THE RELATIONSHIPS BETWEEN MODERN WARFARE, CLIMATE CHANGE, AND RESOURCE SUSTAINABILITY

A FINAL REPORT SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF HAWAIʻI AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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Preface

"If your plan is for one year plant rice. If your plan is for ten years plant trees. If your plan is for one hundred years educate children."
Confucius

Growing up is a lifelong process of learning from your mistakes. After fighting the longest war in United States history, Americans have a chance to look at past missteps and help the next generation avoid repeating them. From the perspective of the Global War on Terrorism, one of the key lessons learned was that it's very easy to destroy the enemy in battle but very difficult to gain their trust or cooperation after you've killed their family members. Another lesson learned was that while the American military may be the master of destruction on the battlefield, it needs the complementary strengths of its civilian partners in accounting, engineering, agriculture, education, communication, construction, and health care to help stabilize a country and rebuild a lasting peace.

To avoid making the same mistakes in the next Global War on Terrorism, the United States developed a 3D (Diplomacy, Development and Defense) approach to warfare and announced that providing the local populace with security, restoring essential services, and meeting humanitarian needs were key military priorities to achieve the long-term goal of developing indigenous capacity to secure essential services, build a viable market economy, rule of law, democratic institutions, and a robust civil society. To help prepare the next generation of warfighters, the Department of Defense instituted the Transformation Training (T2) program with the prime directive that, "no one should experience a task in a real-world operation without previously being exposed to that task during training or education." These wartime directives and experiences were the genesis of this research paper.

As the world looks out upon projected climate changes that will exceed all historical records, how will we prepare the next generation for challenges the current generation's leadership has no previous experience with? Will we hold on to the past because it's comfortable and known? Or will we leap boldly into the future, committing completely to our transformation? In the end we can only hope that the education we provide today, will be as useful to the next generation as the ones our predecessors provided 100 years ago.

In 1907, the University of Hawaii was established as a small College of Agriculture and Mechanic Arts with 13 faculty and 10 students. As a Land Grant College, the university's focus is "without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts." From its humble beginnings, the University of Hawaii expanded to 10 separate campuses boasting 55,000 students enrolled in 710 degree programs. And while many things have changed, the purpose remains to meld the strengths of the past with the innovations of the present to prepare the next generation of students for the opportunities and challenges of the future.

Perhaps no other unit at the University of Hawaii exemplifies this belief more than the School of Ocean and Earth Sciences and Technology (SOEST), which holds the mission of "transforming the way people live and thrive on Earth." Recognizing that population growth, rapid

industrialization and destruction of Earth's ecosystem carrying capacity human alteration has intensified over the 20th century, the leaders of the SOEST are "serving society through the acquisition and dissemination of new knowledge about the ocean, Earth, and planets, and to enhancing the quality of life in the state of Hawaii and in the nation by providing world-class education, contributing to a high-tech economy, and promoting sustainable use of the environment."

The professional Masters in degree in Geoscience or MGeo program is one of SOEST's initiatives to provide working professionals an opportunity to gain the practical geoscience knowledge necessary to enter careers in environmental consulting, climate change adaptation, natural hazard mitigation and renewable energy development. Emphasizing applied geoscience studies and a work project over the traditional research thesis, the MGeo degree enhances mid-career professionals' ability to continue life-long learning, stewardship of the natural environment and remain civically engaged with their community.

The MGeo project on "The Relationships between Modern Warfare, Climate Change, and Resource Sustainability" is an attempt to identify the interconnected linkages between the social, economic, demographic, and environmental factors affecting national security. This project is a first in the MGeo Program in integrating social sciences, national security, and geosciences; and is intended to set path lines for integrated research in these critical areas. The hope is that the research will serve to strengthen collaboration between the University of Hawaii, Pacific Command and the National Oceanic and Atmospheric Agency by generating future opportunities for contributing new knowledge that will ultimately contribute to setting guidelines towards creating resilient lifestyles for a sustainable future.

The objective of this project is to study the evolution of the links between modern warfare and climate change's impacts on human society. In the past, each major increase in human knowledge and understanding has created conflicts between the existing power structures and the conveyers of new information until a new state of equilibrium is reached. As knowledge of climate change impacts on human survival increase, so will the need to update the human understanding of the reasons humans engage in conflict and how they define success.

Based on literature reviews and analyses, the following hypothesis will be tested.

1. Warfare is not a one-dimensional process but should be fought in many fronts, with environmental issues fully considered.
2. Climate impacts have caused political destabilization and the collapse of empires in the past and potentially will again in the future.
3. There are recognizable climate response indicators which can be acted upon to reduce the threats of conflict.

The hope is that by finding the connections between the different academic and operational perspectives, the research will provide a conceptual map for the next generation to build a sustainable future in a climate changed world. This research was started knowing every first attempt will be flawed and incomplete. But this failure may not be so great if the findings inspire other researchers to go further and prepare the next generation for the challenges our generation leaves behind.

Introduction

Climate Change is Universal

What is climate change?

In January 2016, Department of Defense Directive 4715.21 defined climate change as: "Variations in average weather conditions that persist over multiple decades or longer that encompass increases and decreases in temperature, shifts in precipitation, and changing risk of certain types of severe weather events."[1] The definition is shortsighted and incomplete.

Climate change is a unidirectional eco-evolutionary dynamic feedback loop that includes "atmosphere, hydrosphere, land, ice cover, biosphere and interactive relationships.".[2,3,4,5 6] Through the carbon cycle, a dynamic exchange of carbon compounds within the air, lands, seas, plant and animals - climate change can raise oceans, level mountains, split continents and blot out the sun.

Given what we know about the universe, every galaxy and solar system has a similar unidirectional eco-evolutionary dynamic feedback loop. This means that although different processes interact with each other in an interconnected feedback loop, like aging, development only proceeds in one direction. Thus, the universe we see around us today has taken 13.7 billion years to create and will never repeat itself again. It means the unique environment that supports human life on Earth has taken 4.5 billion years to create and will never be recreated again.

Three key differences between the Department of Defense and United Nations definitions are:

	Department of Defense	United Nations
Time Scale	>2 decades, potentially reversible	Continuous, unidirectional
Scope	Atmosphere	Atmosphere, hydrosphere, geosphere, cryosphere, biosphere, and interdependent relationships
Agency	Not specified	Manmade

Climate Change Is Life and Death

The Earth's climate system resembles a combined cardiovascular/nervous system for the planet composed of the interactions between all the different carbon exchanges. Through these carbon cycle interactions, the pH and salinity of the oceans, position of the continents and chemical composition of the air we breathe all simultaneously work to balance each other out. Because life or the biosphere is part of the carbon cycle, it both impacts and is impacted by all the other changes in the carbon cycle.

The best science to date tells us that every plant and animal on Earth owes its existence to microscopic cells called cyanobacteria. Through the photosynthetic processes of transforming carbon dioxide (CO_2) into oxygen (O_2), these algal cells reduced the greenhouse effect of Earth's atmosphere 2.3 billion years ago, cooling our superheated planet into a "Snowball Earth".[7] The injection of oxygen into the atmosphere forced the evolution from prokaryote (simple cells) to

eukaryote (complex cells) organisms that finally supported the evolution of complex multi-cellular plants and animals.

Historical examination of speciation (the emergence of new species) and species extinction shows a strong correlation with high rates of global climate change. When the climate change impacts on the environment exceeds a species ability to adapt, it goes extinct. Concurrently, as the environment changes, genetically abnormal individuals can take advantage of emerging conditions to establish themselves as a unique species. Because the climate is always changing, there is a "normal" background rate of speciation and extinction.

When the rate of global climate change exceeds adaptive capacities of the majority species on the planet, it is called a mass extinction event. In the last 600 million years, abnormally high rates of climate change have coincided with five mass extinction events which eradicated more than 80% of all life on Earth. As Earth's environment evolves in a unidirectional manner, organisms that disappear in a previous mass extinction event never reappear again because the unique food web it once depended upon no longer exists. The current rate of climate change and extinction of species indicate we are entering Earth's sixth mass extinction event.[8]

Climate Change Created Humans

Just as climate changes created the continents, oceans and life on Earth, its processes can be tied to the emergence of homo sapiens as a unique species.

The genetic split between chimpanzee and Australopithecus, man's ancient genetic ancestor, occurred 4 million years ago, the same time that the Greenland and Western Antarctic ice sheets began growing and there was a shift in the vegetation zones of Africa.[9,10] Australopithecus went extinct and the more carnivorous Homo erectus emerged about 1.8 million years ago when permanent El Niño conditions across the Pacific, Atlantic and Indian oceans were replaced with the current El Niño-La Niña variations we see today. Homo sapiens or modern humans became a unique species about 200 thousand years ago during the climate cold spell of Marine Isotope State (MIS) 6.[11]

Homo sapiens migrated north 60 thousand years ago during the MIS 3 glacial maximum. Climate change is thought to be associated with the extinction of Neanderthals about 28,000 years ago when humans figured out complex layered clothes, while our genetic cousins did not.[12] Given that the emergence and extinction of a species is dependent upon its ability to adapt to climate change impacts on the environment, understanding, predicting and moderating climate change is an existential priority for humanity. And just as climate changes can determine the survivability of species, it can also create and stop conflicts or raise and level empires.

Climate Change Creates and Destroys Civilizations

The earliest example of climate change induced creation and collapse begins with the Akkadian Empire. 9,000 years ago, climate conditions made the area between the Tigris and Euphrates rivers optimal for the cultivating crops. 7,000 years ago, a small farming village called Tell Leilan grew into an independent city state. For thousands of years the temperate conditions supported crop cultivation in the region and the emergence of the first empire 4,300 years ago.[13,14]

After 100 years of prosperity, an extreme drought struck suddenly resulting in crop failures and famine. As the starvation and political strife increased, four kings ruled in a period of three years before the empire collapsed and the Akkadian capital was abandoned.[15] The localized drought lasted for 300 years before the rains returned and the fields could be replanted. Tell Leilan was eventually reoccupied by the Amorite kingdom and renamed Shubat Enlil.[16]

Climate Change Impacts on Conflict

The impact of climate changes on conflict can also be seen through the rise and fall of the Mayan Empire. Mayan conflict and warfare coincides with the long-term rise and fall of annual rainfall patterns starting in 660, when rainfall and agricultural yields first dropped.[17] Rainfall and peace returned for about a century before periods of unusually scarce rainfall between 780 and 800 resulted in increased warfare. Despite offering up human sacrifices in attempts to reverse the droughts, annual rainfall continued to diminish reducing the Mayan harvests and population growth as measured by the decreasing the number of monuments and urban centers being built.[18] After an especially long drought between 1020 and 1100 the Mayan civilization eventually disappeared.

Climate change can even determine the outcome of warfare itself, as seen by the successful rise of the Mongol Empire.[19] Between 1180 and 1190, the Central Asian steppes experienced an intense drought that corresponds with disunity and conflict amongst the Mongol tribes. Between 1211 and 1225, the region experienced a period of sustained rainfall and mild warm weather that expanded the grasslands that the Mongol ponies foraged on. This allowed the Mongols to expand their empire from Beijing to Bucharest by 1259 and eventually establish the largest contiguous land empire in history.

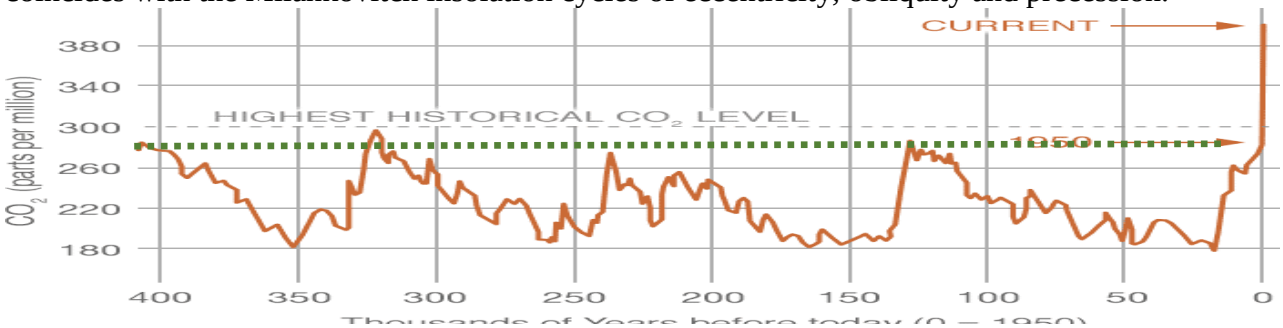
The climate change-human conflict relationship can work in reverse as shown by the creation of the Little Ice Age.[20,21] When European colonizers arrived in the Americas they killed millions of native inhabitants who had been cultivating farmlands throughout the Western Hemisphere. As the surrounding forests reclaimed farmlands on a continental scale, the trees created a carbon sink that sequestered between 17 and 38 gigatons of carbon resulting in a 6 to 9 part per million (ppm) drop in atmospheric carbon dioxide. This caused a 1°-1.5°C (2°-3°F) average drop in global temperatures, affecting European crop production between 1525 and early 1600's.

With climate science being unknown at the time, superstitious villagers turned to witch hunts to remedy the situation, burning old ladies at the stake for supposedly causing the unusually bad winters.[22] Like the Mayans, the European inquisition recognized there had to be some sort of human connection with the environment. But it was too great a mental leap to understand that the bad crop harvests were a tertiary consequence of killing native Americans in the Europeans' quest for silver and gold.

