

# Integration & Synthesis Panel for Climate & Energy Imperatives for Future Naval Forces Symposium

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# Climate Change Impacts – Tactical/ Operational Level

- Potential sea level rise and/or storm damage impact on viability of military operating bases, e.g., Diego Garcia
  - Very large expense to restore Pascagoula after Katrina damage
  - Increased naval support to civil authorities for domestic disasters like Katrina
- Potential increased frequency of extreme weather events in overseas locales – **US military/ naval role as “first responders” for humanitarian assistance/ disaster response (HA/DR) operations**
  - As occurred in Indonesian tsunami (2004) & Haitian earthquake (2010)
  - Likely increased role of seabasing during future HA/DR operations
- US national electric grid fragility/ vulnerability to storms – with adverse effects since USN & other services depend on grid for communications/ other functions
- Examples of USN missions & roles potentially on the rise due to climate change effects include: SAR, MEDEVAC, HA/DR, environmental stewardship, maritime security & awareness

# Climate Change Impacts – Strategic Level

- Climate change will exacerbate negative aspects of various societies, e.g., population growth, industrialization, urbanization, inadequate public health care, ineffective governance (all levels)
- Populations already stressed by drought, desertification, flooding will be further stressed (i.e., compounded) by climate change
  - Increased gap between “haves” and “have-nots”
- Destabilizing effect in various regions, possibly even leading to failed states/ havens for extremists (think Somalia, Darfur)
  - Regional food security issues w/ declining crops in lower latitude regions
  - Water availability/ quality in various regions w/ economic & security implications
  - Spread of infectious disease w/ economic consequences
- Mass migrations (internal & external) and refugee crises due to food/ water insecurity & extreme weather events
  - Internal & cross-border tensions
- Increased demand for international institutions to play new or enlarged roles to manage refugee crises, respond to disasters/ humanitarian crises, achieve climate-related agreements, etc.
- Ultimately could significantly change when, where, why & how the military/ navy operates

# Climate Change Impacts – Arctic

- **“Open seas” in Arctic provide opportunities for:**
  - Increased inter- & intra- shipping, i.e., new maritime shipping lanes requiring protection
  - Exploration/ harvesting of rich natural resources (oil & gas, fisheries, minerals, other) with associated legal/ sovereignty issues
- **Nations posturing for claims/ resources, e.g., possible renewed US/NATO vs. Russia competition**
- **Need for Arctic nations (including US) to ensure safety, security & stability in region**
  - Need for & opportunities for new partnerships with other countries (NATO, Russia) or agencies (e.g., DHS/ USCG)
- **Potential new Arctic missions/ roles: maritime security & awareness, HA/DR, forward presence/patrols, SAR, strategic sealift, escort shipping, BMD & warning, C4ISR, environmental protection, traffic management, maritime law enforcement, fisheries enforcement, logistics supply, freedom of navigation & overflight**
- **Potential new Arctic capabilities: ice-breakers, different ship designs (ice-hardening, handle extreme cold), weather & ice forecasting, enhanced navigation & comms (e.g., SATCOM), deep water ports, enhanced sensor suites, C4ISR integration w/ USCG and partner nations**

Sources: various including “Navy Arctic Roadmap”, CNO, October 2009

# Climate Change Impacts – Africa & Middle East

- Climate-induced water/ food shortages (availability, affordability) in **Africa** resulting in weakened governance, economic collapse, human migrations, extremist havens, potential conflicts
  - Up to 50% agricultural losses from rain-fed crops in North African countries
  - Severe food insecurities in Sahel and Horn of Africa (HOA) regions
  - Rwanda, Somalia, Algeria & Kenya current water shortages will be compounded
  - 75-200 million more people exposed to increased water stress by 2020 including S. Africa
  - Nigeria vulnerable to drought/ desertification & sea level rise w/ mega-city Lagos at risk
  - East Africa – large fluctuations in rainfall during next 30 years (flooding/ soil erosion in winter & droughts in summer)
- Increased waterborne disease in sub-Saharan Africa, the region potentially most severely affected by intense/ widespread drought
- Potential climate-induced mass migrations in Nigeria & East Africa
- Humanitarian emergencies & potential African state failures
- In the **Middle East** food, water & other resource shortages and associated pressures to emigrate. With respect to water security:
  - 2/3 of Arab world depends on water resources external to their borders
  - Kuwait, Jordan, Israel shortages today will only get worse
  - 75% of water in Middle East is located in Iran, Iraq, Syria & Turkey
  - E.g., Turkey could potentially employ water as a political tool (e.g., against Syria or Kurds)

