and cost less than current jet fuels. The Air Force is planning to use 50 percent of its jet fuel from a green source by 2016 in the continental United States (CONUS). In addition, airplanes are being modified so that they burn less fuel through engine changes, better flight planning, better aviation operations and reduced airframe drag.

The Air Force is looking at its installations and bases to see how GHG can be used. Here in Hawaii, the Air Force has worked with the Department of the Navy on the use of fuel cell vehicles.

At the Honolulu International Airport, the Air Force built a hydrogen fuel service station. This station uses solar power to make hydrogen. The vehicles that use hydrogen are more efficient and less polluting than petroleum-powered vehicles. Also, new buildings are being built that are more energy efficient and use the latest advanced “green” technologies. Existing buildings are being updated with newer more efficient HVAC systems and better energy conservation windows and insulation.

Mr. McGhee went on to say that the Air Force is also studying the effects on climate change at 161 of its bases. There were four key areas that the Air Force looked at when it came to climate change and how it might affect these bases:

- Sea level rise
- Storm intensity/surge
- Temperature rise
- Precipitation pattern changes

The study found that the sea level rise would put a sizable amount of infrastructure at risk. One example that Mr. McGhee gave was that Langley Air Force Base, near Newport News, VA , would have a large amount of its airfield underwater if the sea level were to rise. Installations that are located on islands or near the coast are at the greatest risk of rising sea levels and increased damage from storm surges. Already, some of the island bases have experienced “wash over” by seas. Overall, the Air Force is less at risk than several other services if the sea level were to continue to rise, but there would still be an impact.

There would be an increase in wear on military equipment and personnel. The operation tempo DoD-wide is expected to increase due to climate change. The roles and missions the military takes would also change due to climate change. An example would be the probable increase of humanitarian assistance and disaster relief.

One area in which the Air Force is doing some important work is weather forecasting. Right now the Air Force is looking at a long-range weather forecasting system called Operational Climatic Data Summaries (OCDS). Taylor Air Force Base, Alaska is looking at weather forecasts in 2030 and 2050. These OCDS are mainly looking at Alaska, the interior and the coastal areas. Many different climate scenarios are being used to try to determine what the weather will be like in the future. The three key scenarios are as follows:

- A1B - Rapid economic growth, low population growth, with the rapid introduction of new and more efficient technologies.
- A2 - Higher emissions scenario, regional economic growth with slower development of new technologies.
- B1 - The best-case scenario is lower emissions, local solutions to economic, social, and environmental sustainability with less rapid technological changes.

The area of the world where the Air Force has done the most studying of these three scenarios and also the changes that have already occurred is Alaska. Alaska has already experienced a great deal of climate change, and temperature rise is more significant in northern Alaska. An example is Elmendorf Air Force Base (a coastal base) which has seen a mean temperature rise of about 2.2 degrees Celsius over the past 62 years. The biggest increase in temperature was from 1996 to 2005 when temperatures rose by two degrees Celsius. However, the increasing temperature trend has turned sharply downward since 2005 (mean temperature has fallen by three degrees Celsius since 2005). Eielson Air Force Base (an interior base) saw mean temperatures also increase by three degrees Celsius between 1996 and 2002. Again the mean temperatures have been on the decline since 2005 (decrease of three degrees Celsius).

The Air Force has been also studying what the impact would be to CONUS if scenario A1B were to occur. Under this scenario the northwest region of CONUS would see 50-plus fewer days at or below freezing, while the south and southeast regions of CONUS would see 50-plus days a year above 90 degrees Fahrenheit. The impact of these higher temperatures would be less

mountain snowpack and greater stress on HVAC systems, which would lead to more electric power demand.

Next, the Air Force looked at what these climate changes would do to air force bases throughout CONUS. One example is Langley Air Force Base in Virginia. The base has a mean elevation of only three feet. In fact, it currently has flooding problems at certain high tides. So with the warmer climate, a higher sea level would put Langley at a great risk. If the sea level were to increase by only four feet it would put 40 to 50 percent of Langley at risk (including the runway). If a storm surge were to occur with the higher sea level the whole air force base would probably be under water.

Mr. McGhee then explained that it was not just air force bases that will be affected by climate change. Places like the Kennedy Space Center and Cape Canaveral will also be affected. The Air Force and NASA are working together to assess and address environmental risks to the Kennedy Space Center (KSC). Right now it is projected that by 2016 the NASA railroad line will be breached and an over wash will occur that will threaten the infrastructure on the launch complex. The Air Force and NASA are working jointly to build protective secondary sand dunes to protect KSC.

The Air Force is actively working to educate senior leaders on the changing climate situation, the biggest emphasis being on how climate change will affect the following:

- Water availability
- Agricultural production
- Damage to economically significant infrastructure from extreme weather events.
- Arctic climate changes and how they will impact Alaska and North America.
- Vulnerability to the nation due to sea level rise, water scarcity and their projected impact.

The Air Forces has integrated climate change and environmental issues all throughout the Air Force education system U.S.

Air Force Academy is home to the USAF Institute for National Security Studies (INSS). Climate change has been identified as an fiscal year 2011 priority security and sustainability topic for the INSS. The Air Command and Staff College (ACSC) program is incorporating education courses dealing with climate change, energy security, and environmental security. MINERVA Initiative, which is a DoD-sponsored, university-based program, has incorporated initiatives on energy and environmental security. The goal of the MINERVA Initiative is to establish research that assess and promote innovative solutions to the changing climate, energy security and environmental security. Later educational programs and courses will be developed that educate all Air Force personnel on these environmental issues.

Air Force efforts on environmental issues and climate change are still in the early stages of development. It is the goal of the Air Force to train current and future Air Force leaders on how to deal with these environmental challenges. Also, the Air Force is developing the tools to be able to deal with these very complex issues.

Panel 4: Disaster Preparedness

Speaker 1: Colonel Norberto Cintron, Command Engineer, U.S. Southern Command

COL Cintron began his presentation with the comment "what is a guy from SOUTHCOM doing here in PACOM?" COL Cintron answered, "I'm here to address a common theme of disaster relief and that the issues we have discussed the last few days cross all boundaries." In Haiti, the U.S. military mission focused on saving lives and reduce human suffering. He then shared the greatest lesson from the operation, that is, one of communication: the time to communicate is before not when disaster happens. Meetings such as PESC are vital to establish communications and relationships with regional partners.

COL Cintron covered the many recovery challenges as well as successes of Joint Task Force Haiti and Operation Unified Response. The first of which was to reestablish the airport. Once operational, airport handled up to 150 flights a day compared to a predisaster average of 13. Medical teams, on and off shore, treated over 19,000 patients and performed over 1,000 surgeries.

Concurrently, the challenge was to clear the debris and provide usable surface transportation routes and safe water. Initially the water distribution requirements overwhelmed the system, but, water ceased to be an emergency by Jan. 24.

After initial efforts of rescue turned to recovery, the seaport was reopened. This allowed bulk cargo to flow into theater. JTF Haiti contributed to humanitarian assistance/disaster relief (HADR) in addition to the previously mentioned roles providing shelter, food, as well as tasks such as coordinating transportation, rubble removal, and building assessments.

COL Cintron then explained how the JTF worked with the government of Haiti, international partners, the U.N. mission, as well as government and non-governmental organizations. He reemphasized that the coordination and control starts with knowing who the players are and developing relationships from the top on down.

COL Cintron then introduced the top ten observations form Operation Unified Response.

1. Respond quickly and effectively. Little-to-no warning exists in natural disasters, therefore the response of search and rescue (SAR), medical, water, food and shelter must be quickly integrated, as well as practiced and trained for in advance. Forces and supplies will be ad-hoc with leaders pulling what is necessary at the time. Air, sea and land logistical routes must be reestablished quickly. Players must understand joint capabilities, as they are not all the same. As missions progresses and develop, reassess priorities. Overall, build relationships early.

2. Protect the people always. There is a two-fold mission: save lives and mitigate human suffering. Additionally, there are three priorities: provide critical medical aid, distribute food and water, and SAR. Overarching them are reaching out to the people, understanding the environment and providing hope.

3. Build partnerships with key players. Identify the key players in the host nation, U.N., partner nations, interagency, NGOs, and nontraditional partners. Include others in planning and information sharing. Unity of effort reduces duplicated effort and maximizes strengths and capabilities.

4. Coordinate and collaborate (C2) to achieve unity of effort. Understand the other key players and what capacity each of them brings to the table. Remember who has the lead. Establish a common operations picture. Be open, transparent and share information. Get buy in up front and then execute together.

5. Communicate — communicate — communicate. You can't have enough! Be transparent, approachable and responsive. Consistent message is key; get everyone saying the same thing. Promise nothing and seek to overachieve. Use social networking. Remember to plan early and that military is in support, not the lead.

6. Support the lead federal agency within clearly defined roles. Establish a lead agency. If the military is temporarily in the lead, focus on transition to civilian control. Establish clear roles, responsibilities and authorities. Reduce duplication by identification of roles agreed upon early in the mission. The strength of the Department of Defense is to secure, plan and make things happened. It has the skills sets of medical, engineering, logistical, linguistics, planning and leadership.

7. Pull from all available resources to form the Joint Task Force. Consider the ground force component the core of the JTF. Tying into the Department of State country team and lead federal agency is key.

8. Include the host nation government as much as possible. Respect for the sovereignty of the host nation and act at their request. All actions should have a host nation face on them. Coach, teach. mentor and train as appropriate. Patience is a virtue.

9. Work closely with the UN humanitarian community. They have a wealth of HADR experience. Understand UN missions, timelines and limitations. Ultimately work to develop host nation capability. Remember diplomacy and have patience.

10. Anticipate challenges with internally displaced persons (IDPs). Natural disasters often cause IDPs and the sooner the problem is addressed the better.