Planetary Climate Changes

While the military definition of climate change is simplistic and incomplete, it accurately notes that atmospheric CO_2 concentrations are one of the easiest way to measure climate changes rates. Looking back over the past 400,000 years, the average concentration of CO_2 has been 240 ppm

with a variation of 60 ppm roughly every 100,000 years.[23] This variation in CO_2 concentrations coincides with the Milankovitch insolation cycles of eccentricity, obliquity and precession.



Based on this historical trend, the atmospheric CO_2 concentrations on Earth should be peaking or dropping. Instead, CO_2 concentrations exceeded the 400,000-year maximum of 300 ppm in 1950.[24] In 2016, human carbon output pushed CO_2 concentrations to 400 ppm for the first time in 4 million years, well before a time when the Earth's environment favored the evolution of homo sapiens.

Section 1 Human Interaction

Carbon Contribution of Farmers

Traditional farmers are not to blame. Humans have influenced the Earth's carbon cycle by burning firewood and clearing forests to plant crops for over 10,000 years. And as long as farm work is done by the human or animal labor, it is virtually impossible to exceed the carbon dioxide threshold of 300 ppm, because the products of an agricultural economy are consumable calories and plant or animal byproducts. This keeps food productivity and human population balanced within the ecosystems natural carrying capacity and atmospheric carbon dioxide within the 240 ±60 ppm limits.

Carbon Contribution of Industrialists

From the perspective of modern man, the magical number is "280 ppm" as represented by the green line above. From the time of Tell Leilan 9,000 years ago until 1750's, the atmospheric concentration of CO_2 remained around 280 ppm.[25,26] But by 1850, the Industrial Revolution had burned enough fossil fuels to increase atmospheric CO_2 to 285 ppm. By 1900, atmospheric concentrations had reached 295ppm.

This made the Industrial Revolution different from agricultural economies in at least three ways.

- First the amount of fossil fuels being burned increased from coal or peat for the fireplace to huge factories, power plants, locomotives and steam ships. This meant that complex organic carbon chains that had been created through millions of years of compression and heat were being released back into the atmosphere in a matter of seconds.
- Second, the replacement of human or animal labor with fossil fuel energy allowed an explosive growth in human population. As agricultural productivity increased, the global population grew from less than 1 billion people in 1800 to 6 billion by 2000, a 500%

increase. This trend will continue as more human labor is replaced by fossil fuel driven systems

- Third, the industrial economy reduced the Earth's carbon sinks through deforestation, mining, and the building of cities, roads, dams and canals. As less carbon was absorbed by forests, oceans and other natural processes, the rate of climate change accelerated.

Industrializing America

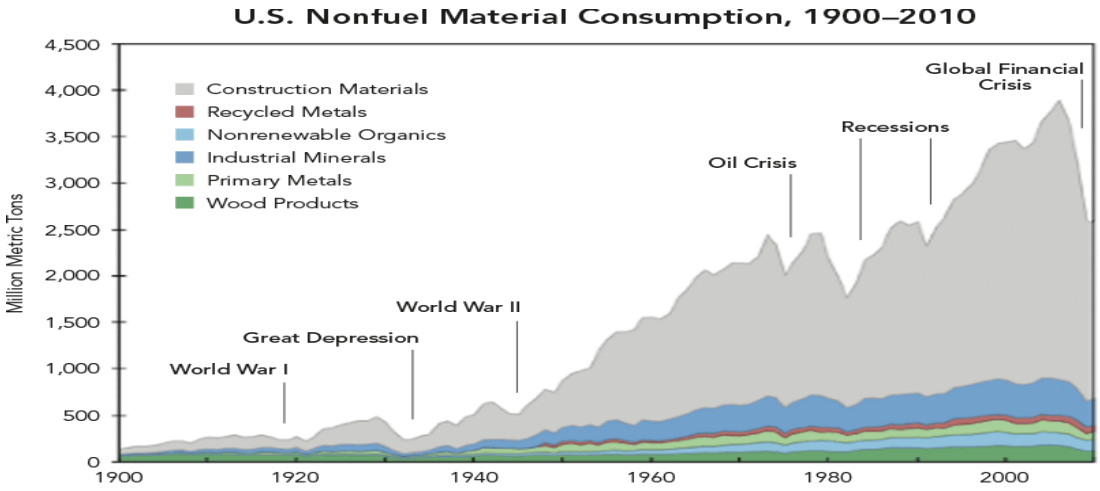
Perhaps no country reflects this transition from an agricultural to industrial economy better than the United States. In 1775, almost all Americans were engaged in some sort of farming activity. After 200 years, there fewer than 10% of the American population was engaged in farming.[27,28,29] These advances were made possible by fossil fuels.

Year	**1775**	**1800**	**1850**	**1900**	**1950**	**2000**
Population	2.5m	5m	23m	76m	152m	282m
% Farmers	90%	83%	65%	38%	12%	2%

By unleashing the stored energy of coal and oil, the United States was able to triple its population while simultaneously increasing per capita consumption of food, water, and energy.

	Population	**Food**[30]	**Meat**[31]	**Water**[32]	**Energy**[33]	**Home**[34,35]	**Waste**[36]	**CO_2**[37,38]
1900	76M	3,212 kCal	150gm	600 gal	125 MBTU	270 sqft	2.7 lbs. 1960	8.72Mt
2000	282M	3,804 kCal	250gm	1,200 gal	300 MBTU	960 sqft	4.7 lbs.	20.38Mt
%Δ	**+271%**	**+18%**	**+60%**	**+100%**	**+140%**	**+255%**	**+74%**	**+133%**

To achieve this level of productivity, the United States also increased its consumption of raw materials 1,650% from less than 200 million metric tons in 1900 to over 3.5 billion metric tons in 2000.[39,40] While making up only 5% of the world's population, the United States consumed about 30% of the world's construction materials.[41] Many of these raw materials are extracted by mining, cutting down forests, and polluting groundwater through the use of chemical extraction practices like cyanide leaching, further diminishing the planet's carrying capacity.

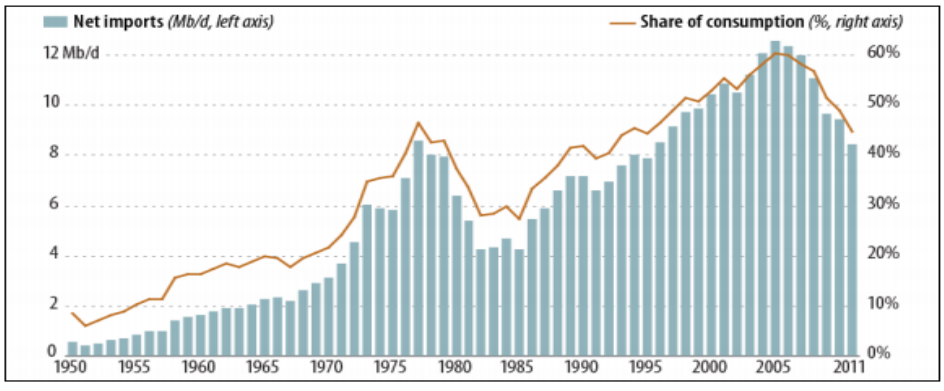


As consumption increases, so does excretion. In past 40 years, Americans have increased their waste production from 2.7 lbs. of garbage per person per day in 1960 to 4.7 lbs. in 2000. Today, methane created from America's rotting organic waste produces the equivalent of 100 million tons of carbon dioxide.[42,43,44] Combined with the carbon released by American factories, power plants, cars, airplanes, and ships American per capita carbon dioxide output has increased from 8.72 million tons per year in 1900 to 20.38 million tons in 2000.

As one of the first countries to industrialize its economy, the United States became the world's number one producer of CO_2 by 1900 and was producing as much CO_2 as the rest of the world combined by 1945.[45,46] As of today, the United States is responsible for 27% of all the carbon emissions ever produced in human history, more than China, Russia, Japan and India combined.[47] What took cyanobacteria 1.6B years to accomplish, humans are completing in 300 years or 0.00001875% of the time.

Role of Oil

From 1850 to 1950, the United States was self-sufficient in oil use. By 1950, the United States began to import cheap foreign oil to keep its economy growing. When the United States' dependence on foreign oil reached 50% in 1975, the values of the country began to change.[48]



Data Source: EIA, *Petroleum & Other Liquid Fuels*, February 28, 2012, http://www.eia.gov/petroleum/data.cfm.

Changing American Values

Throughout its history, the United States claimed its military would be used to protect American values like truth, justice, democracy and individual freedoms. The United States sold World War II to Americans by promising that their soldiers would be protecting the Four Freedoms.[49,50]

1. Freedom of speech and expression everywhere in the world.
2. Freedom of every person to worship God in his own way everywhere in the world.
3. Freedom from want which, translated into world terms, means economic understandings which will secure to every nation a healthy peacetime life for its inhabitants, everywhere in the world.
4. Freedom from fear which, translated into world terms, means a world-wide reduction of armaments to such a point and in such a thorough fashion that no nation will be in a position to commit an act of physical aggression against any neighbor, anywhere in the world.

Section 2 Climate Change and Conflict

Post World War II

After World War II, the United States kept their promise to rebuild peace and stability around the world, including the economies of their former enemies, the Germans and Japanese. The United States leaders recognized that:

> "Our policy is directed not against any country or doctrine but against hunger, poverty, desperation and chaos. Its purpose should be the revival of a working economy in the world so as to permit the emergence of political and social conditions in which free institutions can exist."[51]

This policy was based on the American Declaration of Independence philosophy that "all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness."[52] Americans believed:

> "That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed, --That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness."

The Founding Fathers believed a just government started with ensuring everyone had the food, water and shelter necessary for Life. Once protection against poverty and chaos was ensured, the role of the government was to protect the Liberty of its people to speak their mind freely and worship their God in the way that they wanted. Finally, the protection of an individual's pursuit of Happiness was sacrosanct, so long as it did not negatively impact another person's Happiness. Phrased another way, your right to swing your fist ends at the tip of the other person's nose.

After the United States became the world leader at the end of the Cold War, the validity of all governments came to be judged by these criteria.

The 1960 Kennedy Administration exemplified this idealism believing that "development assistance *was* security assistance" and "that subversion and revolt around the world fed on social injustice and economic chaos." [53] To that end, the Kennedy Administration nurtured the creation of:

- United States Agency for International Development (USAID), designed to eliminate extreme poverty and promote resilient, democratic societies;
- Peace Corps, working to promote world peace and friendship; and
- Special Forces, established to help people overthrow oppressive governments

This changed when the oil producing nations attempted to use oil as a weapon to influence United States policy during the 1973 Arab-Israeli War. Recognizing the America's economic prosperity had become dependent on imported oil, the United States military shifted from protecting the Four Freedoms for the world to protecting economic prosperity for America by ensuring the flow of oil from the Middle East.[54] The instigation of the insurgency in Afghanistan and promotion of the Iran-Iraq War throughout the 1980's are just two examples of this policy.

Post-Cold War

At the end of the Cold War in 1990, the United States increased this prioritization of domestic economic growth over foreign humanitarian and development assistance using the logic that international aid was ineffective and harmed developing countries. American leaders who opposed overseas assistance argued that "helping all the poor people of the world, though laudable, is impractical" and that furthermore "if U.S. foreign aid does the job of promoting economic growth overseas, it will have adverse consequences for the United States" because the poor countries will "have become competitors in the global market."[55]

To show its commitment to realpolitik values, the United States Government removed USAID programs from 24 nations after the fall of the Soviet Union. The United States Information Agency (USIA), designed to understand, influence and inform foreign audiences about American values, was eliminated in 1999.[56] Finally, the conflicts exacerbated by the breakup of the Soviet Union in places like Albania, Algeria, Burundi, Cambodia, Chad, Chechnya, Democratic Republic of Congo, East Timor, Georgia, Guatemala, Guinea-Bissau, Indonesia, Liberia, Nepal, Senegal, Sierra Leone, Sri Lanka, Tajikistan, and Yemen were considered to be of little interest to the United States and left to burn themselves out.[57,58]

All this was happening at the same time that fossil fuel contributions to climate changes were being confirmed. Much of the technology and equipment used to identify climate change came from the United States preparations for war and America's military industrial complex.

Detailed world maps and the advances in geography necessary to produce them were paid for by the Department of Defense. Sonar and the oceanographic study of the impacts of pH, temperature and salinity on underwater soundwaves, both of which are now critical for mapping the oceans floors, were first used to detect and destroy enemy submarines.[59] Meteorology and the use of radar to track and predict weather patterns was first developed to bomb cities and destroy

enemy aircraft. Geology itself evolved from the eccentric hobby of searching uninhabited wastelands for fossils to a highly paid and well respected career after the discovery of oil.

This trend continues into the Digital Age as Global Positioning System (GPS), first developed to help submarine launched nuclear missiles accurately destroy their targets, became the foundation of digital mapping. Finally, the internet, now ubiquitous in every household, business, school and factory, had its beginning as a post-apocalypse communication system. Collectively, these technologies and knowledge systems were showing that reliance on fossil fuels was degrading the ability of the Earth's "atmosphere, hydrosphere, land, ice cover, biosphere and interactive relationships" to support human life.