Sources: “Global Warming”, Center for American Progress, Nov 07;  
“National Security & Threat of Climate Change”, CNA, 2007

# Climate Change Impacts – Asia & Australia/ New Zealand

- 40% of 4B people in **Asia** live within 45 miles of coast – potential for large-scale flooding inundation & mass migration
  - In heavily populated mega-delta region
  - Few places are more directly threatened by human migration than South Asia
  - Potential displacement of tens of millions of people from Bangladesh (due to sea rise) with major migration issues/ concerns for Pakistan, India & China
- Decrease in fresh water availability in Central, South, East & SE Asia, particularly in large river basins
  - Water scarcity & spread of waterborne infectious disease and cholera, including in large parts of India & China by 2025 w/ severe economic & security implications
  - 2/3 of China cities already have water shortages - will be exacerbated by climate change
  - Gobi desert is steadily expanding with severe desertification possible in future, threatening up to 400M people in China
  - Glacial melting of massive Himalayan range – eventually will result in water shortages for hundreds of millions of people
- Decreased wheat, corn, rice yields – could decrease by up to 37% in next few decades in China
- In **Australia/ New Zealand** significant loss of biodiversity, e.g., Great Barrier Reef; in addition, increased water scarcity and declines in agriculture and forestry are projected by 2030

Sources: “Global Warming”, Center for American Progress, Nov 07;  
“National Security & Threat of Climate Change”, CNA, 2007

# Climate Change Impacts – Europe & Americas (Beyond Arctic) and Islands

- In **Europe** large-scale human migration issues could occur (e.g., from North Africa) w/ associated border control issues
- Mediterranean region desertification, resulting in portions of Spain, Italy & Greece being largely unlivable
- Increased likelihood of flash floods in parts of Europe due to storms & sea level rise
- Potential fracturing of long-standing European alliances due to various climate-induced effects such as mass migrations
- In **United States**, some coastal areas will be very vulnerable to sea level rise & potential for more frequent/ intense storms
- Potential significant water shortages in some US western states
- Increased US border stress due to severe climate effects in Mexico/ Caribbean
- In **Latin America** water supply strain in Peru & Venezuela with potential disease outbreaks
- Potential damage to (collapse of) portions of Amazonia rain forest
- For more vulnerable **islands** (world-wide) sea level rise will exacerbate inundation, storm surge, erosion & other hazards; water scarcity can also be an issue due to climate change

Sources: “Global Warming”, Center for American Progress, Nov 07;  
“National Security & Threat of Climate Change”, CNA, 2007

# Climate Change – Areas of Contention/ Uncertainty

- How soon & for how long (how many wks/ mos) will various parts of the Arctic be “ice-free”, and will this allow practical and cost-effective marine shipping in Arctic? Some opinions...
  - Within a few years (American Geophysical Union)
  - “Ice free” September in 25-30 years (CNO/N84)
  - Largely “ice-free” summers between 2030 and 2060 with no big increase in shipping over next 20-30 years (CNA, Michael Bowes)
  - “Ice-free” Arctic in 2060 (National Snow & Ice Center)
- How accurate are current global warming forecasting models including predictions for various effects (e.g., sea level rise)?
  - 2007 IPCC Report estimated global surface temperature rise of 1.1 to 6.4 degrees C (or 2.0 to 11.5 degrees F) by end of century depending on various scenarios (e.g., the types/ amounts of energy consumption across globe)
  - If forecasts are tightened, will they be on the high end or the low end, i.e., are today’s median estimates optimistic or pessimistic?
- **“Insufficient credible research tying together observations & projections about climate change with social trends (such as demographics & poor governance) and delineating how this will affect US & global security.”**

January 2010 CNAS Working Paper “Promoting the Dialogue: Climate Change & the QDR”