COL Cintron summed up his presentation with key points:

- Be ready for disasters
- Talk to folks
- Know your contacts before disasters strike
- Push up the best tactical level situational awareness to strategic leaders
- Remember the end state is a work in progress

Speaker 2: Mr. James K. Ligh, Chief, Business Management, Pacific Ocean Division, United States Army Corps of Engineers

Mr. Ligh started his presentation, asking: What is CMEP? CMEP, Civil Military Emergency Preparedness, is a tool, a program and a methodology. It can be used as a roadmap or tabletop planner tool. As a tabletop planner, CMEP can be used to test ideas under a gaming format (TTXs) and AARs.

What does CMEP do? It is a capacity building tool that can be used to work with hazards and disasters when they occur. CMEP is able to run many disasters at the same time; for example, CMEP could run a series of disasters similar to what occurred recently in Japan, with the earthquake, tsunami and nuclear accident taking place within days of each other. Normally responders only plan for one disaster, but in reality they need to plan and practice for many disasters occurring at the same time. CMEP can tabletop game multidisasters at the same time. CMEP focuses on the basic needs (i.e., food, water and shelter) during a disaster, which helps planners determine and manage acceptable risk. It also addresses environmental security, clean up and mitigation. CMEP covers a very broad spectrum of needs and issues.

How does a government respond to a multinational disaster? CMEP tries to imagine multiple disasters affecting many countries all at the same time. CMEP can actually examine these disasters before they occur. CMEP also allows planners to figure out how to work with NGOs; it can increase civil and military cooperation.

As Mr. Ligh pointed out, the worst time to exchange business cards is when a crisis has just happened. Much of CMEP's planning has to do with civilians and military working together.

CMEP allows users to use the best approach to develop plans for all types of disasters, which is to develop one main plan tailored and customized for each individual crisis, as having a different plan for each type of disaster or crises is not effective. CMEP's tabletop gaming ability allows improvement to the main plan.

CMEP can also strengthen ties with other nations through tabletop gaming of different international scenarios. Mr. Ligh stated Japan disaster may generate interest for many more seminars using CMEP.

CMEP has many services useful to full cycle planning and when disasters do occur. Early warning planning can be built into CMEP planning, as well as recovery plans and clean up. Planners can incorporate the provisioning of food, water, energy and health planning into a CMEP plan.

CMEP planners can review the impact of hydropower, as hydropower has a significant effect on the environment in areas such as fishing and water use. An analysis of hydropower's total impact is normally complex; however during a time of disaster, hydropower analysis can become extremely complex. CMEP provides modeling tools capable of dealing with these extremely complex situations. One such example of this analysis involves the Army Corps of Engineers' invitation to members of the Mekong River Commission to come and review the management of the Mississippi River.

The U.S. Army Corps of Engineers aren't the only users of CMEP; other federal agencies such as FEMA and Homeland Security have used it as well. Last year, planners in 45 different used CMEP capabilities, and so far, there have been over 110 events where CMEP has been used. An example of international partnering involves Mongolia's request to use it to help with a problem with flooding. Through the use of CMEP, planners were able to determine where the flooding would not occur and the Mongolian government was able to direct relocation of villages to these areas where flooding would not occur. As a side, Mongolia

had been planning to build a flood control channel to reduce the impact of flooding; CMEP analysis demonstrated through modeling that the channel would have no impact on reducing flooding. This use of CMEP provided evidence that, ultimately, prevented the use of resources on a project that would not have any real impact on the problem.

Currently CMEP is being used on identifying and locating missing persons from disasters. As the Japan disaster is now demonstrating, speedy identification and location of missing persons is vital to successful disaster relieve operations.

CMEP brings the following benefits:

- Global experience
- Focus on the mission at hand
- Improvement of civil and military cooperation, both before and after a disaster
- Development of experienced civilian and military planners
- Network of emergency/disaster agencies and planners
- Improvement of training and planning for future disasters

Speaker 3: Mr. Mahendra Bahadur Gurung, Joint Secretary, Ministry of Irrigation, Nepal

Mr. Gurung started his talk by orienting the audience to the location and geography of Nepal, which is located on the north eastern border of India. Its capital city is Kathmandu, located in the Himalayan mountain range. He explained that Nepal has an extremely large variation of altitude (ranging from the lowest elevation of 60 meters above sea level to the highest being 8,848 meters above sea level). Nepal has three major river basins: Sapta Koshi, Sapa Gandaki and the Karnalli. Out of these major river basins are seven minor river basins: Kankai, Kamala, Bagmati, East Rapti, West Rapti, Babai and Mahakali. Out of these river basins, Nepal has an annual surface flow of 225 billion cubic meters of water, of which only about 15 billion cubic meters

is used for economic and social purposes (96 percent used for agriculture, one percent for industry and three percent municipal use).

Nepal's water resources are mainly fed by rainfall. Most of the rainfall is very temporal (time). In Nepal more than 80 percent occurs between June to September. Mr. Gurung went on to explain that Nepal's annual rainfall has a high spatial variation (space), ranging from scarce rainfall 250 millimeters at Mustang to a high of 3,500 millimeters in Pokhara. In some cases, there will be cloudburst that will dump 300 to 500 millimeters in a 24-hour period.

Nepal has two regions that are very prone to flooding and water disasters. These regions are the Mahbharat mountain range and the Gangetic Plain (lower elevation areas of Nepal). The water related disasters have been extreme. For example, Nepal has seen more than 7,500 deaths, 65,000 affected families, at a cost of 18.4 billion Nepalese rupee related to water disasters from 1983 to 2009.

Mr. Gurung went on to talk about the Sapta Koshi River Basin. The basin itself is actually made up of seven rivers. Its annual river flow is 1,590 cubic meters per second and has an average width of 15 square kilometers. It has an annual average sediment rating of 118 million cubic meters, which makes it one of the highest sediment laden river basins in the world. Finally the Sapta Koshi has a catchment that is divided between Nepal (46 percent) and China (64 percent).

The Koshi disaster occurred on August 18, 2008. The main reason for the disaster was a high flood discharge of 168,850 cubic meters per second, which destroyed two spurs and another badly eroding third spur. Also, at around 1 p.m., local time, the river breached an embankment, causing another embankment to fail, allowing the river to change course. Within 24 hours, 60 percent of the river flow had changed course, and 48 hours later 80 percent of the river had changed course. The flooding forced four villages upstream to evacuate more than 45,000 people. Meanwhile lower downstream in Bihar, India, millions of people were affected because they were not aware of the flooding upstream in Nepal.

The causes of the flooding were due, in part, to the high water flow of the river before the breach. However, when compared to the river's past history, this was not that high a water flow. In 1968, the river flow hit a high of 913,000 cubic meters per second without the flooding that occurred in 2008. So while the high water flow was partly responsible for the flooding, it was not the main cause of the disaster. Nor was the disaster due to an abnormal climatic issue, such as a thundershower or cloud burst. The foremost cause might be the continued concentration of the river pushing itself against the left embankment. As the river pushed more against the left embankment, it created more and more erosion of the embankment and spurs. There was also seepage under the embankments that led to piping failure. The process was further aggravated by the lack of proper maintenance and regular monitoring of the river spurs and embankments.

The aftermath of the Koshi disaster lead to the construction of new spurs and 29 kilometers of new left embankment built by the government of India under the Bilateral Koshi Treaty. Upstream, the government of Nepal reconstructed the remaining 15-kilometer embankment. In addition, the Bihar government will now coordinate with the Nepal government when flooding occurs again. Flood affected areas along the Koshi are now coded Red, Yellow, Green zones with the degree of impact declining in order. Napal's Ministry of Home Affairs monitors the spurs and embankments on a regular basis, the last one completed in September 2010. Irrigation projects are being done in the yellow and green zones that build shallow tube wells (STW). So far, 539 STW have been completed with an additional 500 STWs planned in the near future. Twenty-six schools have been rebuilt and a temporary hospital was built in Laukahi.

The Koshi disaster also caused some long term aftermath planning. In 2010, the Nepal Risk Reduction Consortium (NRRC) formed and since has been working with its partners and institutions like the Red Cross, Red Crescent and the United Nations Development Program (UNDP). The NRRC has been working to develop a long term disaster reduction action plan. The action plan will be built on the Nepal's government new National Strategy for Disaster Risk Management, approved in October 2009.

Another project of the NRRC is an early warning flood forecasting plan and an early warning system. There is also a proposed program that will give $24.2 million to the management of flood control of the Koshi River Basin.

The U.S. and Nepal share a history of mutual cooperation from education, to roads and irrigation. Environment security is a new front where we can again work together for water related disaster risk reduction.

Panel Questions and Answers

Q: In the past the military came up with ways they could work with civilian agencies and governments to respond to a disaster. Could you tell us about the problems you observed in the disaster response in Haiti?

A: (U.S.) We developed a system with the U.N. We would set up a coordination cell. In the coordination cell there was one representative from each cluster cell. Planning was done with local communities. We brought all the representatives into the U.N planning meetings and went through the mission planning process. You have to start working with the different countries and NGOs right at the start. After a while all the countries and NGOs started to work together as a team.

Q: How can you insure that when you're responding to a disaster that you don't affect or harm the environment?

A: (U.S.) We used the assets that were on the ground right at the start. One of the first things we did was to use those assets to start to clean the roads. Next we set up locations where we could start to take the rubble and set it aside for future use. Experts were brought in to look at the separated rubble and make sure that there was nothing in the rubble that could cause pollution later when we used the rubble. We also worked with the Haitian government in setting up mass burial sites.

Q: What was your mission in Haiti?

A: (U.S.) Our role was not to stay there for the long term, but to get the economy going again in Haiti. We also wanted to get water and the sewer systems working again. We did get the water system going again, and we gave it back to the Haitians so they could run it themselves. We also worked very hard at getting the economy going as fast as possible too. That way the Haitians could rebuild their own country.