Global Warming Challenges

This understanding of Earth's unidirectional eco-evolutionary dynamic feedback loop, combined with the history of human development, was creating a clearer picture of humanity's interdependent relationship with the evolution of Earth.

Ever since the emergence of Homo sapiens as a distinct species 200,000 years ago, the entire planet's human population had remained under 2.5 million individuals until 10,000 BCE. The cultivation of crops and domestication of livestock allowed the human population to reach 500 million by 1400 before doubling to 1 billion around 1800. But the Industrial Revolution, along with its advances in agriculture, medicine and science, promoted exponential growth.

Date	1805	1925	1960	1975	1987	2000	2012
Population in billions	1	2	3	4	5	6	7
Interval in years	199,800	125	35	15	12	13	12

In contrast, the surface area of the Earth remained fixed. With a planetary surface area of 520 million km^2, each human could rely on 200 km^2 of Earth's ecosystem services 10,000 years ago. Today, each human's share has shrunk to 0.07 km^2 or less than $1/2{,}500^{th}$ the ecosystem resources available to the ancient inhabitants of the Akkadian city, Tell Leilan.[60]

Luckily increases in farm productivity were achieved through the mechanization of farming tasks as well as using irrigation, hormones, pesticides, fertilizers and artificial lighting. Collectively, these innovations allowed industrial farmers to force plants, animals and the soil itself to produce more rapidly than normal. But all these processes required fossil fuels. Today, the "food sector (including input manufacturing, production, processing, transportation marketing and consumption)" accounts for 30% of the global energy consumption and 20% of greenhouse gas emissions, which all accelerate the rate of climate change.[61]

Climate Changed Conflicts

The problem for societies without access to fossil fuels or mechanical systems is that climate changes can reduce traditional agricultural production. In 1992, drought conditions in Somalia caused a famine that killed 350,000 people, including one quarter of all Somali children under five years.[62] 15 years later, another drought struck Somalia killing 260,000 people, half of them children. [63,64] Scientific studies determined that these droughts were driven by climate variations

not been seen in the region for 2,000 years.[65] And even where drought does not cause famine conditions, overpopulation in unindustrialized agricultural economies can result in violence.

At the end of the Cold War, Rwandans living abroad returned home to land scarcity, ethnic discrimination and a struggle for political power that triggered a civil war from 1990 to 1993.[66,67,68] After the civil war ended, there were few provisions for how to distribute land equitably amongst an agricultural-pastoral society where 60% lived on less than $1.25 a day.[69,70,71] When the Rwandan President's plane was shot down in April 1994, it triggered a genocide that resulted in 800,000 people being slaughtered by metal bars, farming implements and machetes.[72,73]

To put the death toll into perspective, 800,00 people represented roughly 14% or 1/7th of Rwanda's population. In comparison to World War I, the Battle of Verdun required ten months to kill 800,000 people with machine guns, artillery and poison gas whereas the Rwandans accomplished the same death toll using hand held weapons in three months.[74] For an American comparison, the Rwandan death toll exceeded the 656,406 "battle deaths" of all the military service members who died in wars between 1775 to 2016.[75,76,77]

In keeping with its post-Cold War philosophy, the United States response was to slow the deployment of UN peacekeepers and dissuade the international community from using the term "genocide" so as to avoid any obligation to respond.[78,79,80] While neither the droughts in Somalia nor the violence resulting from overpopulation in Rwanda could be directly attributed to the United States history of fossil fuel use, they provide clear examples of the types of macro challenges facing humanity in a climate changed world. What was becoming clearer is that the American consumption of luxuries increasingly depends upon taking other people's share of the Earth's natural resources at the same time as contributing to the hardships of people with traditional agricultural economies.

Unsustainable Dream

The United States dependence on foreign oil became a key driver for initiating and continuing the Global War on Terrorism. While the United States had been developing policies to control the flow of oil in the Middle East since World War II, America's intentions to control the Middle East crystalized after the oil embargo in 1973. Unable to continue economic growth without imported oil, the Carter Doctrine announced that America would use military force to ensure its unrestricted flow from the region.[81]

So, while the United States was unwilling to stop the famines of Somalia and genocide in Rwanda, Americans were quick to expel Iraq from Kuwait in 1991. After the Gulf War, the United States built permanent bases in Saudi Arabia and established an aerial blockade designed to cripple Iraqi's economy. The basing of non-Muslim foreign troops in Saudi Arabia, the birthplace of Islam, was one of the key outrages Osama bin Laden cited in justifying his attacks on America. Among bin Laden's other justifications for the 9/11 attacks included failing to provide humanitarian relief for people in need, supporting Israel's oppression of the Palestinians, forcing the oil producing countries to sell their product at unfairly low prices and destroying the natural environment.[82,83,84]

Instead of addressing bin Laden's charges that the American Way of Life was destructive to the world, the United States chose to tell its citizens that "they hate us because we're free." This implausible explanation was generally accepted because most Americans were ignorant of who exactly "*they*" were. In 2002, only 17% of Americans between 18 to 24 years of age (the prime age range for military enlistment) could find Afghanistan on a map.[85] Four years later, after continuous news coverage of operations in the country, only 12% of young Americans could now find Afghanistan on the map when the National Geographic survey was repeated in 2006.[86]

American ignorance of history and larger geostrategic issues made it possible for policy makers to construct a narrative that downplayed the role of oil when responding to 9/11. This allowed the misdirection of attention from Saudi Arabia, the philosophical birthplace of Wahhabism and physical birthplace of Osama bin Laden and 15 of the 19 hijackers, to Afghanistan and then Iraq. From a Carter Doctrine perspective, this strategy killed four birds with one stone.

First, redirection of attention from Saudi Arabia to Afghanistan protected the traditional relationship between American oil companies and the House of Saud, rulers of the largest proven oil reserves at the time. Second, occupying Afghanistan renewed the possibility of building the Trans Turkmenistan-Afghanistan-Pakistan-India pipeline through the country, after negotiations were disrupted by Osama bin Laden's attacks on the U.S. embassies in Tanzania and Kenya.[87] Third, Operation Iraqi Freedom broke apart Iraq's state run oil system, providing American and other foreign oil companies access to the fifth largest oil reserves in the world.[88,89] Fourth, occupying Iraq and Afghanistan provided the United States a way to sandwich Iran, the country with the fourth largest oil reserves in the world, with American military forces and control their reentry into the world oil market under terms set by the United States.[90,91]

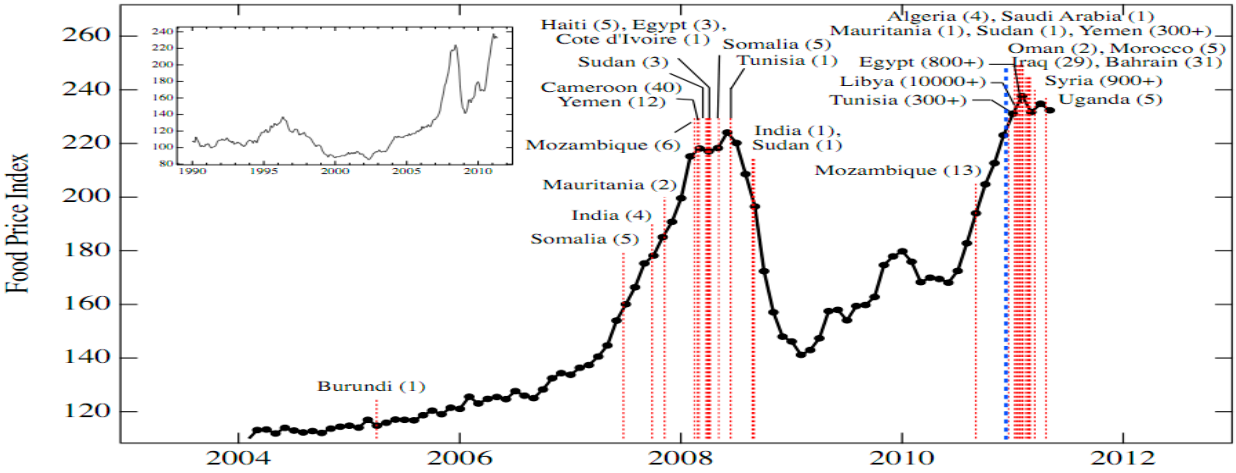
These strategies allowed uniquely American entertainments like the National Association for Stock Car Auto Racing (NASCAR) to remain a $3 billion dollar-a-year industry and the No. 1 spectator sport in the United States.[92] In stadiums that would make Roman charioteers envious, up to 190,000 screaming fans gathered to see which one of the 43 racecars would drive 200 times around a 2.5 mile oval track the fastest, each car burning 5,300 gallons of fuel in the process.[93] The only problems was that this continuous flow of oil required an ever present military effort overseas that pumped even more carbon pollutants into the atmosphere.

For example, in 2013 the Department of Defense burned 87 million barrels of oil resulting in 37 million tons of CO_2 being released into the atmosphere.[94,95] One year worth of the United States military's carbon emissions were greater than Haiti, Togo, Equatorial Guinea, Niger, New Caledonia, Malawi, Mali, Djibouti, Fiji, Rwanda, Burundi, Somalia, Chad, Sierra Leone, Maldives, Belize, Liberia, French Polynesia, Central African Republic, Eritrea, Swaziland, Bermuda, Saint Lucia, Seychelles, Grenada, Gibraltar, Timor-Leste, Guinea-Bissau, Aruba, Montserrat, Solomon Islands, Gambia, Western Sahara, Tonga, Dominica, Samoa, Comoros, Cape Verde, Kiribati, Falkland Islands, Palau, Cook Islands, Anguilla, American Samoa, Saint Helena, Guam, Greenland, Faroe Islands, Nauru, and Tuvalu combined. This gave every American service member an 82-ton carbon footprint, four times the size of the average American and 350 times larger than any one of the 175 million citizens in the 50 above named nations and territories.[96]

Arab Spring

150 years of America's carbon contributions helped make 2010 the warmest year on record, as climate changed weather patterns decreased wheat production in Canada, Russia and China.[97,98] Crop production shortfalls, combined with a global recession sparked by the United States housing market collapse, caused a spike in the food price index, the change in prices of an essential food basket (meat, dairy, cereal, oil, sugar).[99]

After a Tunisian fruit vendor set himself on fire to protest the confiscation of his goods in December 2010, public demonstrations erupted in Tunisia, Egypt, Libya, Yemen, Syria, Kuwait, Bahrain, Lebanon, Saudi Arabia, Morocco, Jordan, Oman, and Mauritania. Fed up with high unemployment, increasing food prices, and their national government's use of the Global War on Terrorism as an excuse to suppress public dissent, the people of the Middle East and North Africa took to the streets. The governments of Tunisia, Egypt and Libya collapsed. Many governments restored order only after making political concessions with the demonstrators, while Libya, Syria, and Yemen deteriorated into civil war. The graph below shows the correlation between food price index spikes, civil disturbances and resulting deaths.[100,101]



Observers called the Arab Spring "a textbook example of what analysts mean when they talk of complex causality and the role of climate change as a 'threat multiplier.'"[102] On the surface, 200

million citizens in 13 countries revolted because of the self-immolation of a single fruit vendor. But climate scientists understand that these social responses merely reflect the IPCC definition of climate change as "complex interactions between climatic, environmental, economic, political, institutional, social and technological processes" that "may have significant international and intergenerational implications in the context of broader societal goals such as equity and sustainable development."[103]

Section 3 Identifying Linkages Between Climate Change and Conflict

Disconnected Dots

This connection between change in rainfall over time, decreasing wheat production around the world, and the political turmoil during the Arab Spring would be obvious to any paleo-climate historians who knew that the ancient Akkadian Empire stretched over parts of modern day Syria, Turkey and Iraq. They could tell you that the ancient city of Tell Leilan was located in northeast tip of Syria, the same area where recent crop failures had forced farmers to migrate to the cities like Homs, Damascus and Aleppo, overwhelming the social infrastructure and fueling the civil war in 2006.[104,105] Unfortunately, the same American education system that failed to teach Middle Eastern geography was also failing at math, science, and climate change.[106]
As evidence, the world's largest cross-national education survey, the Program for International Student Assessment (PISA), ranked the United States 27th out of 64 nations in science, behind Estonia, Poland and Latvia. In math, the United States did even worse ranking 35th out of 64, after Vietnam, Russia and Slovakia.[107] And while money cannot solve all the world's problems, it can sometimes buy a few answers.

The budgets for the United States Department of Education and Department of Defense reflect the respective value Americans place on promoting knowledge or conflict. The average annual budget for the Department of Education between 2002 and 2015 was just over $60 billion dollars a year, while the Department of Defense's average annual budget was roughly $540 billion dollars over the same period.[108,109] This equated to a per capita investment of $1,200 for each of the 50 million American students attending public pre-kindergarten to 12th grade schools and $1,200,000 for each of the 450,000 military service members; a student-to-soldier ratio of 1:1,000.[110,111] The differences in salaries between teachers and soldiers reinforced this contrast.