# Energy Supply/Demand Impacts – Tactical/ Operational Level

- **Overreliance on oil on battlefield** (e.g., for powering various vehicles)
  - Heavy/“just in time” logistics burden for replenishment, potentially costly in dollars & lives
  - E.g., up to 70% of tonnage required to position today’s US Army on battlefield is fuel
  - Ties up combat assets to protect long, vulnerable supply lines – resulting in reduced overall combat effectiveness (i.e., reduces combat force employment flexibility)
  - Need for more efficient & less vulnerable approaches – today’s fossil fuel platforms (combat, non-combat) have significant range/ endurance constraints
- **Need diversified energy sources** for military efficiency/ resilience/ sustainability (and hopefully for a reduced “carbon footprint”)
- **Potentially fragile electricity grid** – outdated, over-taxed weak link
  - Critical military electricity infrastructure both at home & overseas - vulnerable to both natural & man-made (either physical or cyber) threats
- **Possible disconcerting “effects” from competition for diminishing energy supplies** (5/08 brief by James Russell & Daniel Moran of NPS)
  - Contesting of new energy resources (e.g., in Arctic)
  - Seizure of energy assets (including to protect them from harm or misuse)
  - Overthrow of governments whose conduct is adverse to functioning of global energy markets
  - Intervention to defend government of energy-producing state against insurgents/ extremists
  - Military protection of (or attacks on) energy production & transportation infrastructure
  - Protection of international straits & other regions through which energy assets move
  - Indirect control of energy assets (e.g., by means of “puppet states”)
  - Exclusive trading blocs (e.g., bilateral deals between China & Asian/ African suppliers)

# Energy Supply/Demand Impacts – Strategic Level

- **Dependence on imported oil** – US imports 60% of petroleum needs; US consumes about 25% of world oil, but controls < 3% of oil supply – **with potential adverse strategic consequences**
  - Undermines foreign policy initiatives, e.g., the forming of coalitions/ policies on Iranian issues
  - Causes entanglements in various regions/ countries including with repressive, autocratic regimes (e.g., Carter Doctrine & large military presence in Persian Gulf)
  - Potential oil shortfalls (“oil crunch”) due to increasing demand from China, India & other “rising” nations in midst of their industrialization/ urbanization/ economic growth periods
  - Large amount of wealth in small group of supplier nations (reflecting periods of high oil prices), e.g., helps Iran to sponsor terrorism and to pursue nuclear weapons
  - Large US oil imports (plus high oil prices) can be large contributor to America’s growing debt
  - High carbon emissions with oil as an energy source & potential harm to the environment
- **Dependence on increasingly tight supply of oil/ other energy sources**
  - Volatile energy market (e.g., reflected in prices) with volatile impact on economies of various countries (both suppliers & importers)
    - Note: \$10 increase for barrel of oil results in \$300M increase in US Navy’s annual fuel bill (OPNAV N43)
  - Market vulnerability to manipulation by those who control large energy supplies
    - Oil used as a diplomatic tool by foreign leaders
    - Recent example of temporary denial of Russian natural gas to Europeans
  - Key oil/ energy nodes as attractive targets to terrorists/ insurgents (e.g., oil production facilities, pipelines, other means of distribution)
    - Potentially vulnerable/ fragile energy supply chain (oil, liquefied natural gas)
    - Need to protect critical chokepoints (e.g., St. of Hormuz, St. of Malacca) from energy flow disruptions – historically a major USN role since nearly 80% of world’s fuel transits by ocean
    - Need to protect critical energy infrastructure by combined public/ private efforts
  - Need to diversify energy sources/ supplies for enhanced resiliency

# Energy Supply/Demand – Areas of Contention/ Uncertainty

- **Much controversy/ uncertainty with “peak oil” debate, i.e., when will global oil production diminish for the foreseeable future?**
  - “Oil Drum” community predicts during next few years (peaking at < 90M barrels per day)
  - IEA in 2008 World Energy Outlook (WEO) warns of an oil supply crunch by 2015; JFCOM’s Joint Operating Environment (JOE) 2010 concurs, citing a 10MBD shortfall as early as 2015
  - IEA’s chief economist Fatih Birah expects a plateau around 2020 if oil demand grows on a business as usual basis
    - Based on IEA analysis of historical production trends of 800 individual oil fields
    - Birah recently said “even if oil demand was to remain flat, the world would need to find more than 40B barrels per day of gross new capacity – equal to (4) new Saudi Arabias - just to offset the decline.”
  - 2007 GAO report states peak oil will likely occur before 2040
  - Opponents/ notables believing there will not be a near-term (i.e., any time soon) oil crunch: OPEC, EIA, CERA, some oil corporations (Exxon, BP)
  - Proponents/ notables believing there will (could) be near-term oil supply problems: IEA, various oil corporations (e.g., Shell, Chevron, Hess), T. Boone Pickins, Warren Buffet, JFCOM
- **Stability of fuel prices – two differing views:**
  - Prices remain volatile indefinitely due to various factors, e.g., global energy supply/ demand
  - Prices largely stabilize (e.g., at moderate prices) in future except for unforeseen events
- **Development speed & scalability of alternative energy sources that can be used to compensate for dwindling oil supplies and/or reduce dependence on fossil fuels - two differing views:**
  - Enabling technologies & increased funding/ priority can largely mitigate in next 20-30 years
  - Large technical hurdles & economic constraints will significantly limit how rapidly alternative energy sources can replace fossil fuel-based energy