Q: How can the military insure that the early warning systems are working and actually warn the people early enough?

A: (Mr. Ligh) It is important that you conduct practices and planning so when the disaster does occur the people are prepared and ready for the disaster.

Conclusion - Closing Plenary Session

Summation Remarks:

Dr. Butts challenged each delegation to provide feedback to the group:

- Where does the forum, as a group, go from here, with information shared and lessons learned?
- What kind of linkages can be drawn for roles and missions for the armed forces with regards to environmental security and sustainability?

Bangladesh: First and foremost we must continue the dialog amongst ourselves; really it should have started years ago. In future conferences, we should pick out one to two case studies and analyze them for how they dealt successfully and unsuccessfully with the challenges of climate change. We should further test these studies these against current international policy. Through this type of analysis we can discover better roles and missions for the military. Finally, have a better mix of U.S. stakeholders as presenters, not all military.

Cambodia: In future conferences USPACOM should take care to invite more civil-military participants. In addition, brainstorming sessions on ways to deal with future crisis should be incorporate. However, the conference should concentrate on strategies for preparedness in successfully dealing with the upcoming problems due to climate change. Lastly, please host the conference in different countries.

Indonesia: Climate change is clearly an enormous challenge that is here; it's not just theoretical. We must concentrate our efforts on learning from other countries' experiences and work together for solutions. Maybe host a future conference in Indonesia.

South Korea: The conference is a good opportunity to build a global platform, so we can all work together on common problems. We have generated a lot of paper and presentations, but we need concrete action to make a difference!

Laos: This is the first time I've heard the military talk on the subject of climate change and I'm very impressed. Most climate change issues have to do with civilians and civil difficulties. The private sector cares about bottom-line investment and our challenge is to educate them on the long-term implications of climate change. With this in mind, it would be appropriate to bring some of the civilian stake holders into future conferences including the private sector. NGOs also play an important part and should participate too.

Mongolia: We definitely see benefits in continuing associate with the conference and its goals! From floods, to blizzards, we have many natural disasters, learning how others have successfully dealt with problems is excellent. Enhancing regional cooperation in disaster management and mitigation is very important and this meeting should be a form for that cooperation. In the future, command post type exercises would be beneficial as to how to successfully cope with regional disasters.

Malaysia: Very good meeting! Please include in the next conference air quality problems, as this is also a major environmental problem. Additionally, pleas allocate more time on how to plan for disasters, or disaster preparedness. I believe some of the other country delegations have asked for this too.

Maldives: We average one meter above sea level, climate change for us is happening -- it's real! Our civil and military forces work together without problems, tackling problems related to climate change. I would suggest in future, the conference have a bit on time devoted to small island states and the problems and issues that confront them with climate change and environmental security.

Philippines: Climate change is not just science, it's real. We cope with the reality of rising sea levels to the frequency and intensity of natural disasters. Our greatest challenge is the policy shift from concept to action. I hope we concentrate regional collaboration.

Singapore: Continue the conference! This was a very valuable exchange of information and contacts with other regional officials. We truly hope the forum becomes a repository of knowledge on the subject for regional subject matter experts in APAN (Asia Pacific Advanced Network). In addition, it would be very

beneficial to include the U.N. and some NGOs in future conferences.

Thailand: Water resource management should be a focus of the next meeting. Climate change is real; there is no debate. We would like to see more exchanges on best business practices on dealing with issues.

Sri Lanka: The conference and the sharing between delegations have been wonderful. We have picked up many good points and ideas. One point is that there is no place for boundaries when dealing with the environment. Natural disasters, relief, rebuilding mutual cooperation and understand. The legal framework needs to be considered during discussions too. During the next meeting we would like to see presentations on lessons learned from the disaster in Japan. Also, we would like to encourage India, Pakistan and China to participate in future conferences. Without the participation of these major regional players we are working in isolation.

Nepal: Between the regional powers of India and China. First, we have opened our eyes to the way our military can aid in protecting the environment. Second, the forum seemed to focus on Southeast Asia; in future forums it would be nice to see a more balanced approach with South Asia. Three, U.N. and civil military planners should be included. Fourth, bring the next conference to Nepal, although this might be too difficult.

Vietnam: Thanks for inviting our delegation; this was an invaluable meeting. We are currently suffering from the effects of climate change and look forward to cooperation and assistance from our regional partners in dealing with climate change.

Australia: Resurrecting the forum was a useful step in dealing with environmental security issues. We see three broad aspects for continued meetings. First, what are the geopolitical and strategic implications of climate change? Second, how should military forces best be used to effectively counter natural disasters? Third, how should defense organizations manage climate change and what can we learn from each other? Last, do we keep a broad or narrow focus to these discussions on these topics and, most importantly, how do we as a forum achieve concrete outcomes?

Canada: Thanks for including us in the conference! There are many grim facts and results out there [concerning climate change] and equally grim results if we don't take actions. It's extremely uplifting to see the U.S. military proactively dealing with climate change! One concern with the conference is that it's only military to military; we would like to see more civil involvement.

Brigadier General Martha Wong, U.S. Army offered closing remarks by teaching the delegations another Hawaiian word -- ohana. She explained that ohana translates to family of people. Truly the Pacific Environmental Security Conference is a family of people working together towards the common goal — ohana and aloha!

PESC Papers New Challenges to Water Related Issues in Korea

By
Dr. Sangman JEONG
Director of National Institute for Disaster Prevention

Dr. Tae Sung CHEONG
Director of Disaster Information Center, National Institute for Disaster Prevention

Abstract

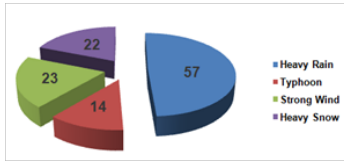
The world are being faced with environmental threats and challenges to water issues such as storms, water scarcity, floods and droughts. For Korea, the annual damage was about 1.8 billion USD and the annual recovery cost was about 3.0 billion USD from water related disasters during last 10 years from 2000 to 2009. Out of damage from natural disasters in recent decade, more than 60% is due to typhoon in Korea. To overcome new challenges to water related issues in Korea, Ministry of Land Transport and Maritime Affairs (MLTM), Korea has performing the Four Major Rivers Restoration Project (FMRRP). The overall FMRRP consists of three sets of projects: i) Main projects – the Han, Nakdong, Geum and Yeongsan rivers revitalization projects; ii) projects on the 14 tributaries of the four major rivers; and iii) refurbishment for other smaller-sized streams. The FMRRP has five key objectives: i) securing abundant water resources against water scarcity; ii) implementing comprehensive flood control measures; iii) improving water quality and restoring ecosystems; iv) creation of multipurpose spaces for local residents; and v) regional development centered on rivers. To reduce major disaster risk due to climate and environmental changes, National Emergency Management Agency (NEMA) has been developing National Disaster Management System (NDMS) as a comprehensive nationwide information system to support disaster management processes in terms of prevention, preparation, response and recovery. Now, as disaster aspects show complex and compound disasters, integrated disaster information analysis is very important. National Institute for Disaster Prevention, NIDP developed GIS based disaster information analysis sys-

tem through information sharing and analyzing with GIS based information based on IT technology to assess disaster risk. To reduce disaster risk and adapt climate change in Asia and the Pacific region, NEMA has developing the global platform by 2015 as an international cooperation system for sharing information and technology related to Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA). The global platform is one of the action plan of the 4th Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) and is need to establish tangible and practical strategies for DRR to share information and technologies for CCA.

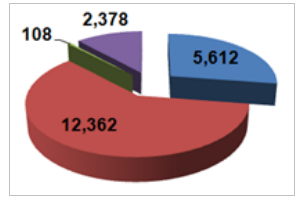
Key Word : Climate Change Adaptation, Disaster Risk Reduction, Disaster Risk Management, Four Major River Restoration, GIS based disaster information analysis system.

Introduction

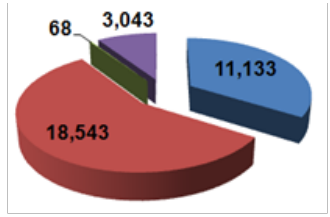
The world is being faced with environmental threats and challenges to water issues such as storm, water scarcity, water sanitation, water quality, floods and droughts. For Korea, the annual damage was about 1.8 billion USD and the annual recovery cost was about 3.0 billion USD from water related disasters during last 10 years from 2000 to 2009. Out of damages from natural disasters in recent decade, more than 60% is due to typhoon in Korea (Figure 1).



(a) Number of Events



(b) Damages (M USD)



(c) Recovery (M USD)

Figure 1. Record of Natural Disasters in Korea During from 2000 to 2009

Since 2009, Ministry of Land Transport and Maritime Affairs (MLTM) has performing the Four Major Rivers Restoration Project (FMRRP) to overcome new challenges to water related issues in Korea. The overall FMRRP consists of three sets of projects as follows: i) Main projects – the Han, Nakdong, Geum and Yeongsan rivers revitalization projects; ii) projects on the 14 tributaries of the four major rivers; and iii) refurbishment for other smaller-sized streams. The FMRRP has five key objectives such as: i) securing abundant water resources against water scarcity, ii) implementing comprehensive flood control measures, iii) improving water quality and restoring ecosystems, iv) creation of multipurpose spaces for local residents and v) regional development centered on rivers.

National Emergency Management Agency (NEMA) has been developing the National Disaster Management System (NDMS) as a comprehensive nationwide information system to support disaster management processes in terms of prevention, preparation, response and recovery. As disaster aspects show complex and compound, integrated disaster information analysis is issued. National Institute for Disaster Prevention (NIDP) developed GIS based disaster information analysis system through information sharing and analyzing with GIS based information based on IT technology to analysis and assesses the complex and compound disasters risk.