During the Global War on Terrorism, a 22-year old Corporal or Petty Officer 3rd Class with no dependents and 4 years of service received a compensation package worth about $70,450.[112] Those serving overseas or qualifying for hostile fire, hardship duty or family separation pay could receive up to $3,000 in additional monthly bonuses for a total of over $100,000 dollars a year. Private military contractors hired by the United States Government to provide security in Afghanistan and Iraq did even better, receiving from $165,000 to $365,000 dollars a year tax free.[113,114]

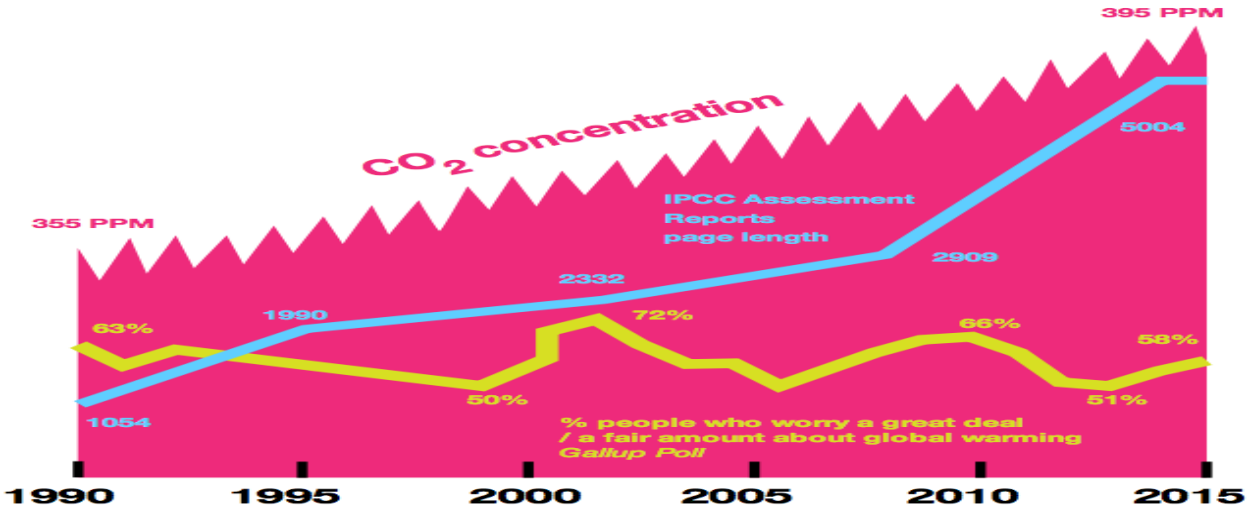
A 30-year old teacher with a family and 8 years of experience in educational combat zones like Baltimore might only receive $57,000 a year, which could account for why so many teachers are leaving the profession. [115,116,117,118] Nationally, 8% of all teachers are quitting the classroom each year, the majority before retirement.[119] Noting that low income students now made up the

majority of public school attendance, the Southern Education Foundation predicted, "Without improving the educational support…the trends of the last decade will be prologue for a nation not at risk, but a nation in decline…"[120]

Climate of Meta-Ignorance

All these factors combined to create a "rational" disbelief in the correlation between the Industrial Revolution, use of fossil fuels, impacts of climate chance and resulting social and political conflicts. Part of this might be explained by the psychological phenomena called the Dunning-Kruger effect, where individuals with the least knowledge about a subject or skill tend to greatly exaggerate their knowledge and competence.[121,122] Resistance to the idea of climate change is also caused by selective perception, the tendency to only believe information that reinforces old beliefs. These cognitive biases, along with the relationship between the media, scientific community, businesses and political interests influence the ability of the American population to prioritize the information it receives in a way that avoids extinction.[123]

At the end of the Cold War, scientists from the United States had worked with the United Nations Intergovernmental Panel on Climate Change (IPCC) to publish the 1,054 page long First Assessment Report (FAR), assessing the probability of global climate change and its implications. The IPCC published follow-up Assessment Reports in 1995, 2001, 2007, and 2013, each time expanding the scope of inquiry while providing increasing levels of detail and confidence in anthropogenic climate change. Yet in 2013, despite 23 years of United Nations studying the climate and reporting on its changes, the percentage of Americans who "Worry a great deal or fair amount about global warming" had dropped from 63% in 1989, before the IPCC's First Assessment Report to 58%.[124] The graphic below shows the increasing CO_2 levels



against the increasing length of IPCC Assessment Reports and America's seesawing concern about climate change.

While the reports of the March 2016 Gallup Poll showed 64% of Americans are now worried a great deal or fair amount about global warming, Americans are still uncertain that humans are causing it. Despite having created all the technology, equipment and science that made it possible to recognize climate change was occurring and man-made, the September 2016 Pew Research Center poll showed that only 48% of Americans believed that "Earth is warming

mostly due to human activity."[125] Fewer than 44% believed that climate change would harm wildlife, cause droughts and crop failures, make storms more severe or erode shorelines through sea level rise. The results seemed to reflect, like the decreased ability of young Americans to find Afghanistan on the map after four years of fighting there, that the amount information Americans receive has little impact on their ability to understand the issues.

The real danger is that the unscrupulous can exploit American ignorance to create scapegoats, much like the superstitious Europeans did with witches during the Little Ice Age, to create baseless correlations. Using false flags, manipulators could then establish an erroneous narrative, like "they hate us because we're free," instead of exploring more unpalatable propositions like "foreigners hate the United States because Americans are using their oil and destroying the planet in the process."

Once established as "facts," false beliefs could be used to justify ineffective policies, like the Mayan practices of human sacrifices to appease the rain gods, regardless of how detrimental these policies might be for the general population. Viewed from these perspectives, the Global War on Terrorism can be seen as a political decision to frame reasoned opposition against American actions overseas as a false threat to "freedom" in order to continue economic practices that rely on fossil fuels to the detriment of the environment and human race.

Seeds of the Conflict

If we examine Osama bin Laden's motives, his objections dealt primarily with the United States pursuit of national economic prosperity at the expense of other people's freedom and survival.[126], Osama bin Laden quotes revolutionaries like Thomas Paine in the translations of the various "Letters" to the American people and talks about the need to have transparent, universal laws that are just and equitable for all the peoples of the planet, whether they are Americans or not.[127,128] Bin Laden's own argument was that he attacked the United States not because it was "free," but because the United States was denying the America's promised Four Freedom's to the rest of the post-Cold War world.

But bin Laden's issues with America were result of the United States reliance on cheap imported foreign oil from the Middle East. Had the United States achieved energy independence, as had once been attempted in 1973 after the OPEC oil embargo, Americans would never have needed to repeatedly use military force in the Middle East. And living within its domestic energy supplies, the United States could have avoided becoming a global energy hegemon.

The greatest problem of holding on to erroneous beliefs like "they hate us because we're free" is that it retards the ability of the United States to create a "more perfect Union…and secure the Blessings of Liberty to ourselves and our Posterity" within continually changing climactic and environmental conditions.[129]

Section 4 Global War on Terrorism

Cost of the Global War on Terrorism

2500 years ago (500 BCE), a Chinese military strategist wrote in the Art of War:[130]

> "There is no instance of a country having benefited from prolonged warfare." "Poverty of the State exchequer causes an army to be maintained by contributions from a distance. Contributing to maintain an army at a distance causes the people to be impoverished… With this loss of substance and exhaustion of strength, the homes of the people will be stripped bare, and three-tenths of their income will be dissipated while government expenses for broken chariots, worn-out horses, breast-plates and helmets, bows and arrows, spears and shields, protective mantles, draught-oxen and heavy wagons, will amount to four-tenths of its total revenue." "In war, then, let your great object be victory, not lengthy campaigns"

So how much did it all cost?

Intrinsic Costs

In responding to the 3,000 people killed in the 9/11 attacks, the United States Government conducted a global war where 6,882 American service members were killed and 52,485 were injured. [131] The mastermind of the attacks was killed, but the price for revenge was high.

The targeted killing/assassination of Osama bin Laden sets the slippery slope for similar attacks against United States leaders who institute policies that threaten other nation's security. But it also sets a precedent of one country being able to enter another country's airspace to kill a third country national.

If America's Global War on Terrorism rules of war become the accepted norm, Americans should not be upset when China sends a team of its special forces soldiers to the United States to kill an Uzbek dissident who is fomenting a Uyghur rebellion in Xinjiang without prior notification. As Unmanned Aerial Vehicles (UAV) are increasingly used for this purpose, Americans should not be surprised when other countries use drone launched missiles to eliminate foreign undesirables hiding in American backyards. While this threat may still be years away, the more immediate blowback from the way the United States prosecuted the Global War on Terrorism is how American soldiers will be treated after being captured.

Having redefined torture as only those actions that cause organ failure, impairment of bodily functions or death, the United States has created a new threshold of pain for American military service members to be ready to endure.[132] If other countries accept the new American standards that waterboarding, sexual abuse, and sleep deprivation are legal and effective, they may openly use them on American prisoners.[133,134] Countries may argue that they only use rectal feeding and rectal rehydration practices on American soldiers because the United States Government has approved them as valid medical procedures.[135,136] More worrisome than breaking the traditional laws of armed combat was the number of innocent civilians killed as "collateral damage" or unintended casualties in the Global War on Terrorism.

Army of Aggrieved

Unclassified estimates of Al Qaeda operatives and supporters ranged from 3,000 to 100,000 at the beginning of the Global War on Terrorism. [137] The estimates of foreign civilian casualties range from 100,000 to 4 million. This wide range of casualties depends upon whether the numbers are derived from corpses brought to the national morgues and officially recorded or

estimated civilian deaths associated with starvation and diseases caused by social welfare programs and public infrastructure being destroyed by the fighting.[138,139,140] Using these figures, the collateral damage ratio of civilians to terrorists killed was between 1:1 and 1,300:1.[141]

With an average family size of 6 people in Afghanistan and Iraq, 600,000 to 24 million people have a family member who was killed unjustly by the United States.[142,143] As the median age in Afghanistan and Iraq is 18.6 and 19.9 years of age respectively, the United States has created an army of individuals with personal grievances against America who will remain a threat for the next 50 years. Utilizing America's "Global War on Terrorism" approach in future operations will continue to multiply the number of enemies with lifelong grievances against the United States.

Overseas Costs

Despite the best intentions of operations Enduring Freedom, Iraqi Freedom, New Dawn, Inherent Resolve, and Freedom's Sentinel, life for the average Afghan or Iraqi has become less stable. Without the unifying power of Saddam Hussein, Iraq fractured along religious and ethnic lines into Sunni, Shiite and Kurd regions. By 2007, 2 million Iraqis had left the country becoming refugees while an estimated 1.9 million remain internally displaced.[144]

Iraq

In the rush to exploit Iraqi oil resources, 600 million cubic meters of gas are being flared off each year adding 387 kt of carbon into the atmosphere, more than the annual carbon footprints of Nauru, Kiribati, Republic of the Marshall Islands and Federated States of Micronesia combined.[145,146] From a climate change perspective, the Tigris and Euphrates, the rivers that gave birth to human civilization, have dropped 1.5 meters in height and are referred to as open sewers.[147] Pollution and salinization of the Shat al-Arab waterway had decreased the number date palms lining its banks from 62 million to 10 million

In 2015, Baghdad experienced one of the hottest summers on record with temperatures soaring above 49°C (120° F) for days on end. At the same time oil exports from Iraq to the United States were doubling, its capital was suffering power outages that shut off fans, refrigerators and air conditioners causing problems for grocery stores, hospitals and morgues.[148,149,150] The longer that post-invasion life remains worse than life under Saddam Hussein, the more confirmation Iraqis have that their suffering was deliberately planned by the United States. American reconstruction efforts were no better in Afghanistan.

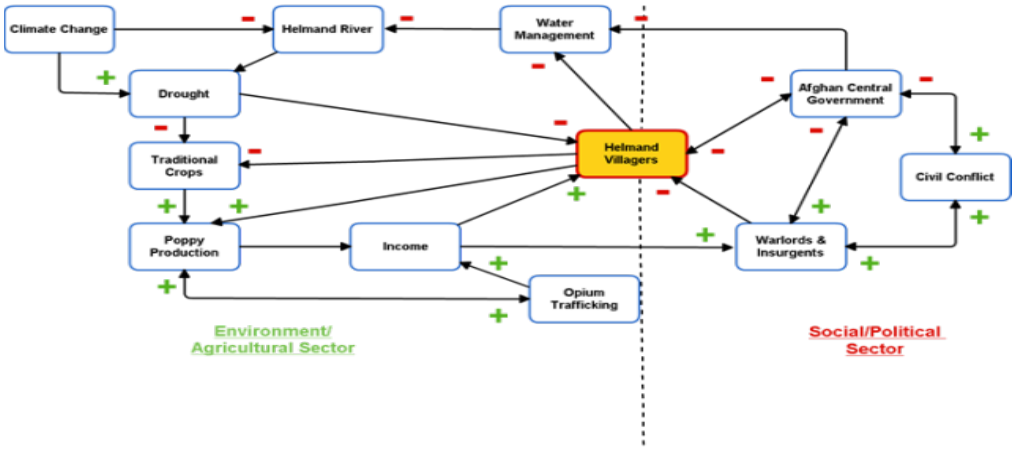
Afghanistan

Despite having once produced 60% of the dried fruits and nuts on the world market in the 1980's, Afghanistan is in shambles after more than 30 years of war.[151] The American "bear-trap" worked wonderfully against the Soviets, but at enormous expense to the Afghan people. Over 50% of their villages were bombed, 25% of the irrigation systems were destroyed and 70% of their livestock lost resulting in 30% of the farms being abandoned.[152] As the Soviets dropped over 10 million mines across Afghan farmlands, total food production dropped 55%.[153]

While the United States coalition attempted to do better in 2001, after 15 years of fighting, the proxy Government of Afghanistan only has control of 70% of the country. Out of a population of

30 million, 1.2 million Afghans remains internally displaced while another 3.7 million Afghans are refugees around the world.[154,155,156]More worrisome from an American perspective is the shift in crop cultivation from fruits and nuts to drugs.