# Other Relevant Areas of Contention/ Uncertainty

- Are energy insecurity & climate change mitigation measures largely in synch or somewhat at cross purposes?
  - “There is a relationship between the major challenges we’re facing. Energy, security, economics, climate change – these things are connected. And the extent to which these things really do affect one another is becoming more apparent. It’s a system of systems. It’s very complex, and we need to think of it that way.”  
(GEN G. R. Sullivan, USA (Ret.), former Chief of Staff, USA & former chairmen of CNA MAB)
- What about other drivers? How do they play?
  - Globalization trends/ effects including “wildcards” (e.g., pandemics)
  - Demographic trends (e.g., population shifts, urbanization)
  - Rising powers & a changing/ diverse multi-polar world power structure
    - Potential decay/ weakening of key international institutions including nation-state itself
    - Rise in influence of non-state actors (including multinational corporations, NGOs)
  - Sectarian/ religious struggles
  - Shifts in the nature of power/ nature of war
  - New alliances/ coalitions
- Will states/ institutions effectively address global/ regional problems?
  - Energy: IEA, OPEC, IAEA influence on global energy system – how effective have they been & for how long will rising powers rely on traditional, Western, market-based institutions?
  - Climate: recent G-20 differences in achieving consensus – does this forecast a challenging future for crafting global approaches to climate change?
  - Economy: WTO, Financial Stability Board, IMF, World Bank, OECD – how effective have they been & for how long will rising powers be excluded from some of these institutions, or will rising powers not be interested in joining anyway (preferring regional or other approaches)?
  - Security: G-20, NATO, UN – how effective addressing international security issues in future?

# Summary/ Wrap-Up

- **Perceived Impact of Climate & Energy Imperatives on Future Naval Forces in an Uncertain World (80Kft View)**
  - Two newest core capabilities for USN identified in 2007 maritime strategy (i.e., maritime security and HA/DR) will likely rise in importance in the future due to climate change & energy supply/ demand issues addressed in this symposium
  - Future maritime security activities could have many flavors – some of which have historically been done by others; that said, the USN will likely find itself doing more of these efforts in the future (in cooperation w/ USCG or others), e.g.,
    - Environmental security
    - Border/ migration security
    - Fisheries/ other resources protection
    - Critical infrastructure protection
  - Stability operations & humanitarian assistance in general appear to be increasingly important in a world plagued by climate change and/or energy insecurity – the USN will likely have an expanded role (w/ other services/ agencies)
  - There is a clear need for the US & the US military to partner with others (e.g., other nations, other agencies, NGOs) to address these types of global & regional issues – they are far too challenging to take on alone

# Other Integration & Synthesis Panel Participants

- **Mr. Adam Siegel (Northrop Grumman Corporation)**

- Senior Analyst, Naval/Energy, in Northrop Grumman Analysis Center
- Principal focus on naval, maritime, industrial (primarily shipbuilding), irregular warfare, climate & energy issues
- Previously spent 15 years at Center for Naval Analyses including deployments as a civilian analyst in Kuwait (90/91), Haiti (94) & Kosovo (99)
- Extensive publications including for over 35 journals and newspapers
- Board member of the non-profit Energy Consensus – had a leading role behind the DoD Energy Conversation lecture series

- **Dr. Michael Vlahos (JHU/APL)**

- National Security Studies Fellow at Johns Hopkins University Applied Physics Laboratory
- Areas of expertise include history, anthropology, national security studies & foreign policy
- Addressed climate & energy challenges in recent project *Ashen Truths: Exploring a Crisis of Globalization*
- Prior to his tenure at JHU/APL, worked at the Department of State and at JHU School of Advanced International Studies (SAIS)
- Extensive publications including eight books and monographs plus > 100 journal articles
- 2009 book - *Fighting Identity: Sacred War & World Change* (Greenwood-Praeger)

- **Dr. Ed McGrady (CNA)**

- Senior Research Analyst at Center for Naval Analyses
- Conducts studies on a wide range of topics, most recently working on projects related to the effect of climate change on US military involvement in HA/DR
- Research work in humanitarian emergencies, disaster response (overseas, domestic), medical humanitarian missions (military/ naval role) & cooperation between military forces & NGOs
- Written extensively on role of military forces in HA/DR operations & other military/ naval topics