To reduce disaster risk and adapt climate change in Asia and the Pacific region, NEMA has developing the Platform of Infor-

mation and Technology for Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) by 2015 as an international cooperation system for sharing information and technology related to DRR and CCA. The global platform is one of the action plans decided in the 4th Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) and is need to establish tangible and practical strategies for DRR to share information and technologies for CCA.

Four Major River Project

The Four Major Rivers Restoration Project of Korea is the multi-purpose green growth project on the Han River, Nakdong River, Geum River and Yeongsan River. This restoration project will provide water security, flood control and ecosystem vitality. This project was first announced as part of the "Green Growth" policy launched in January 2009. It was later included in the Korean five-year national plan released by the government in July 2009 and its funding, a total of 17.3 billion USD, is reflected in the five-year plan total investment. The project was proposed to cope with climate change, to restore riverine environment and to boost local economy in the name of Green Growth (Ministry of Land, Transport and Maritime Affairs, 2009). The purposes of the project is to store water to be prepared for drought and water shortage; to prevent flooding; to improve water quality and restore ecosystems; and to promote local tourism.

Figure 2. Map of Four Major Rivers Restoration Project in Korea.

The overall project consists of three sets of projects: i) the Han, Nakdong, Geum and Yeongsan rivers revitalization projects; ii) projects on the 14 tributaries of the four major rivers; and iii) refurbishment for other smaller-sized streams. The Four Major River Restoration Project has five key objectives: i) securing abundant water resources against water scarcity; ii) implementing comprehensive flood control measures; iii) improving water quality and restoring ecosystems; iv) creation of multipurpose spaces for local residents; and v) regional development centered on rivers. More than 929 km of national streams will be restored as part of the Four Major River Restoration Project. A follow-up project will be planned to restore more than 10,000 km of local streams. More than 35 riparian wetlands will also be reconstructed. As all the necessary processes were cleared, the government of Korea will build more than 16 new dams on the mainstreams of the four largest rivers and 5 new dams on their tributaries, to raise 87 existing irrigation dams, to reinforce 377 kilometers of riverbanks and to dredge 570 million cubic meters of sediment from 691 kilometer long sections of the rivers to keep the rivers to be 4 to 6 meter deep.

The Four Rivers Restoration Project of Korea is a packaged project shown in Table 1 that aims to resolve water-related problems such as floods and droughts and renew Korean territory centering on water. It is also a comprehensive pan-government project that consists of various plans set up by diverse ministries with massive investment over a short-term period. Korean government estimated an adequate amount of water resources to prepare for future water scarcity (800 million m^3 in 2011, and one billion m^3 in 2016 expected). Excessive amount of budget has been spent in recovering water-related damages that could have been saved through investment in disaster prevention measures. Korea is to strengthen the management of pollutants to improve water quality due to the increase of Chemical Oxygen Demand (COD) that takes a long time for degradation and Total Phosphorus that results in eutrophication. Existing spaces and programs for water sports and cultural activities cannot meet the rising demand from the rise of income levels. This river restoration plans are to be congruous and comprehensive since rivers have diverse functions related to water storage and control,

environment, development, and leisure. The Four Major Rivers Restoration Project is to contribute to recovering the real economy from the recession through job creation and local economic revitalization.

Table 1. Various Measures established by the Four Major River Restoration Project.

Measures	Han River	Nakdong	Geum River	Yeongsan
Weir (Number)	3	8	3	2
Dredging (M m^3)	50	440	50	30
Reservoir (Number)	12	31	30	23
Retention (Number)	2	-	-	2
New Dam	-	3	-	-
Waterway Restoration (km)			67	80
Reinforce Levee (km)	31	335	117	37
Eco Stream (km)	193	407	199	130
Bicycle Lane (km)	305	749	248	432

Disaster Information Analysis System

Now, as disaster aspects show complex and compound disasters, integrated disaster information analysis is very important. For example, the information needed for urban flood disaster risk management are i) the hydrologic and hydraulic characteristics of the river basin, ii) strategy for risk management such as land-use planning, stream code, building code and guideline for enhancement of river basin, iii) utilities such as natural drainage system within an urban area, iv) urban flood risk management policy and v) the economic, political, socio-cultural and ecological environment of the flood prone area.

These information are not provided by one institute or one government organization but by various institutes and government organizations who they provide information collected from monitoring and measuring, determined or estimated from integrated analyzing or/and modeling for their own objectives. For the disaster risk management, these all information are used for sharing, analyzing or integrating to create new knowledge, estimate for warning and support decision making. The main issue is

how can collect these information to share and analysis. Linking among database systems of various institutes and government organizations is solution. It is not easy to link or combine systems because system has different data format but data as an output or input of system and model to analysis is easy to collect control in a system.

For combining and integrating the information in a system, it is important to make a standard format to access and integrate the information conveniently. Using the geographical definition, it is possible to make combine and integrate the information in a system. Also national level network system is needed to share the information in real time in anywhere which is very important for urban flood risk management. To reduce major disaster risk due to climate and environmental changes, National Emergency Management Agency (NEMA) has been developing National Disaster Management System (NDMS) as a comprehensive nationwide information system to support disaster management processes in terms of prevention, preparation, response and recovery.

NEMA collect all disaster management related information form 34 agencies of Korea for one-sight disaster information services which statistics, resources, risk and disaster information are shared and transferred (National Institute for Disaster Prevention, 2010). NDMS services information as follows: i) real time monitoring information such as river stage, flow, wind speed, rainfall, dam water level, CCTV images and satellite images shown in Figure 3, ii) statistical information analyzed by period and disaster type, iii) resources information such as emergent recovery equipments, relief goods, refugee facilities, iv) localized risk information such as forest fire risk map, landslide risk map, flood risk map and wind related disaster risk map, v) real-time disaster information such as flood, typhoon, heavy rain, landslide, earthquake, forest fire and vi) other information such as media, communication and special weather report.

Figure 3. CCTV Information Sharing through NDMS

National Institute for Disaster Prevention, NIDP developed GIS based disaster information analysis system through information sharing and analyzing with GIS based information based on IT technology to assess disaster risk. Some data and information are used for analyzing, calculating and simulating of natural phenomena. For example, Rainfall data is used for input data of rainfall-runoff model and water surface elevation, flow and velocity data is used for calibration and validation to represent flow or estimate risk. Some data and information are combined and integrated to create new knowledge, input data of a system, decision support information. For example, inundation area represented by numerical model overlapped on GIS information such as population, land use, vacancy of hospital, school and utilities can support effective decision making for urban flood risk management and can estimate damages from disaster for efficient emergency recovering shown in Figure 4. High resolution satellite and aerial images and CCTV images are also useful to estimate damage boundary and help to make a decision because real time images can help to understand easily all situations regarding on disasters. Real-time rainfall data are monitored on concentrated area based on GIS system for warning and emergency management. The rainfall data with three hrs leading time forecasted by MAPLE is used for flash flood warning especially in the mountain area which area has severe flood risk because water depth in stream suddenly increase and many people enjoy leisure in the mountain valley.

Figure 4. GIS based Decision Support System

The integrated or linked real-time CCTV images, especially established in riverside and flood risk area can help to understand local disaster situation for effective disaster risk management. Detecting technologies to capture disaster case automatically, for example automatically detecting water depth over limit line in the river and warning to an operator is important because numerous real-time images from various regions are presented in same time and longtime monitoring through CCTV is not easy. Effective disaster management, integrated network system to link the CCTVs and integrate analysis is needed. For operation of integrate network system, the role of each governmental organization at city, province and national is defined as i) national disaster agency monitor all images of CCTVs in a country to detect disaster situation for supporting decision making, ii) province manage all CCTVs in the province to monitor and send the video images to the organizations and institutes to share information and iii) city collect video data from CCTV installed at disaster risk area, stage gauges, major bridges and control CCTV for rotation, angle and camera zooming for monitoring area condition.

The 4th Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR)

The 4th Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) was held in Songdo, Incheon on Oct. 25 for a three-day run under the main theme of disaster risk reduction through climate change adaptation. Along with ministers for disaster management from 53 nations, more than 900 participants were attend the international conference to discuss the mutual cooperation and common resolution in the Asian region for disasters induced by climate change, such as typhoon and heavy rain. Among those to participating in the event were three heads of state - the Prime Ministers from Nepal, Bhutan and Vietnam, representatives from UN agencies, the Vice President of the Asian Development Bank (ADB), Commissioner of the European Commission, and representatives of NGOs. AMCDRR is the only official international ministerial conference for disaster management in the Asian region. It has been sponsored by the United Nations International Strategy for Disaster Reduction (UNISDR) secretariat since 2005 for disaster risk reduction in Asian region after the tsunami occurred in South Asia in December 2004.

Particularly, globally 38 percent of the disasters happen in Asia. However, 90 percent of the global disaster victims are found in Asia. Therefore, Asia is the most vulnerable area, and because of the difference in the disaster management systems and technical levels, it is difficult to draw practical cooperation. The main purpose of the 4th AMCDRR was to derive agreement for common response to the disasters induced by climate change in the Asian area for the first time. The Incheon REMAP and Action Plan is an action plan composed of five-year projects implemented to change each nation's disaster management system into a disaster management system with climate change adaptation. It reorganizes the disaster prevention standard and vulnerability analysis through systematic study of disaster status and climate ideas in Asia and the Pacific area, in order to strengthen disaster management capacity.

It trains climate change adaptation and disaster prevention experts through education and training for disaster risk reduction and climate change adaptation, targeting officials and stakeholders of each nation. The plan is also designed to introduce a global website and technology related to climate change and disaster

prevention by building a climate change adaptation technology-information platform, and improve response capability by sharing good and bad cases for large disasters.