Throughout the fighting, orchards that once provided some of the world's best pistachios, apricots, plums, mulberries, figs and walnuts were cut down for firewood, used for buildings or destroyed in firefights. In their place, Afghans grew whatever would feed their families. As the graphic below shows, the simplest crop was poppies.



While fruit and nut trees can require anywhere from 5 to 12 years to bear fruit, the entire growth cycle of planting and harvesting an opium crop can be accomplished in 120 days.[157,158] More importantly, poppy plants require little water, making them viable crops in the face of climate change driven drought.[159,160,161] And even though the opium gum is surrendered to the drug lords, poppy seeds can be used to make cooking oil, poppy plant stalks can be used for cooking fuel and poppy ash can make soap.[162] Unfortunately for Americans, the drugs also turn a profit.

While the Taliban had nearly eradicated Afghan poppy cultivation in 2001, under the United States led coalition poppy production soared to the point where Afghanistan now provides over 80% of the world's supply.[163] Over the course of the Global War on Terrorism, the rate of heroin overdose deaths in the United States quadrupled from 0.7/100,000 people in 2000 to 2.7/100,000 in 2013.[164] Unexpectedly, the war in Afghanistan is causing drug overdose deaths in America.[165,166,167,168]

Financial Costs

After the 9/11 attacks, the Congress voted to authorize the President to "use all necessary and appropriate force against those nations, organizations, or persons he determines planned, authorized, committed, or aided the terrorist attacks that occurred on September 11, 2001, or harbored such organizations or persons, in order to prevent any future acts of international terrorism against the United States by such nations, organizations, or persons."[169] When assessing the financial price tag of the Global War on Terrorism, there are at least two ways to calculate the total cost.

The most conservative estimate would be the supplemental budget provided to the military specifically for chasing terrorists between 2001 and 2016 or $1.6 trillion dollars.[170] But the military was only one of many assets used in pursuing the Global War on Terrorism. In addition to the Department of Defense, the 9/11 attacks justified the creation of the Department of Homeland Security and Transportation Security Administration, while greatly expanding the budgets of the various intelligence agencies and Department of Veterans Affairs.[171,172,173,174] Aggregating these organizations budgets, the total bill to fight worldwide terrorism from 2001 to 2016 could be as high as $11.5 trillion dollars.

Domestic Losses

This means that the American taxpayer paid anywhere between $290 million to $2 billion dollars-a-day for 15 years to protect themselves against the threat of Al Qaeda, the equivalent statistical risk of being crushed to death by your furniture or television.[175,176] And every tax dollar spent chasing terrorists overseas was a dollar not spent at home on education, public infrastructure or social welfare programs. Despite all the losses associated with investing in a war resulting from America's dependence on foreign oil, there were two clear winners. Osama bin Laden and the military industrial complex.

Osama bin Laden

From the perspective of Osama bin Laden, the planning and execution of the 9/11 attacks had cost only $500,000 while United States Global War on Terrorism had cost between $1.6 to 11.5 trillion dollars.[177] From an economic perspective, bin Laden could claim an attack to response cost expenditure ratio of between $1:3.2x10^6$ and $1:2.3x10^7$ dollars. Even if the calculations are off by a factor of 1,000, it would still mean for every dollar bin Laden spent, the United States spent at least $3,200 dollars in response. More significantly, the United States black torture sites, bombing of hospitals, and millions of innocent people injured and displaced by the fighting provided proof for bin Laden's supporters that America was anti-Muslim, violent and immoral.

Military Industrial Complex

The other group of people who prospered during the Global War on Terrorism were the companies that produced the weapons, equipment and machinery for the military. Reviewing a list of the top ten American companies that produced munitions, weapons and equipment for the United States military, their average stock value was $35 dollars in 2001 and rose to $129 dollars by 2016 for an average increase of 260%. Only one company, General Electric decreased in stock value, while the top performer, Lockheed Martin, increased their stock value over 600%.

Rank[178]	Company	Stock price (2001)	Stock price (2016)	Increase
1	Lockheed Martin	$33.50	$236.28	605.31%
2	Boeing	$46.50	$140.10	201.29%
3	Raytheon	$24.85	$132.97	435.89%
4	General Dynamics	$39.48	$149.81	279.45%
5	Northrop Grumman	$41.00	$225.23	449.34%
6	United Technologies	$34.20	$101.33	196.28%

7	L-3 Communications	$31.28	$134.59	330.27%
8	Honeywell	$35.70	$108.25	202.93%
9	Textron	$24.72	$39.08	58.09%
10	General Electric	$39.66	$29.84	-32.90%
MIC	**Military Industrial Complex**	**$35.09**	**$129.75**	**269.76%**
USA	**American hourly wage earner**[179]	**$14.60/hour**	**$21.72/hour**	**48.76%**

Ultimate Cost

But perhaps the greatest cost of the Global War on Terrorism was the United States loss of world trust and respect. In 2014, the same year that the Senate released its report of CIA torture practice, a poll of 65 countries found that 24% of those surveyed believed that the United States represented the greatest threat to world peace.[180,181] Pakistan, the second most threatening choice, received only 8% of the votes. Countries like China (6%), or Iran, North Korea and Israel (5% apiece) barely registered any concern in comparison.

This outcome was anticipated in 2004 when the Department of Defense reminded policy makers that:

> "the United States is engaged in a generational and global struggle about ideas, not a war between the West and Islam. It is more than a war against the tactic of terrorism. We must think in terms of global networks, both government and non-government. If we continue to concentrate primarily on states ("getting it right" in Iraq, managing the next state conflict better), we will fail."[182]

While Americans successfully killed Osama bin Laden and protected their access to oil in the Middle East, the United States paid an enormous cost in terms of its national reputation, the well-being of its people, and stability of the international system it benefits from. Most dangerous for the future are the implications of denying man-made climate change and relying on a fossil fueled economy that accelerates its impacts.

Section 5 Understanding Why

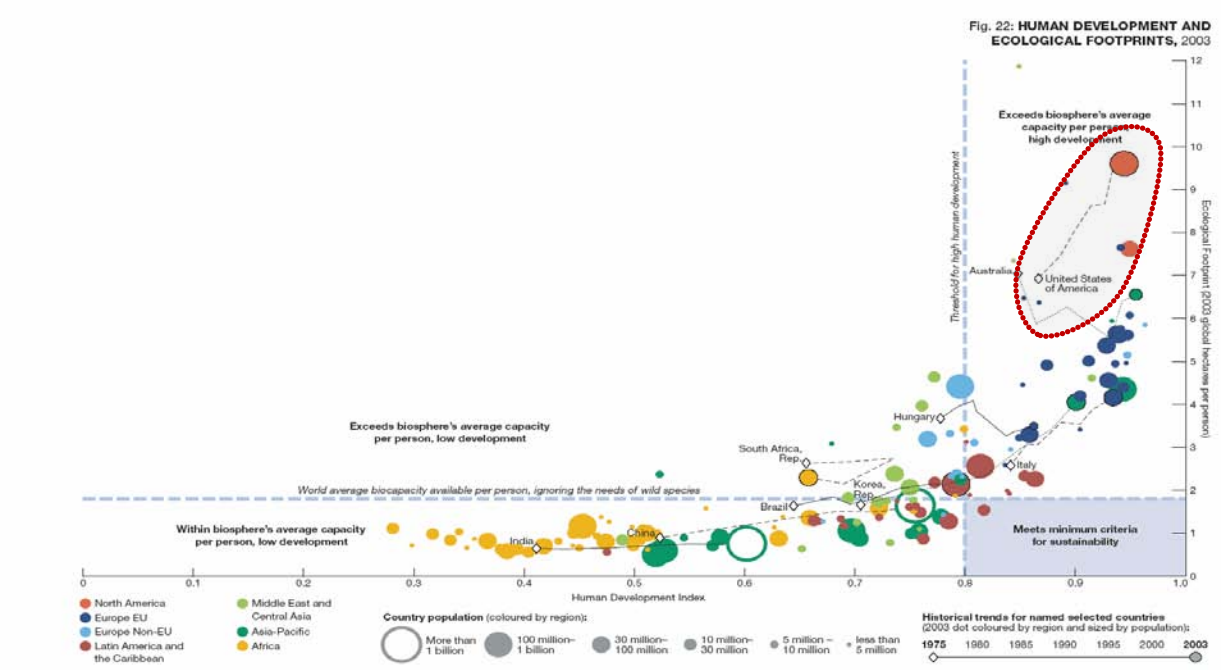
Why it matters

The world has been evolving for 4.5 billion years through continuous climate change. During this process, there have been 5 mass extinctions that coincided with high climate change rates and wiped out 80% of all the species alive at the time. This means that from the beginning of time, evolving conditions on earth have wiped out >99.96% of all species that have ever existed on the planet. Of the few species we know survived, most are micro-organisms like cyanobacteria, the blue green algae that started the entire cycle of life on Earth.

All indications are that human fossil fuel use is creating climate change conditions unseen in the 4 million years initiating a 6th mass extinction. Given what we know about past mass extinction events, it's unlikely that humans will survive as a species.[183] Thus, like a parasite sucking off the blood of its host, humans have a vested interest in protecting the regeneration capacity of Earth's ecosystem services.[184]

The Choice

As the United States moves past the Global War on Terrorism what path it will take? Will Americans return to the ideals of the Founding Fathers, the Four Freedoms and the belief that development assistance *is* security assistance or will they hunker down in the comforting delusion that "they hate us because we're free"? It's a rhetorical question because if the United States fails to evolve from its fossil fuel economy, Americans will either make the planet uninhabitable or be forced by the rest of the world to change.



If Americans continue their current lifestyle and people around the world attempt to follow the United States' example, it would make the planet unlivable for humans. The countries on the right of vertical dotted line represent "high development," according to the United Nations Human Development Index. Anything above the horizontal line on the World Wildlife Fund's graphic above exceeds the Earth's average ecosystem carrying capacity.[185] The target area is to be in the bottom right corner, high development, low impact.

At the top right in the dotted ellipse, near 9.7 global hectares per person is the United States. This means that it would take at least another 4 additional Earth's resources for everyone to achieve the American standards of living using an oil dependent economy. Put into more concrete terms, if we take the average American's per capita consumption and pollution and multiply it by the population of the world today, 2050 and 2100, we can see how much food, water, and energy humanity would need live the "American" way.

People *billions*	**Food@** *3,800kCal*	**Meat@** *250gm*	**Water@** *4,500 liters*	**Energy@** *300 MBTU*	**Waste@** *730kg*	**CO_2@** *20Mt*
7	$2.66x10^{13}$ kCal	$1.75x10^{6}$ Mt	$3.15x10^{13}$ l	$2.1x10^{18}$BTU	$5.1x10^{9}$ Mt	$1.4x10^{11}$Mt
9	$3.42x10^{13}$ kCal	$2.25x10^{6}$ Mt	$4.05x10^{13}$ l	$2.7x10^{18}$BTU	$6.5x10^{9}$ Mt	$1.8x10^{11}$Mt
11	$4.18x10^{13}$ kCal	$2.75x10^{6}$ Mt	$4.95x10^{13}$ l	$3.3x10^{18}$BTU	$8.0x10^{9}$ Mt	$2.2x10^{11}$Mt

Food

In 2050, it's expected that food production will need to increase by 70% to feed everyone on the planet if they received an average of 3,050 kCal per person per day.[186] But the Earth would need to produce 87% more food in 2050, if everyone tried to achieve a 3,800 kCal "American Way of Life" standard.[187] From a purely kCal perspective, it's theoretically possible to feed billions more people.[188]

But there's an enormous difference in the energy used to produce plants versus meat. In the American industrial agricultural system, a single fuel calorie of oil can grow 4 food calories of corn or 1:4 fuel-to-food ratio.[189] However it takes 57 fuel calories of oil to produce a single food calorie of lamb or 57:1 fuel-to-food ratio. This means it takes 228 times more fuel inputs to feed someone a calorie of lamb than a calorie of corn. When calculating how many people the planet can feed, the question becomes, "Will we all have to become vegetarians?"

Meat

The average American consumes 250 grams of meat a day. The world population in 2050 is expected to be 9 billion people. A 545kg steer yields a 350kg carcass, which when deboned yields 222 kg of beef.[190] If everyone in the world ate 250 grams of beef a day in 2050, it would require slaughtering and processing ~10 million head of cattle a day or 3.7 billion cattle a year.

As calves are raised for 14 to 16 months before consuming, it would require at least 4.6 billion cattle in continuous production. Each head of free range cattle requires 0.8 hectares of pasture which would require devoting 3.7 billion hectares of land (37 million km^2) or converting all of China, Canada, Brazil and the United States into cattle pasturelands.