The country can derived preemptive international disaster prevention guidelines for climate change disasters through suggesting and agreeing on the Incheon REMAP and Action Plan for the Asian region in this conference, and enhanced national prestige by building a climate change information and technology sharing platform. For contributing to disaster risk reduction in Asia the Pacific region, NEMA provided Korea's excellent up-to-date disaster prevention systems, such as WEB GIS Based Typhoon Committee Disaster Information System (WGTCDIS), earthquake disaster response system free of charge to each nation (Cheong, 2009; Yi et al., 2008). Through series of participatory consultations, the participants of the fourth Asian Ministerial Conference on Disaster Risk Reduction have confirmed an action plan based on Incheon REMAP as follows:

Raising Awareness and Building Capacity for DRR & CCA

The number of disasters can be considerably reduced if people are well informed and government and technical agencies pay high attention to capacity building at all levels. There are several plans to raise awareness and building disaster risk capacity, which are outlined below.

Developing and Sharing Information, Technology, Sound Practices, and Lessons Learned in Climate and Disaster Risk Management

With the increased disaster risks brought by climate change, many countries in the region are taking actions to alleviate their vulnerabilities to disasters. To achieve development and assistance for the countries in the region better, sharing previous lessons, and cooperating between stakeholders in government, civil society organizations and international or regional organizations is indispensable. Information is indispensible in reducing disaster risk. Timely and accurate information helps policy and decision makers and local communities and ownership. It improves community and individuals' capacity and resilience in the disasters. Disaster risk reduction knowledge, tools, and good practices can be shared through information sharing system.

To share information, technology, sound practices, and lessons learned in climate and disaster risk management, NEMA is developing the Platform of Information and Technology for CCA and DRR with budget of 2.5 Million USD during 2012~2015. The global platform have four main menus such as “System and Technology,” “CCA & DRR Platform,” “Education & Training” and “4th AMCDRR” Shown in Figure 5. The System and Technology provides advanced technologies and system to share and transfer technologies regarding CCA and DRR. The CCA & DRR Platform provide an information of CCA and DRR to analysis linked information to the global platforms in the world which new integrated and combined knowledge is used for early warning and decision making. The Education & Training support information about schedule and program education and training operated by Global Education Training Institute (GETI) which GETI can develop the training program for technical transfer and share information of CCA and DRR. The 4th AMCDRR provide information such as history of AMCDRR, results of 4th AMCDRR and also results regarding on Incheon REMAP and action plain decided on 4th AMCDRR.

Figure 5. Four Main Menus of the Platform of Information and Technology for CCA and DRR

Promoting Integration of DRR & CCA into Development for green growth

Disasters are a big concern for most countries and have great impact on our economy. Disasters can take significant number of lives and leave long lasting negative impact on our properties. Without disaster prevention and reduction, we cannot attain millennium development goal and sustainable development. Disaster prevention is not only environmental and social issue, but development issue as well. As there is a saying “Disasters can be an opportunity,” we need to turn disaster into opportunity and create new type of growth. Thus, ensuring disaster reduction policy is a part of broader economic and development policy in environmentally-friendly way.

Conclusions

As a measures to adapt new challenges to water related issues or to reduce disaster risk due to climate changes in Korea, MLTM has performing the Four Major Rivers Restoration Project (FMRRP), NEMA developed the NDMS, NIDP developed GIS based decision support system through information sharing and analyzing with GIS based information based on IT technology and NEMA has developing the global platform to share information and technologies regarding on CCA and DRR. The FMRRP is for i) fundamental resolution of floods and water scarcity, ii) contribution to a sound ecosystem restoration by water quality enhancement and river rehabilitation, iii) increased quality of cultural and leisure activities, iv) local economies revitalized through the Green New Deal and v) promotion of green growth initiatives using the four major rivers.

NEMA has been developing NDMS as a comprehensive nationwide information system to support disaster management processes in terms of prevention, preparation, response and recovery. NIDP developed GIS based disaster risk management system through information sharing and analyzing with GIS based information based on IT technology to assess disaster risk. The disaster risk management system as a successive prevention oriented disaster information system integrated local and GIS based information to analysis complex and compound disasters. It is provided that comprehensive nationwide information system is useful for disaster risk reduction and supporting decision making on emergence response and recovering.

A global disaster information network as a tool for disaster risk reduction and climate change adaptation is suggested in here. The global platform for sharing disaster information and related technology for CCA and DRR is international cooperation system considering emerging disaster risk due to climate change, developed to response Asia-Pacific's initiatives for climate change adaptation and disaster risk reduction considering vulnerabilities in the region. NEMA has developing the global platform by 2015 as an international cooperation system which global platform will be used to reduce disaster risk and adapt climate change in Asia and the Pacific region.

References

Cheong, T.S., 2009. *WEB GIS Based Typhoon Committee Disaster Management Manual*, WMO/TD-No. 1508, SBN 978-89-90564-92-4 93560.

Ministry of Land, Transport and Maritime Affairs. 2009. *Master Plan of the Four Major River Restoration Project*.

National Institute for Disaster Prevention. 2010. *Disaster Information Analysis Center Operation System Setup (II)*. NIDP-PR-2010-02-02, P. 189.

Yi, W., Cheong, T.S. and Jin, K. 2008. *Typhoon Committee Expert Mission Report*. WMO/TD-No. 1148, ISBN 978-89-90564-88-7 93560.

PESC Paper - Legislating for Disaster Resilience, Climate Change Adaptation, and Environmental Security in the Philippines

By Loren Legarda

Senator, Republic of the Philippines
United Nations Regional Champion for Disaster Risk Reduction and

Climate Change Adaptation for the Asia-Pacific

Through many decades, the complexity of the development problem in our world has been widely examined for insights into better approaches and solutions. Yet, the problems have persisted and the tasks for well-intentioned development leaders have become more daunting as ever.

Today, disasters abound and are getting bigger, deadlier and worse. Our cities are burgeoning and climate change impacts are intensifying along with disaster risks.

The Asia Pacific region is the world's most disaster prone region. People in Asia are four times more likely to be affected by disasters caused by natural hazards than those in Africa; and 25 times more likely than those in Europe or North America, based on a recent UN report.

Moreover, climate change has already made its presence felt in our region and in our respective countries. Extreme weather events, stronger typhoons, heavier rains, more severe floods, and devastating droughts have become recurring events.

If there is one development issue then that cuts across all these concerns,it is the issues of disaster risk reduction, climate change adaptation and environmental security. And resolving this development issue is today's most daunting task for all sectors.

For inequitable economic growth, population pressures, and extreme climate events have connived to increase disaster risks in our midst. Poor urban governance, ecosystems decline and vulnerable rural livelihoods have also become principal sources of risk, driving disaster vulnerability and poverty and making our Millennium Development Goals all the more elusive.

Leadership for effective risk reduction

The fact is a disaster can be prevented if we consider risk reduction not as a cost but a wise investment.

The rising trend of disaster risk can be stopped if political leaders govern with commitment, responsibility, and accountability to bring about a safer and more resilient society.

No conscientious leader would want to see the poor and most vulnerable constantly drawn back by disasters into abject poverty for lack of government action.

No responsible politician would want the government to waste millions on public infrastructure that can be instantly destroyed by earthquakes and floods.

As leaders, we have the mandate to introduce change and to ensure that it happens.

We can employ risk reduction strategies that are supportive of the national development agenda and will safeguard our hard-earned development gains.

The Philippine Experience

The lessons of Typhoons Ketsana and Parma in 2009 have taught us that we should not train our sights merely on enhancing our capacities merely to respond, recover, and re-build after each and every disaster. We cannot content ourselves with merely reacting to disaster events that claim countless of lives, ruin properties, and leave lingering effects on people's livelihoods and the environment.

As a country and people constantly at risk, we realized that we need to rethink our development approach. We need to protect our development gains from the regressive impacts of disasters. We need to mainstream disaster risk reduction and climate change adaptation into our national development plans, policies and programs. We need to be proactive if we are to win against disaster and climate change.

Landmark laws on DRR and CCA

At the legislative front, we addressed the development challenge head on. We passed the needed laws for disaster risk reduction and climate change actions in the past two years.

In October 2009, our country adopted the Climate Change Act, which I principally authored and sponsored. It provides the strategic framework for a comprehensive program and action on climate change at national and local levels.

We also passed in May 2010 the Disaster Risk Reduction and Management Act, a law that strengthens our institutional mechanisms for disaster risk reduction and management and lends great importance to disaster prevention and mitigation.

These two landmark legislation give our country and our people pride as they are now considered legislative models by the UN International Strategy for Disaster Reduction and the Inter-Parliamentary Union for other nations to emulate. However, while these laws are adopted, their implementation remains a work in progress and an enormous challenge to the government both at national and local levels.

The Philippine Climate Change Act of 2009

The Climate Change Act mandates the mainstreaming of climate change in various phases of policy formulation, development plans, and poverty reduction strategies among other development strategies by all the agencies of government. It also creates the Commission on Climate Change tasked to coordinate, monitor and evaluate the programs and action plans of the government relating to climate change.

To highlight the urgency of addressing climate change, the Commission is headed by no less than the President of the Philippines and composed of three Commissioners, one of whom shall be the Vice-Chairperson. The Commissioners are experts in climate change by virtue of their training and experience. There is an advisory board, composed of Secretaries of different government agencies; the Presidents of the League of Provinces, Cities, Municipalities and Barangays or villages; and representatives from the academe, business sector, NGOs and civil society.

The Commission has completed the National Framework Strategy and is finalizing the National Climate Change Action Plan, which shall both serve as blueprints for comprehensive and sustained action.

Moreover, the law places the local governments in the frontline of the formulation, planning and implementation of climate change action plans in their respective areas. It also places disaster risk reduction as the first line of defense against climate change risks.

Recognizing that climate change adaptation and disaster risk reduction are closely linked and effective disaster risk reduction enhances climate change adaptive capacity, the measure ensures the integration of disaster risk reduction into policies, programs and initiatives on climate change.

In brief, this law is focused on strong government-wide coordination, multi-stakeholder consultation, high-level leadership, and links to science and local level action.

As of this writing, the Committee on Climate Change, which I chair, is sponsoring amendments to the climate change law to address financing issues.

To support local governments in undertaking climate change adaptation programs and projects, we recognize the need to establish the People's Survival Fund. It will be a special trust fund shall to be used for activities that are in direct support of the climate change action plans of local governments.

Philippine Disaster Risk Reduction and Management Act of 2010

Another significant development last year was the passage of the Philippine Disaster Risk Reduction and Management Act of 2010, which I co-sponsored. This law provides for the development of policies and plans and the implementation of actions and measures pertaining to all aspects of disaster risk reduction and management, including good governance, risk assessment and early warning, knowledge building and awareness raising, reducing underlying risk factors, and preparedness for effective response and early recovery.

The National Disaster Risk Reduction and Management Council (NDRRMC), composed of a total of forty-one (41) agencies and organizations including representation from four (4) civil society organizations and a private sector, is empowered with policy-making, coordination, integration, supervision, monitoring and evaluation.

One function of the NDRRMC is the development of a national disaster risk reduction and management framework, which shall provide for a comprehensive, multi-sectoral, inter-agency and community-based approach to disaster risk reduction and management.

At the local government level, the local disaster risk reduction and management councils (LDRRMC) will ensure the integration of disaster risk reduction and climate change adaptation into local development plans, programs and budgets as a strategy in sustainable development and poverty reduction.

The present calamity fund appropriated under the annual General Appropriations Act is now known as the National Disaster Risk Reduction and Management (NDRRM) Fund and it shall be used for disaster risk reduction such as formulation of DRRM plans, training of personnel and procurement of equipment.

Of the amount appropriated for the NDRRM Fund, thirty percent shall be allocated as Quick Response Fund or standby fund for relief and recovery programs.

Beyond legislation, the greater challenge is to ensure that these landmark laws work and are fully implemented down to the local level. One opportunity is for the lead institutions empowered by these two laws -- the National Disaster Risk Reduction

and Management Council and the Climate Change Commission -- to transcend sectoral boundaries and build partnerships for a more effective support to local government units in disaster risk reduction and climate adaptation.

In March, we took a significant stride towards close cooperation between the two institutions in building our country's resilience to disasters and climate change through mutual understanding and agreement. They will jointly endeavor to enhance the understanding of risk and reduction measures by local chief executives and community leaders, and build common risk information systems to aid development planning as well as joint action planning on risk reduction and climate adaptation at national and local levels.

Integration, common understanding, and cooperation are key success factors in our fight against risk.

I earnestly hope that the political commitment to disaster risk reduction and climate change adaptation will translate into more risk-sensitive development investments in all nations, especially the most vulnerable.

There is no more opportune time to make a difference, individually or collectively, for our people than now.

PESC Paper - U.S. Navy Energy and Environmental Security
The U.S. Navy's Approach to Climate Change and Sea Level Rise in the Pacific Region

By

CAPT Timothy C. Gallaudet, Courtney C. St. John, Kevin P. Forest, Abigail N. Graefe

Introduction

Melting Arctic sea ice, the stability of developing and resource-poor nations, changing fish stocks in Asia, and high intensity rainfall events may seem like unrelated scenarios, but in fact all are caused or affected by changing climate. There is broad scientific consensus that the Earth's climate is changing. This change is occurring on a variety of scales around the world with economic, human health, societal and national security implications. Impacts of climate change will vary from region to region around the world, and it is imperative to understand projected changes to inform prudent planning for Navy readiness in the twenty-first century. This paper examines the National security implications of climate change and their impacts on U.S. Navy missions, force structure, and infrastructure in the Pacific region.

Climate Change Observations and Predictions

To understand how climate change will affect the U.S. Navy in the Pacific region, one must first comprehend the science on a global scale. The Navy monitors several key climate change indicators on a regular basis, including observations of the Earth's atmosphere, oceans, biosphere, and cryosphere confirming that the planet's climate is changing. For example, global average temperature since 1990 has risen about 1.5 degrees Fahrenheit (CCSP 2008). The Arctic region is currently warming at a rapid rate with higher rates projected in the future; furthermore, the region is experiencing declining sea ice extent and volume, increasing glacial and ice sheet melt, and shrinking snow areas

(IASC 2010) (Figure 1). Also exhibiting significant decline is the mass of the Greenland Ice Sheet (Figure 2). Rapid melting of Arctic sea ice will likely trigger permafrost melting and warming on land, while the Greenland and West Antarctic Ice Sheets have the potential to trigger massive sea level rise around the world if they continue melting (Allison et al. 2009).

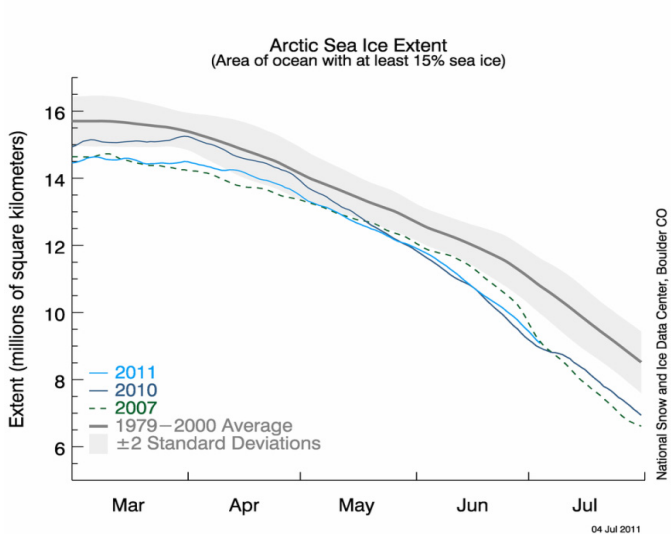


Figure 1. Arctic Sea Ice Extent

Source: National Snow Ice and Data Center

Note. The graph above shows daily Arctic sea ice extent as of July 4,2011 along with daily ice extents for previous low-ice-extent years in the month of April. 2011 ice continues to track below the 1979 – 2000 average

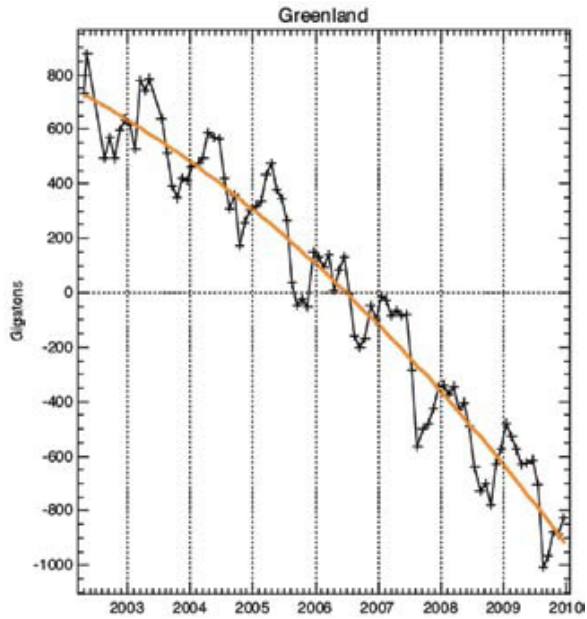


Figure 2. Greenland Ice Sheet Mass

Source: University of Colorado at Boulder Cooperative Institute for Research in Environmental Sciences

Note. The graph above shows the decline in the mass of the Greenland ice sheet from 2002 to December of 2009 as indicated by the Gravity Recovery and Climate Experiment (GRACE) data.

Ice sheet melting is one of two processes that contribute to global sea level rise. The other process is thermal expansion of ocean water due to rising global ocean temperature. The 2010 State of the Climate Report (Blunden et al. 2010) states that the 2010 average global sea surface temperature was third warmest on record and sea levels globally continued to rise. Recent satellite altimeter measurements that have been used to record global sea level since 1993 indicate a 3.4mm/year increase. Because the projected rates of global mean sea level rise over the next century far exceed those observed in the past several thousand

years, the potential exists for coastlines to see historically unprecedented impacts to the natural environment and the infrastructure society depends upon (SERDP 2011).

While observed trends in global averages are significant, variability and extremes relative to these averages are expected to have mostly adverse impacts on natural and human systems, altering the time available for humans to recover and adapt (IPCC 2007, CCSP 2008). The U.S. Climate Change Science Program (CCSP) notes that the cumulative effects of these events are compounded, usually occurring concurrently, thus having more severe impacts (CCSP 2008). Understanding the variability in climate and climate extremes is a difficult task. Oscillation in climate from one extreme to the next presents a challenge for populations around the world to adapt in a safe and timely manner. Improved understanding of predicted events is essential for future adaptation planning and investment.

Climate Change Security Interests in the Pacific Region

The 2010 Department of Defense Quadrennial Defense Review (QDR) identified two broad ways in which climate change will affect the Department of Defense (DoD). First, climate change will shape the operating environment, roles, and missions that the DoD undertakes. The projected effects of climate change will have geopolitical impacts around the world that may contribute to poverty, environmental degradation, further weakening of fragile governments, and resource scarcity (DoD 2010). The second consideration identified in the QDR is the ways in which the agency will have to adjust to the impacts of climate change on military capabilities and facilities. The Navy locates the majority of its installations along coasts, which will be increasingly vulnerable to the impacts of sea level rise and extreme events (DoD 2010).