American livestock production requires about 40 calories of fuel to produce 1 calorie of beef food calories and each gram of beef produces around 2.5 calories of energy.[191] This means each person consumes an average of 25,000 calories a day in fossil fuels when eating 250 grams of beef. Each barrel of oil contains about 1.4 billion calories of energy.[192] At those rates, 9 billion beefeaters would consume the equivalent of 5.8 million barrels of oil a day, roughly the same production as ExxonMobil in 2016 and push 900 million tons of carbon dioxide into the atmosphere annually.[193]

On top of that, cattle produce 8-20g of methane per kilogram of feed with beef cattle eating 11 kilograms of feed a day.[194] 3.7 billion flatulent cattle in constant preparation for slaughter would produce a minimum of 325,000 tons of methane a day, creating the carbon dioxide equivalent of 2.9 billion tons a year or 30% of the global output today.[195,196] Thus the land, fuel and methane outputs of a beef heavy diet would all work to accelerate climate change.

Water

Today, 1.8 billion people or 25% of the human population drinks water that has fecal contamination and over 2,000 children under five die every day due to diarrheal or other waterborne disease.[197,198,199] By 2050, the total freshwater need is anticipated to increase by 55% due to demands in manufacturing use, electrical generation and domestic use.[200] Using these estimates, 4.8 billion people will live in water stressed areas in 2050 and $63 trillion dollars or 45% of the global GDP will be at risk due to water stress.[201]

If 9 billion people were to use 4,500 liters of water a day like the average American does today, it would require a 4,300% increase in availability or the equivalent of emptying Lake Superior and Lake Huron every year.[202] And knowing half the world will be living in water stressed areas based on human population increases alone, the number of people dying of thirst and waterborne diseases under an American consumption model would reach pandemic proportions.

Energy

The annual global energy consumption today is 549 quadrillion British Thermal Units (BTU) for a global average of 78 million BTU per capita.[203] The current annual American usage is 300 million BTU per capita or 4 times the global average.

Shell anticipates world energy usage will increase to between 729 and 834 quadrillion BTU's by 2050, requiring a 33% to 52% increase in total energy production.[204] With global populations expected to reach 9 billion people by 2050, this reflects a 4-18% per capita increase of energy consumption from 78 million BTU's to between 81 and 92 million BTUs. If 9 billion people were to attempt the American Way of Life they would consume 2,700 quadrillion BTUs of energy, a 390% increase production worldwide.

Oil currently provides 36% of the United States energy needs. If the world were to use the same energy mix as Americans in 2050, it would equal 972 quadrillion BTU's or an annual global consumption of 170 billion barrels of oil.[205] This amount is equal to the total current reserves of the United Arab Emirates (98 bbl.), Nigeria (37 bbl.) and the United States (37 bbl.) combined and add 73 billion tons of carbon dioxide to the atmosphere.[206]
And if the rest of the world used their militaries to secure that oil as America does, it would add immensely to the carbon budget. Each of the United States 450,000 service members has an 82-ton carbon boot print in terms of jet fighter planes, tanks and huge ships to support military operations. If every country in the world provided their soldiers similar 82-ton carbon boot prints, the 9 million soldiers would generate 738 million tons of carbon a year, roughly the same amount of all aircraft flights around the world in 2016.[207]

Waste

In 2010, the humans created 1.3 billion tons of municipal solid waste (MSW).[208] The daily amount of waste per capita ranged from between extreme low end of 0.09 kg in Africa to extreme high end of 5.7 kg in the Middle East and North Africa. Here, the United States fell in the middle range of about 2kg of trash per American per day.

Current projections have world trash production increasing from 1.3 billion tons in 2012 to 2.2 billion tons in 2025.[209][210] If every person throws away 2kg of trash a day, when the population

reaches 9 billion people in 2050, it would amount to 6.5 billion tons of trash or a 400% increase over 2012 levels. As nearly 12% of all global methane production comes from landfills, if everyone threw away as much food as Americans do today, the methane created from rotting food would equal 3 billion tons of carbon or roughly the current carbon output of India and Japan combined.[211]

CO_2

In 2009, scientists projected that adding 1 trillion tons of carbon into the atmosphere by 2050 would raise the atmospheric temperature 2°C.[212] In 2015, the world produced about 35 billion tons of carbon.[213] While the world seems to be slowing its carbon emissions, some estimate that the world will reach 75% of its 1 trillion tons of carbon limit by 2030, resulting in as much as 3° C global warming by the end of the century.[214,215]

The current annual carbon footprint for the United States is 20 metric tons per capita. If everyone on Earth copied the American Way of Life, annual global emissions would jump from 35 billion to over 140 billion tons of carbon. This would result in 5.6 trillion tons of carbon by 2050 or 5 times the year 2100 limit, increasing mean global temperatures between 6.6°C to 11°C and making hot and humid areas like the Persian Gulf literally death traps.[216,217]

Section 6 Learning Lessons Taught

Preventing the next 9/11

Simply put, there's no way for all the humans on Earth to use fossil fuels to achieve the American Way of Life. And given that maintaining this lifestyle requires taking other people's share of the planet's resources and accelerating climate change in a way that causes droughts, floods, and famines, those suffering from America's excesses will eventually, like Osama bin Laden, fight back. The difference is that next time the United States attackers will have a broader network of support.

The narrative of the American as the good guy, always going the extra mile to do the right thing, is being replaced by someone who doesn't believe the evidence of climate change around them, believes that "they hate us because we're free" and can't find the country they are fighting in on the map. As one Al Qaeda fighter explained to his CIA interrogator:[218]

> All these movies that America makes — like Independence Day, the Hunger Games, and Star Wars — they're all about a small scrappy band of rebels who will do anything in their power with the limited resources available to them to expel an outside, technological advanced invader. And what you don't realize is that to us, to the rest of the world, you are the empire, and we are Luke and Han. You are the aliens and we are Will Smith.

Material support for an attack on the United States will likely come from some of the 60 million Afghans and Iraqis who suffered directly as the hands of an American occupation that brought neither peace, stability nor prosperity, if only in the form of shipping more heroin and opium to the United States. There will be vocal support from the survivors of Somali famines and the genocide in Rwanda who waited for help from the United States that never came.[219,220]

Emotional support will come from rioters of the Arab Spring and the 200 million people in North Africa and the Middle East who experienced firsthand how their governments used the Global War on Terrorism to suppress their civil liberties and free speech.[221] There will even be intellectual support from the 480 million people living in countries as diverse as Greece, Hong Kong, Iceland Ireland, Italy, Japan, Latvia, New Zealand, Singapore, Spain, Sweden, Turkey, Switzerland, Taiwan, Ukraine, and the United Kingdom, who lost their jobs, homes or retirement pensions through the rapid deflation of the United States' housing bubble that eliminated >$10 trillion dollars of their global wealth.[222,223,224,225]

And all these people, having experienced firsthand, how the American Way of Life has destroyed their Four Freedoms, their Life, Liberty and pursuit of Happiness outside the United States and will have little sympathy for any American casualties within it. And a more uncomfortable truth is that the United States military will be ineffectual in stopping them.

The inability to stop the next 9/11 will have nothing to do with competence or skill. After 16 years of continual warfare, the United States has more real world fighting experience than any other Western nation. Inability to stop the terrorists will have nothing to equipment or technology, as there is no other country on the planet with more sophisticated weapons than the United States. Rather the inability to stop the attack will be from a lack of patriots willing to die to stop the attacks and a bankrupt system that cannot pay mercenaries enough to defend it.

Broken Trust

The Global War on Terrorism was sold to the American people based upon the belief that the attackers were opposed to the highest ideals of the United States like truth, justice, democracy, and individual freedom. Not knowing exactly where they were headed or who precisely they were fighting, Americans boarded planes trusting in their government's plan and purpose. After fighting a faceless enemy for fifteen years, they return knowing their efforts leave the world worse off than when they started.

Not only are Afghanistan and Iraq far from the strong self-sufficient democratic countries the American invasion was supposed to turn them into, but the countries have become breeding grounds for insurgents who have increased conflicts in Libya, Syria, Kashmir, Kurdistan, Yemen, Lebanon, Northwest Pakistan, Palestine and Egypt.[226] And after deploying overseas, the average soldier can begin to see the world from America's opponents' perspective and start to understand their grievances. And having lost their own friends, innocence, or limbs to armed conflict, many veterans now look differently at their countrymen as well as the costs of maintaining the American Way of Life.[227]

Many of the Americans who answered the call to arms after 9/11, now believe nothing they hear and only half of what they see. [228] After leaving America with great fanfare and receiving a generous salary while overseas, veterans return to a tight job market where 75% of Americans believe the American Dream is suffering and 64% think the government was on the "wrong track" in 2015.[229,230] The downward spiral indicated by the widening political gulf between Democrats and Republicans, the racially charged "Black Lives Matter" demonstrations over police brutality, ongoing homelessness, and increasing number of deaths from drug overdoses as Americans turn to drugs like heroin just to make it through the day.[231,232,233]

This cohort of veterans will be harder to convince that any fight will be easy or that the enemy doesn't have at least a few grievances that are real. These veterans, as fathers and mothers, brothers and sisters, or uncles and aunts, will share their battlefield experiences and hard won wisdom with the youth of America, making enlistment more difficult for the next generation of military recruiters. The Department of Defense recognizes this and is rebranding military service as the "Force of the Future," where "whatever you want to do can be done in the service of your country."[234]

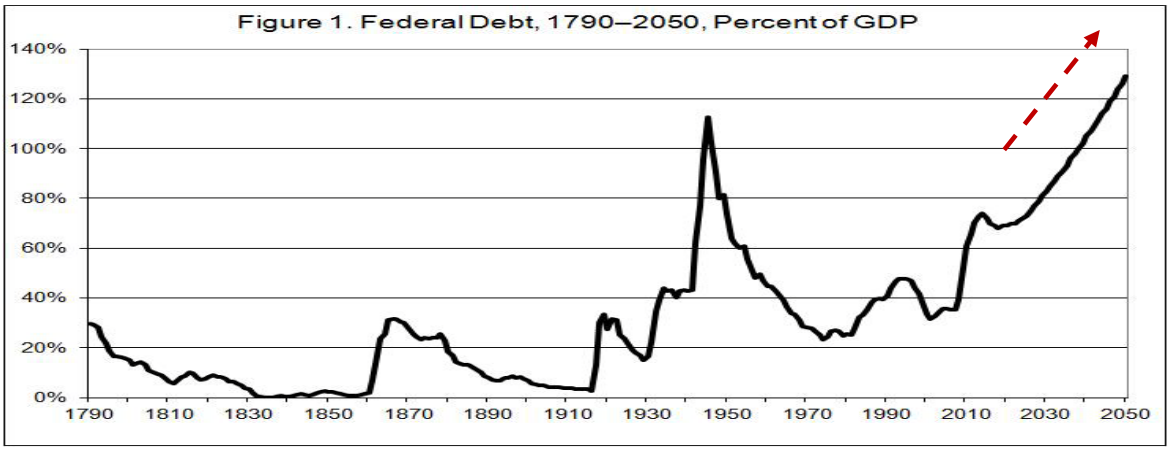
This outreach strategy equates military service to a successful business career presenting the President as the CEO and Congress as the military's Board of Directors.[235] However it ignores the principal difference that legal businesses rarely require you to kill your competition or die for the company's profit margins. And what politicians who used American patriotism to hide the economic motive of securing oil in the Middle East failed to remember, is that while people are willing to the kill for money, but they will only die for ideals. And there is no money left.[236]

Simply Broke

The United States was born into debt, taking on millions of dollars through dummy corporations from France to pay for the American Revolutionary War.[237] The federal debt dropped to 0% until the American Civil War when it rose to 30%. The war debt was almost completely paid off until World War I. After World War I, the debt dropped until federal expansion through the New Deal and programs like Civilian Conservation Corps raised the national debt over 40% of GDP.

The United States debt climbed to its highest levels during World War II and the creation of the military industrial complex. After World War II, debt to GDP percentages headed towards pre-Civil War levels of less than 30%. But after the 1970's oil crisis and the Reagan Administration in 1980's the federal debt rose to 40% of GDP. After the Cold War, national debt once again headed to below 30% of the GDP when the United States responded with the Global War on Terrorism to Osama bin Laden's 9/11 attacks.

The graph below shows the amount of federal debt as a percentage of GDP, which reflects a correlation with America's wars.[238,239] Please remember the dotted red line below.



The invasion of Afghanistan started 7 October 2001 and was completed 9 December two months later. The invasion of Iraq started 20 March 2003 and Baghdad fell 1 May. The total amount of time required for the United State to defeat both countries was just over 100 days. In 2003, America's national debt was still under 40% of the GDP.

But with the United States housing market crash, Hurricane Katrina, Super Storm Sandy and the ongoing Global War on Terrorism, the United States national debt climbed from $5.8 trillion in 2001 to $14.8 trillion dollars in 2011. When the United States Government showed little ability to break the Congressional deadlock over the national budget, Standard and Poor's (S&P) downgraded America's credit rating from AAA to AA+ for the first time in history.[240,241]

Creative Accounting

In 2013, the final report of the Special Inspector General for Iraq Reconstruction (SIGIR) noted $7.3 billion or 15% of Iraq reconstruction projects was unaccounted for and of the $42 billion dollars' worth of projects that were properly documented, there were buildings that went used, infrastructure that failed and overcharging for parts and labor by over 1000%.[242,243] The 2015 Special Inspector General for Afghanistan Reconstruction (SIGAR) report noted that the Department of Defense only had receipts for $21 billion of the $61 billion obligated for reconstruction, meaning 73% of the funds had gone missing.[244,245,246]

In July 2016, the Inspector General of the Department of Defense released an audit of the Department of the Army noting that "the Defense Finance and Accounting Service Indianapolis (DFAS Indianapolis) did not adequately support $2.8 trillion in third quarter journal voucher (JV) adjustments and $6.5 trillion in yearend JV adjustments made to AGF data during FY 2015 financial statement compilation."[247,248] In short, the Department of the Army, an organization with an annual budget of $147 billion dollars, could not account for budget outlays equaling $6.5 trillion dollars or 38% of the United States GDP.[249] The dotted red line above reflects this amount.