United States Naval Installations

The U.S. naval installations in the Pacific region, such as those located in Washington, California, Hawaii, Guam, Japan, Singapore, and the Indian Ocean, provide a strategic advantage to the Navy in terms of location, ease of access to different regions around the world, and logistics support. For example, the

island Diego Garcia[1], home to a joint US-UK military air base, is at risk due to sea level rise. The island is a low-lying coral atoll with an average elevation of four feet above sea level and a maximum elevation of 22 feet above sea level. Historically, the island has been impacted by natural disasters, including a tsunami in 1983 damaged buildings, piers, and the airfield. From 1988-2001, relative sea level at Diego Garcia increased by 4.4 mm per year, nearly twice the global average for absolute sea level change (Ragoonaden 2006). Diego Garcia houses refueling tankers and provides military presence in the region to protect oil-shipping lanes from the Middle East. The Navy must consider how increased sea level rise will modify the base's ability to perform its mission.

In March 2011, the Naval Studies Board released a report entitled *National Security Implications of Climate Change for U.S. Naval Forces*. The report declares that specific effects of climate change can be anticipated on piers, utilities, and freshwater resources. One of several recommendations from the report is that the Chief of Naval Operations (CNO) should prepare to invest in early stage adaptation for targeted low-elevation naval installations identified in current vulnerability assessments as being at "very high risk" from the effects of climate change (NSB 2011). The economic cost of protecting vital components of an installation will be significant. If the Navy is able to properly plan for potential impacts to infrastructure the costs can be minimized.

Water and Food Resources

The *Fourth Assessment Report* of the Intergovernmental Panel on Climate Change (2007) states that stresses on water resources will be heightened from the combination of climate change, population growth, and economic and land-use changes. Alterations in freshwater systems will present challenges for flood management, drought preparedness, and water supply (NRC 2010a). Shifting water resources have the potential to catalyze conflict and instability in affected regions of the world and are likely to be a part of increasing humanitarian assistance and disaster relief (HA/DR) missions for the Navy (DoD 2010, NSB 2011).

1 While technically located in the Indian Ocean, Diego Garcia is part of the U.S. Pacific Command.

Agricultural crops of maize, wheat, rice, and soybeans constitute the vast majority of calories consumed directly or indirectly by humans. A study by Lobell et al. (2011) suggests climate trends and advances in agricultural technology have contributed to a decline in global yields of maize and wheat in recent years. This decrease in yields, combined with a projected increase in global population, and an increase in demand for commodity crops, will force upward pressure on prices. The upward pressure on food prices has the potential to be problematic in densely populated regions of the world, including many countries in the western Pacific.

Additional impacts to water and food resources in the Pacific region include the effects of climate variability from the El Niño Southern Oscillation (ENSO), a well-known phenomenon with its origins in the tropical Pacific Ocean and its effects seen on a global scale. The ENSO has the potential to cause extreme events and variability in weather patterns, leading to instability due to flood, drought, and change in sea surface temperature. This climatic variability tends to have an impact on agriculture and the marine ecosystem, which in turn affects the livelihoods of a region's population. Different climate models have yielded various results regarding the impact that climate change has on ENSO. Timmerman et al. (1999) produced a model that predicted more frequent ENSO-like conditions and stronger cold events in the tropical Pacific Ocean. The magnitude of impact that this could have on the marine ecosystem and the societies and communities of many countries is difficult to predict. Nevertheless, more frequent ENSO-like conditions is another factor which has the potential to generate a need for increased HA/DR.

Humanitarian Assistance & Disaster Relief (HA/DR)

HA/DR is a core capability of the United States Maritime Strategy, *Cooperative Strategy for 21st Century Seapower* (CS21) (U.S. Coast Guard, et al. 2007). One hundred sixty million people around the world live less than one meter above sea level, and these people are at risk from more intense coastal storms, flooding, and erosion (Allison et al. 2009). Extreme weather events due to climate change will likely be exacerbated by prevailing issues in developing states, such as unemployment, poverty,

social conflict, and government corruption (Smith 2007). While exact estimates of increases in extreme events are uncertain, the National Intelligence Council (2008) estimates that demand for food will rise by 50 percent by 2030 as a result of growing world population, rising affluence, and a shift to Western dietary preferences. This results in greater stresses on resources already under pressure from climate change effects. A large portion of future world population growth is expected to occur in Asia and Latin America (NIC 2008). Combined, these factors may increase the potential for HA/DR requirements in the Pacific region. The Naval Studies Board recognizes that "as a forward-deployed force the Navy is in position to reach disaster relief sites faster than other agencies and will almost assuredly experience increased demand for assistance if disasters increase due to climate change" (NSB 2011, 5).

Wild Card Scenarios

The Navy is concerned with climate change "wild-cards," or those aspects of climate change for which little is known or has been addressed by the climate science community. One such wild card is abrupt climate change set off by "tipping elements." Tipping elements are defined as Earth System components vulnerable to such abrupt change, such as the Indian summer monsoon, Atlantic Ocean thermohaline circulation, and the Amazon rainforest (UNEP 2009). Tipping elements do not follow linear paths of change and present a challenge to climate scientists and modelers in observing and predicting future events. The significance of tipping points in the climate system being triggered means that the observations and climate phenomena will likely become even more unpredictable, with greater need for military response (UNEP 2009).

A second "wild-card" is ocean acidification. The world's oceans have absorbed approximately 40 percent of fossil fuel emissions, currently totaling about one-third of the total emissions from the past 200 years (Barry 2010). The uptake of carbon dioxide (CO_2) into the world's oceans is causing unprecedented modifications to ocean chemistry, which in turn creates a domino effect of changes to a myriad of ocean organisms, including fisheries that millions of people around the world depend upon as a

food source (NRC 2010b). Of concern is that the current ocean acidification event is taking place more rapidly than at any other time in the past, leaving oceanic species little time to adapt (Doney 2006). While changes in temperature, salinity, and oxygen content alone can affect the distribution of fisheries, it is expected that ocean acidification may exacerbate these changes in some parts of the world. Leading fishery scientists estimate decreases of up to 40 percent in overall catch potential for most major fisheries near the tropics over the next four decades due to warming and changes in ocean chemistry (Cheung et al. 2010). The impacts of ocean acidification on the marine food chain may have significant implications for emerging coastal economies and could cause severe food shortages for millions of people that depend upon it for sustenance, potentially causing civil disturbances on a variety of scales. In Pacific island countries and territories, many rural communities depend heavily on subsistence fishing, which supplies the fresh fish that constitute the majority of animal protein in the islanders' diets (Bell et al. 2009).

Wild-card climate scenarios do not occur linearly and require greater monitoring and international collaborative research. These and the other near- and mid-term climate change impacts discussed will shape the Navy's approach to climate change and energy security and help it adapt to a changing climate by reducing risk associated with changing environments.

Navy and Department of Defense Initiatives

To address climate change, the Navy is responding to guidance issued by the Federal Government and the DoD, as well as its own strategic guidance. On the national level, Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* requires federal agencies to set goals for improving energy efficiency, resource conservation, greenhouse gas emission reduction, water efficiency, and green procurement. Within the DoD, the QDR directs the DoD to craft a strategic approach to energy and climate that considers the influence of climate change on shaping the operating environment, roles, and missions of the DoD, and the impact of climate change on facilities and military capabilities. With respect to the influence of climate change on installations, the QDR recognizes the

significant level of environmental stewardship exercised by the DoD, and directs the DoD to foster efforts to assess and adapt to the impacts of climate change. Primary Navy guidance includes the Maritime Strategy (CS21). CS21 identifies climate change impacts in the Arctic as a strategic challenge, and defines Navy strategic imperatives including the prevention or mitigation of disruptions or crises and the fostering and sustainment of cooperative relationships with more international partners.

To address the tasking set forth for the Navy regarding climate change adaptation, former CNO Admiral Gary Roughead formed Task Force Climate Change in May 2009 to answer implications of climate change for national security and naval operation, to answer the question "when" in terms of Navy decisions regarding climate change, and to ensure the Navy is ready and capable to meet all mission requirements in the 21st century. The Navy's *Arctic* and *Climate Change Roadmaps* respond to this direction. Released in May 2010, the *Navy Climate Change Roadmap* is a five-year action plan with a focus on partnerships and using the best available science to support decision-making and future-planning. The *Climate Change Roadmap* takes a broader view of global climate change outside the Arctic and seeks to achieve full mission capability through changing climatic conditions. Significant actions in the *Climate Change Roadmap* fall into three broad categories: Assessment, Prediction, and Adaptation. Near-term assessment and prediction efforts include the development of a next generation coupled air-ocean-ice operational prediction system and a capabilities based assessments for the Arctic and global climate change. Additionally, the Navy is developing formal training and education at the Naval Academy, Naval War College, and Naval Postgraduate School on the science and strategic considerations of climate change. Naval Wargames, table-top exercises, and limited objective experiments are being conducted to examine projected climate change impacts.

Conclusion

The U.S. Navy is committed to understanding and preparing for a changing climate. With direction from the Federal government and the DoD, the Navy's Task Force Climate Change is implementing the Navy's *Climate Change Roadmap* to guide pol-

icy, strategy assessments, investments, and outreach to ensure that the Navy is ready and capable throughout the 21st century and beyond.

References

Allison, Ian, Nathan Bindoff, Robert Bindschadler, Peter Cox, Nathalie de Noblet-Ducoudré, Matthew England, Jane Francis, Nicolas Gruber, Alan Haywood, David Karoly, Georg Kaser, Corrine Le Quéré, Tim Lenton, Michael Mann, Ben McNeil, Andy Pitman, Stefan Rahmstorf, Eric Rignot, Hans Joachim Schellnhuber, Stephen Schneider, Steven Sherwood, Richard Somerville, Kondrad Steffen, Eric Steig, Martin Visbeck, Andrew Weaver. 2009. *The Copenhagen Diagnosis: Updating the World on the Latest Climate Science.* Sydney, Australia: The University of New South Wales Climate Change Research Centre.

Barry, J. 2010. Hearing Testimony before the U.S. Senate Committee on Commerce, Science, and Transportation, Washington, DC.

Bell, Johann D., Mecki Kronen, Aliti Vunisea, Warwick J. Nash, Gregory Keeble, Andreas Demmke, Scott Pontifex, and Serge Andréfouët. 2009. Planning the Use of Fish for Food Security in the Pacific. *6th SPC Heads of Fisheries Meeting*, Noumea, New Caledonia.

Blunden, J., D.S. Arndt, and M.O. Baringer, Eds. 2011. State of the Climate in 2010. *Bulletin of the American Meteorological Society* 92, no. 6: S1-S266.

Cheung, William L., Vicky W. Lam, Jorge L. Sarmiento, Kelly Kearney, Reg Watson, Dirk Zeller, and Daniel Pauly. 2010. Large-scale redistribution of maximum fisheries catch potential in the global ocean under climate change. *Global Change Biology* 16, no. 1: 24-35

Department of Defense [DoD]. 2010. *Quadrennial Defense Review Report*.

Doney, Scott C. 2006. The Dangers of Ocean Acidification. *Scientific American* (March).

International Arctic Science Committee (IASC). 2010. *Arctic Climate Change Impact Assessment*. http://www.eoearth.org/article/Arctic_Climate_Impact_Assessment.

Intergovernmental Panel on Climate Change [IPCC]. 2007. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* eds. R. K. Pachauri and A. Reisinger. Geneva, Switzerland: Intergovernmental Panel on Climate Change.

Lobell, David, Christopher Field. 2011. Climate Trends and Global Crop Production Since 1980. *Science* DOI:10.1126/science.1204531.

National Research Council [NRC]. 2010a. *Advancing the Science of Climate Change: Prepublication Copy*. Washington, DC: National Academies Press.

National Research Council [NRC]. 2010b. *Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean: Prepublication Copy*. Washington, DC: National Academies Press.

Naval Studies Board [NSB]. 2011. *National Security Implications of Climate change for U.S. Naval Forces*. Washington, DC: National Academies Press.

National Intelligence Council [NIC]. 2008. *Global Trends 2025: A Transformed World*. Washington, DC: National Intelligence Council.

Obama, Barack. 2009. *Executive Order 13514. Federal Leadership in Environmental, Energy, and Economic Performance*. http://www.fedcenter.gov/ programs/eo13514/.

Ragoonaden, S. 2006. Sea level activities and changes on the islands of the Western Indian Ocean.

Western Indian Ocean Journal of Marine Science, no. 5: 179-194.

Smith, Paul J. 2007. Climate Change, Weak States, and the “War on Terrorism” in South and Southeast Asia. *Contemporary*

Southeast Asia: A Journal of International and Strategic Affairs 29, no. 2: 264-285.

Timmerman, A., J. Oberhuber, A. Bacher, M. Esch, M. Latif, and E. Roeckner. 1999. Increased El Niño frequency in a climate model forced by future greenhouse warming. *Nature* 398: 694-697.

Strategic Environmental Research and Development Program (SERDP). 2011. *Climate Change*

And Impacts of Sea Level Rise. http://www.serdp.org/Featured-Initiatives/Climate-Change-and-Impacts-of-Sea-Level-Rise.

United Nations Environment Programme [UNEP]. 2009. *Climate Change Science Compendium*, eds. Catherine P. McMullen and Jason Jabbour. Nairobi, Kenya: United Nations Environment Programme.

U.S. Climate Change Science Program and the Subcommittee on Global Change Research [CCSP]. 2008. *Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands*, eds. Thomas R. Karl, Gerald A. Meehl, Christopher D. Miller, Susan J. Hassol, Anne M. Waple, and William L, Murray. Washington, DC: Department of Commerce, NOAA's National Climatic Data Center.

US. Coast Guard, U.S. Marine Corps, and U.S. Navy. 2007. *A Cooperative Strategy for 21st Century Seapower.*

PESC Paper - Climate change: Threat to international Peace and Security

By
A.N.M. Muniruzzaman

President, Bangladesh Institute of Peace and Security Studies

The recent statement of the UN Security Council identifying the impacts of climate change as a threat to international peace and Security is most timely. Nothing can be more severe as a looming threat to humanity than the rapid climatic changes witnessed by the world today. Putting an end to the debate over climate change, the UN Security Council in a presidential statement declared at its meeting on climate change on July 20 that possible adverse effects of climate change may, in the long run, aggravate certain existing threats to international peace and security. Secretary-General of UN, Ban Ki-moon declared that climate change was an “unholy brew” that could create dangerous security vacuums, and that we must address a clear danger that not only exacerbated the threats but was itself a threat to international peace and security.

The security implications of climate change cover a wide spectrum. The recent scientific assessment presents a worrisome picture. According to the Fourth Assessment Report of IPCC, eleven of the last twelve years (1995-2006) rank among the twelve warmest years since 1850. The 2007 IPCC report predicts temperature rise of 1.1 - 6.4 °C by 2100. The number of natural disasters in the world may double during the next 10 to 15 years. Over the past ten years, 3,852 disasters killed more than 780,000 people, affected more than two billion others and cost a minimum of $960 billion.

Major vulnerabilities induced from climatic hazards include human displacement, drinking water shortage, reduced agricultural productivity and food insecurity, loss of livelihood, health hazards, energy crisis, and disaster security.

Climate change worsens water quality and availability in regions with water scarcity. Currently, 1.1 billion people are without access to safe drinking water. 120 million to 1.2 billion will experience increased water stress by the 2020s in South and South East Asia. More than 3.5 million people die each year from water-related disease; 84% of them are children. Nearly all deaths -- 98% -- are in the developing world. This crisis may in turn fuel existing internal or inter-state conflicts and social conflict and it is feared that unresolved water issues could trigger Indo-Pak conflict, which would have unpredictable consequences internationally.

Reduced agricultural productivity and the resultant situation of food insecurity is potentially the most worrying consequence of climate change. If global warming rises to 3°C it is likely that the number of people suffering from hunger will increase by 250 million to 550 million. According to German Advisory Council on Global Change, agricultural production from rain-fed agriculture could fall by about 50% in some regions by 2020. Rising food prices could potentially push hundreds of millions of people back into poverty. This situation can undermine the economic performance of weak and unstable states, thereby aggravating destabilization, the collapse of social systems and violent conflicts.

A changing climate affects the essential ingredients of maintaining good health: clean air and water, sufficient food and adequate shelter. Every year, the health of 235 million people is likely to be seriously affected by gradual environmental degradation due to climate change. Climate change is projected to cause over 150,000 deaths annually and almost 45 million people are estimated to be malnourished because of it.

Direct economic losses and human casualties of global disasters have increased in recent decades, with particularly large increases since the 1980s. According to Oxfam, developing countries will require at least $50bn annually to adapt to unavoidable climate change-related disasters.

The impacts of climate change may damage key energy infrastructures, such as energy plants, energy routes, nuclear installations, and consequently destabilise public order. For instance, the recent earthquake in Japan caused an explosion in the Fukushima nuclear plant, causing human casualties and dis-

ruption to energy production. The decline in hydroelectric power generation may additionally reinforce competition and conflicts over fossil energy sources.

Climate change could potentially trigger large-scale displacement and migration from one region to another. The 2001 World Disasters Report estimated that there were currently 25 million "environmental refugees." It is estimated by IPCC that by 2050, 150 million people could become climate refugees, being displaced by sea level rise (SLR), desertification, increasing water scarcity, floods and storms, etc.

Climate change also has security dimensions. Climate-induced insecurities can trigger interstate tensions and conflicts. States may be stressed to the point of collapse. The potential for regional conflicts due to climate induced condition will be extremely high.

Radicalization and terrorism may increase in many developing societies, particularly in South Asia, due to the climate-induced social and economic deprivation. When a government can no longer deliver services to its people, conditions are ripe for extremists and terrorists to fill the vacuum.

Resource scarcity could be a contributing factor to conflict and instability. The 1994 genocide in Rwanda was in many ways a consequence of squabbles over agricultural resources. The 1974 Nigerian coup resulted largely from an insufficient response to famine. The situation in Darfur, which had land resources at its root, is spilling over into neighboring Chad. The United Nations estimates 300 potential conflicts over water exist around the world today.

Bangladesh is one of the most vulnerable countries to the effects of climate change. The country is facing more frequent and intense natural disasters such as flood, drought, and cyclone, lack of access to adequate safe drinking water, contamination and water-related diseases, and lack of water for irrigation. Between 35 and 77 million of the 165 million Bangladeshis are at risk of drinking contaminated water. According to the British medical journal "The Lancet," up to 77 million people have been exposed to arsenic that can cause 2,00,000 to 2,70,000 deaths from cancer alone in Bangladesh.

Besides, rainfall could increase to 10% at the same time, drastically changing usual rainfall patterns and causing unusual floods. More importantly, if sea levels were to rise by the predicted amount of 2-3 ft then the effect on Bangladesh would be disastrous; loss of roughly 20% of its landmass, and displacement of nearly 20 to 30 million people who will become environmental refugees.

The mangrove forests of the Sundarbans, the Bengal tiger and hundreds of bird species may disappear. About 53% of the coastal areas are affected by salinity. Millions of people in northern Bangladesh are threatened by riverbank erosion and severe droughts. Rising sea levels will wipe out more cultivable land in Bangladesh than anywhere else in the world. By 2050, rice production is expected to drop by 10% and wheat production by 30%.

At this juncture, it is crucially important to recognise that climate change is pervasive and has more security implications than any other threat today. Climate-induced challenges should be placed at the core of security considerations in a rapidly changing world. Hence, effective international cooperation, as advanced by the UN Security Council, should be formed to address the unpredictable security consequences of climate change.

The writer is President, Bangladesh Institute of Peace and Security Studies (BIPSS) and a member of the International Military Advisory Council on Climate Change.