Of course, just because $7.3 billion dollars for Iraq's reconstruction, $45 billion dollars for Afghanistan's reconstruction and $6.5 trillion dollars on the Army's balance sheets cannot be accounted for does not necessarily mean that it was all stolen and wasted, nor that every error is the result of greed, stupidity or incompetence. But it does support Standard and Poor's

assessment that the United States Government no longer has an “extremely strong” capacity to meet its financial commitments. Further proof was provided when the United States Social Security and Medicare Board of Trustees announced that the Medicare fund would be insolvent in 2028 and that Social Security would follow suit by 2034.[250] Today, the estimated national debt is over $19 trillion dollars and projected to exceed 100% of the United States GDP in 2016.[251]

Between January and June of 2016, central banks of foreign nations around the world dumped $192 billion dollars in United States Treasury bonds, normally thought of as some of the safest financial holdings in the world.[252,253,254,255] The selloff is happening at twice the rate as the same time period in 2015 and the highest rate since 1978. China, the United States largest foreign debt holder, sold over $140 billion in United States debt between 2013 and October 2016.[256]

A recent Chinese cartoon showed Uncle Sam heavily weighted down with debt “zhai” (债) reassuring China by saying, “Relax, little brother…I can’t run away.”[257]

Climate Change Sinks In

While individual foreign investors are buying the American debt that foreign government banks have dumped, there are other problems in the making. Of the 74 million American homeowners, more than half are still paying off their mortgage. Of those mortgage holders, 20% are “underwater” meaning that the loan is worth more than the value of the house itself.[258]

While this is generally considered an individual owner problem, the real estate company Zillow estimated that under a 6-foot sea level rise, 300 cities would lose 50% of their houses and 36 cities would be completely submerged putting $800 billion dollars of homeowner equity at risk.[259] This means that even if the physical buildings were not literally submerged, the entire coastal housing market in places like New York City, New Orleans, Miami, San Francisco will be financially underwater recreating the 2008 housing market crash in very slow motion.

After 24 years of ignoring the climate change realities that the rest of the world have been dealing with, the Obama Administration issued Executive Order 13653 designed to prepare the United States for the impacts of climate change.[260] In response, the Government Accounting Office (GAO) began looking at the impending impacts of climate change on military installations and found that the United States military had a “global real-estate portfolio that

includes over 555,000 facilities and 28 million acres of land with a replacement value of close to $850 billion" spread out over 7,591 locations around the world.[261] All of these bases and installations were potentially vulnerable to flooding, drought and sea level rise associated with climate change.

As assessments began to be conducted, military bases like Hampton Roads Naval Station found that the costs of rehabilitation could reach $500 million dollars.[262] Even if each of the 7,591 military installations had climate change costs only 1% of Hampton Roads ($5 million dollars apiece) the total Department of Defense bill would exceed $37 trillion dollars or roughly twice the United States GDP.

The Obvious Choice

Given these factors, the United States is faced with the choice of taking care of the forecasted climate change impacts on individual American homes, businesses and public infrastructure or continuing to utilize its fossil fueled climate change accelerating military to secure foreign oil under the guise of "fighting terrorism." The quantitative decision becomes clearer when factors like military retirement, 50% of base pay for life after 20 years of service, are included.

The current military retirement scheme has financial obligations of $1.3 trillion dollars, of which only $385 billion are funded.[263,264] With all the additional retirees from the Global War on Terrorism, the total cost of military retirement is scheduled to increase to $2.8 trillion dollars by 2034.[265] Add to this equation the average of $2 million dollars necessary to care for each injured American service member over the course of their lifetime and the military's budgetary choices will be to become extremely risk averse during military operations, reduce each injured veteran's coverage or incur more debt.[266] These challenges were identified 60 years ago by President Eisenhower, when the United States first began importing cheap foreign oil and wrestled with the future of the military industrial complex.[267]

Soviet Collapse

Speaking directly to the Soviet generals he fought alongside in World War II, Eisenhower noted that only 8-years prior, Americans and Russians had met as allies and friends, joined with the common goal of guarding "vigilantly against the domination ever again of any part of the world by a single, unbridled aggressive power." Eisenhower believed that a nation's security and well-being could never be achieved in isolation over the long term but only in "effective cooperation with fellow nations." He said, "A nation's hope of lasting peace cannot be firmly based upon any race in armaments but rather upon just relations and honest understanding with all other nations."

As a German-American responsible for the demilitarization of Germany and reconstruction of Europe, Eisenhower had seen the outcomes of both the vengeful Morgenthau Plan, designed to eliminate all German industrial capability, and the restorative Marshall Plan, designed to ensure the prosperity of Europe through the peaceful integration of German industrial genius.[268,269] Based on these experiences, Eisenhower believed the only way to "allow all nations to devote their energies and resources to the great and good tasks of healing the war's wounds, of clothing and feeding and housing the needy, of perfecting a just political life, of enjoying the fruits of

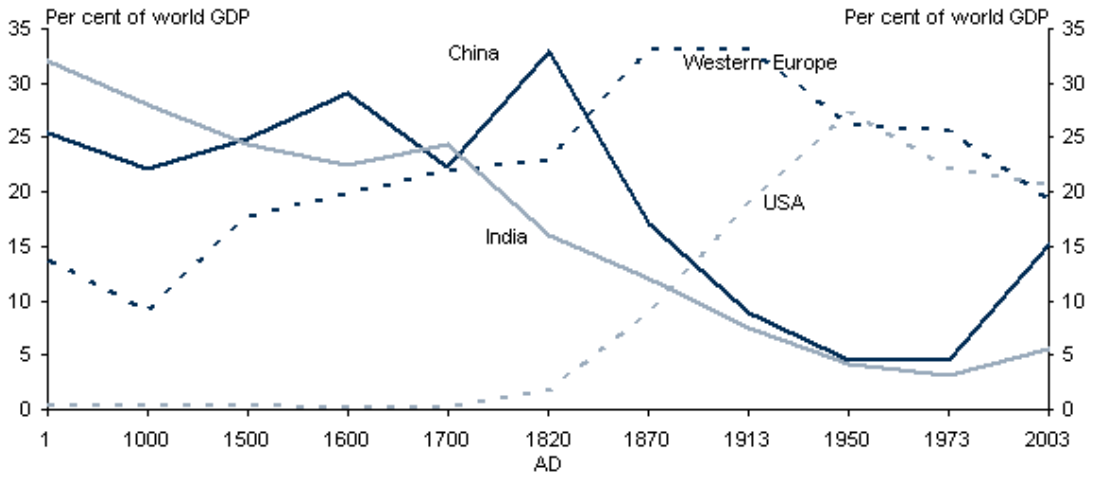
their own free toil" was to control and reduce armaments. He warned his former comrades-in-arms against turning down the dreaded path of maintaining huge armies, subversion of other governments, and rule of neighbor nations, where the ultimate goals were power superiority at all costs and a security bought by denying it to all others.

Unfortunately, the Soviet Union attempted to follow a dual track of increasing its war machine at the same time as attempting to raise the quality of life of its citizens. After a decade-long war in Afghanistan, the Soviet economy collapsed.[270,271] The question for Americans after a decade and a half of war around the world is, "What path should the United States take?

Section 7 Pivot to the Pacific

The Pivot to the Pacific

In 2011, the United States announced that it would begin a "pivot to the Pacific," and shift assets from the centuries old Eurocentric partnerships, as represented by the Organization of Economic Cooperation and Development and Middle East to prioritize relationships with the countries of the Asia-Pacific region.[272,273,274] Economic studies show that China's GDP overtook the United States in terms of purchasing power parity in 2014 and will outstrip the United States in absolute terms by 2030, the same year that Indonesia, Philippines, Malaysia and Thailand will boast trillion dollar economies.[275,276,277] By 2050, India is projected to overtake the United States in terms of purchasing power, at which time intra-regional Asian trade will exceed Asia's trade with rest of the world.[278,279] This means that by 2050, the greater Asia Pacific region should have enough trade internally to achieve the global levels maintained between year 1 and 1700.[280]



The graph above shows both India and China were able to maximize productivity and political stability within an agricultural based economy until the 1700's. With the beginning of the Industrial Revolution, Asia's ability to compete against the mechanized fossil fuel dependent Western economies diminished reaching a low point just after World War II. As both countries industrialized, their economies have begun to rebound to pre-Industrial Revolution levels.

This will have enormous implications for the United States military and its ability to deploy forces or use violence to resolve economic and political difficulties in the region. Not only are

China and India both nuclear powers, which means they cannot be attacked with impunity, but both countries have a potential military manpower base at least 4 times larger than the United States.[281] With a rough parity in military capability when operating near their homelands, any return to the days of East India Trading Company or Opium Wars, when Western nations could dictate terms unopposed, is unlikely. While the United States retain an undisputed advantage in projecting military power to support wars in the Middle East, the Asian countries can afford to buy the resources they need rather than resorting to military coercion or debt.[282]

Indispensable China

Moreover, as global economy's primary producers of consumer goods, China and India cannot be attacked without causing disruptions in the existing supply chains.[283,284] China produces 49% of the world's pork, 60% of the cement, 63% of the world's shoes, 70% of the world's cell phones, 80% of the world's air conditioners and 90% of the world's computers.[285] Any military attack that disrupts the sea lanes of communication would have immediate impacts on the supply of consumer products from China to the United States and the rest of the world.

As China and India overtake the United States as the world's largest economies, their ability to be swayed by the United States economically will be diminished, leaving only diplomatic goodwill, mutually beneficial partnerships and military coercion as options. And as expanding middle class economies throughout the Asia Pacific becomes a self-sustaining engine for the region's growth, countries that supply raw materials and fuel will be given the choice of trading with China, India and the rising economies of the Asia-Pacific region or the United States and the European based OECD, their old colonial oppressors.

Africa provides one example of this future challenge. Africa has an abundance of rare earth metals like niobium, tantalum, zirconium and coltan that are critical to the production of modern electronics including renewable energy technologies.[286] By 2100, the population of Africa is forecast to reach 5 billion people and constitute nearly 50% of the world's population. This means whoever builds a solid relationship with the people of Africa will not only have access to the resources necessary for an Information Age economy, but 5 billion consumers for future products.

China claims a long diplomatic relationship with Africa, starting with the Zheng He's treasure ships which visited the continent in the 1400's.[287] China had little direct engagements with African nations during the Cold War, but with increased growth economic growth on both sides Chinese banks now provide more loans to the continent than the World Bank itself.[288] As a gesture of goodwill, China recently built the $200 million headquarters of the African Union in Addis Ababa, Ethiopia for free.[289] And unlike the United States, China believes in mitigating the impacts of global warming.

Working through the United Nations Environmental Program (UNEP) China's Ministry of Science and Technology (MOST) has developed a South-to-South collaboration between 17 Chinese institutes and 16 African countries and organizations to address the climate change driven environmental challenges through technology transfers, demonstration projects and capacity building.[290,291,292] The programs specifically focus on the human survival needs of potable water, improved sanitation facilities and wastewater treatment as well as sustainable

agriculture and combating desertification through watershed management and rainwater harvesting. With these factors in mind, it's not surprising that China is now Sub-Saharan Africa's largest trading partner.[293,294]

Should this be any different? Should the African nations choose instead to deal with Europeans or the United States when they have a choice? And how will America's disregard for African famines and civil wars in places like Somalia and Rwanda be remembered when business deals are on the table?

The United States also has long history with Africa, starting with the importation of African slaves in the early 1600's. Racial discrimination against blacks was legal in the United States Constitution until 1860's and the Emancipation Proclamation.[295] Functional racial discrimination persisted for another 100 years until the Civil Rights Act of 1964. The fact that the United States developed its military strategy for the African nations within the European Command (EUCOM) for 55 years, provides a clear reflection of the continent's importance to Americans, making the Chinese donation of the African Union headquarters even starker. Even now, Africans with internet access can watch the ongoing battles of African-Americans to make "Black Lives Matter" with local American police.

Location or Mindset

The question as the United States transitions into the 21st century is whether to consider the "pivot to the Pacific" a geographic direction or a spiritual transformation.

Will the pivot to the Pacific mean more energy and resources will be devoted to recreating the Cold War in Asia and a fossil fuels competition to justify the military industrial complex? In doing so will the United States use its military to secure oil resources around the world, increasing conflict and accelerating climate change? Finally, will the resulting political and social instability driven by climate change shortages in food, water, and energy be portrayed as terrorism against the "free"? The world hopes the American people will answer, "No" to all these questions. And in this case, so do members of the American intelligence community.

Alternative Worlds

In 2012, the National Intelligence Council (NIC) began looking at the changes since the end of the Cold War and mapping possible global trajectories over the next 15 to 20 years.[296] The results were published in a report called Alternative Worlds, that identified four key megatrends: individual empowerment, diffusion of power, demographic shifts, and the food, water, energy nexus that would transform the post-Cold War world. Together these factors seemed to indicate that the ability of nation states to utilize top down force would be less and less effective, transforming the concept of power from military power to mutually beneficial relationships.

The report developed four "Alternative Worlds" scenarios that the United States would have to operate in by the year 2030. The best of these was a Fusion world, where China and the United States worked together on a wide range of issues leading to mutually beneficial global cooperation and creating an economic rising tide that lifted all nations. The worst case scenario was called Stalled Engines, where the United States began to draw inwards creating an economic dog-eat-dog atmosphere that fractured the European Union, allowed nationalist parties to claim

positions of influence in government, and caused globalization to stall. The final two scenarios of Gini-Out-of-the-Bottle, where wealth inequalities become rampant, and Nonstate World, where non-state actors take the lead in setting global agendas, were variations on the Fusion and Stalled Engines extremes.

Fusion

In many ways, the Fusion world vision was the spiritual interpretation of a "Pivot to the Pacific." It envisioned looking towards Asia as a partner to work alongside towards a peaceful future rather than the next frontier to conquer or an opponent to face. Given the United States debt is exceeding the annual GDP and there is not enough taxpayer money to pay for military retirement benefits, let alone Medicare and Social Security, reducing armed conflicts around the world seems to be a financially sound choice.

Besides, there are lots of areas the United States and China could work together to solve the pressing challenges of the world. Reports indicate that climate change damage has already cost the global economy $1.2 trillion dollars in lost productivity and is killing 4.9 million humans annually.[297] An estimated $90 trillion dollars' worth of climate adaptive infrastructure will be needed by 2030 to both replace the aging infrastructure in the aging industrialized nations as well as build new water, sanitation, energy and communication networks for the developing world.[298] Not only would developing climate change and sea level rise mitigation measures help protect the $800 billion dollars of American homeowner equity threatened by sea level rise along America's coastlines, but a policy of cooperation with China would reduce the number of military bases needed overseas as a potential enemy was transformed into a steadfast friend.

Section 8 Renewed Cold War

Air Sea Battle – Anti-Access/Area Denial

But despite China being the United States biggest trading and holding more American debt than any other country in the world, Americans decided to announce an Air Sea Battle concept against China in 2011.[299]

Built from the Air Land Battle concept used against the Soviet Union during the Cold War, the Air Sea Battle focuses on ensuring that the United States and its allies can "project power and maintain freedom of action within the global commons."[300] The Air Sea Battle accomplishes this by ensuring the United States ability to overcome an enemy's Anti-Access (A2) and Area Denial (AD) operations. Anti-Access operations are defined as enemy efforts to slow or stop the deployment of American and allied forces to the battlefield, while Area Denial operations are enemy actions taken to hinder American and allied forces moving within a theater of combat.

The question that was first raised when the Air Sea Battle concept and A2AD capabilities were introduced was what country did the United States see as its potential enemy. While the Department of Defense initially denied that the Air Sea Battle plan and A2AD capabilities were designed with China in mind, the Center for Strategic and Budgetary Assessments, which was commissioned to prepare the study, named China 154 times in its 144-page report.[301],[302]

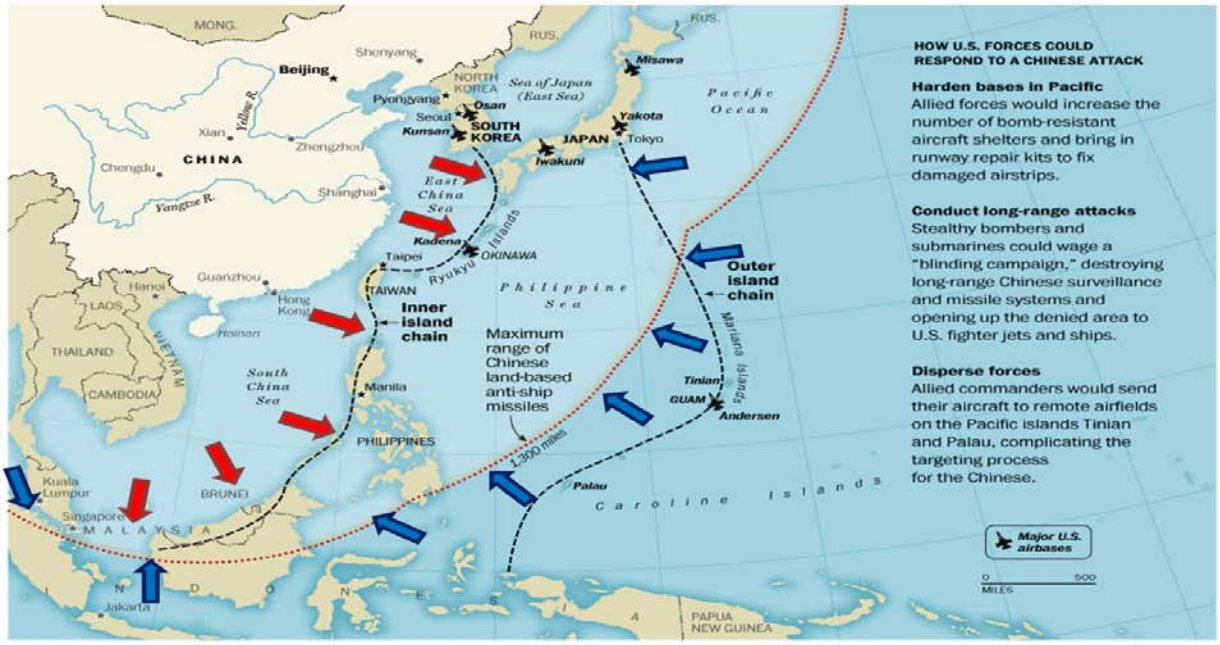
What remains unclear is what possible motive China would have for denying anyone access, American or otherwise, from reaching their ports. Not only does China produce 49% of the world's pork, 60% of the cement, 63% of the world's shoes, 70% of the world's cell phones, 80% of the world's air conditioners and 90% of the world's computers but it exports most of the $2.3 trillion dollars' worth of consumer goods on cargo ships.[303]

China is actively working to expand sea trade through the Panama Canal and is planning to dig a second canal in Central America through Nicaragua. [304] In order to shorten the 1,200 km journey around the Malay Peninsula, China is planning a canal through the Kra Isthmus saving cargo ships more than $100,000 on each journey.[305]

After much discussion, the name "Air Sea Battle" was dropped and the more innocuous name of "A2AD" used in its place. Recent discussions about the logic behind the A2AD concept suggests that the target is not in fact China, but rather the Congressional budget and justifying the need for an increased Air Force and Navy in the 21st century.[306] But regardless of who the A2AD concept is targeting or why it is receiving so much attention, the plan has major vulnerabilities when viewed from the perspective of climate change and sea level rise.

Imaginary Dots of Sand

The Air Sea Battle in Asia is built upon a forward defense of two islands chains. The inner islands chain is composed of South Korea, Japan, Okinawa, Taiwan, Philippines, Indonesia, Malaysia, Brunei and Thailand while the outer islands chain is delineated by the Commonwealth of the Northern Marianas Islands (CNMI), Guam and Palau.[307] Behind the outer islands chain are two oceans zones.



Not In My Backyard (NIMB)

The first liability of the A2AD concept is that it requires the inner islands chain and outer islands chain nations to invite the United States to use their countries as staging bases and battle grounds

against China. While the A2AD concept "term bandied about freely, with no precise definition, that sends a variety of vague or conflicting signals, depending on the context in which it is either transmitted or received," it focuses on getting to the area enclosed by the dotted red line on the map and then fighting within it.[308] Any country looking at the United States past accomplishments during the Global War on Terrorism is likely think twice before agreeing.

Roughly 13% of Iraq and Afghanistan's population (about 1 in 8) have become internally displaced or refugees as a result of the fighting. Both countries have become factionalized socially, culturally, and economically, breaking apart the central governments. Under the United States led occupation, violence, drug use and criminal activity have increased, as has the destruction public infrastructure and the environment.

Millions of refugees from Afghanistan and Iraq have fled to neighboring countries like Syria, Iran, and Pakistan, where they've found shelter, but added to those countries social welfare burdens and political instability. Hundreds of thousands of innocent sick, elderly, women and children are attempting to find asylum in the Europe and the United States only to be refused entry or forcibly sent back.[309,310] The Global War on Terrorism set the stage for the Arab Spring which sent political, social and economic shockwaves through more than a dozen countries that 200 million citizens are still recovering from. The breakdown in security throughout the region expanded opium production in geostrategic hotspots like Kashmir and alleged state sponsored terrorism between nuclear powers like India and Pakistan.[311,312,313,314]

And given that the United States itself hasn't clarified why it would need the A2AD strategy against China, America's largest trading partner and debtor in the first place, it's sensible for other countries to ask why they should be a part of it. Each country in the "inner islands chain" currently does more trade with China than the United States.[315,316]

Trade	**Indonesia**	**Japan**	**Malaysia**	**Philippines**	**S. Korea**	**Taiwan**	**Thailand**
China	***$53 B***	***$297 B***	***$69 B***	***$33 B***	***$231 B***	***$115 B***	***$67 B***
USA	$26 B	$195 B	$42 B	$16 B	$114 B	$87 B	$39 B

Even Brunei, which didn't make the billion-dollar trade level cut, conducts $790 million dollars' trade with China and only $370 million with the United States. This means that China does about $350 billion dollars more trade with the inner islands chain than America. And given that the United States is now considering leaving the Trans-Pacific Partnership, which would "promote economic growth; support the creation and retention of jobs; enhance innovation, productivity and competitiveness; raise living standards; reduce poverty in our countries; and promote transparency, good governance, and enhanced labor and environmental protections," the question is what business would America's warships have in the region at all?[317]

Sinking Cities

The real challenge facing Asia is not Chinese anti-ship missiles targeting cargo ships leaving or entering the East or South China Seas, but the inexorable sea level rise that threatens all the coastal cities of the region. 40% of the world lives within 100 km of the coastline and over half the population of the world lives in Asia.[318,319] Worldwide, 634 million people live at elevations of 10 meters or less and the International Organization of Migration (IOM) estimates that 200

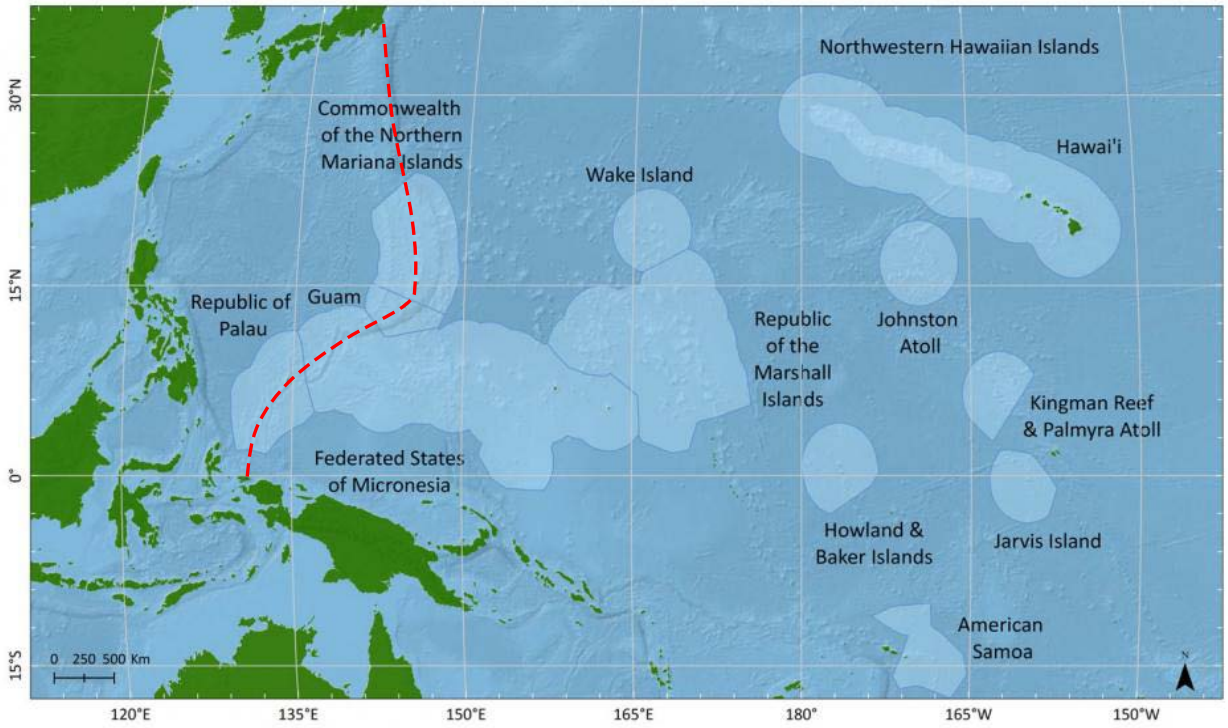
million people will be displaced by climate change impacts by 2050.[320,321] These realities have existential impacts for the major metropolitan areas in Asia now.

Tokyo, Osaka, Jakarta, Manila, Singapore, Seoul, Shanghai, Guangzhou, Hong Kong, Hanoi, Ho Chi Minh City, Karachi, Kolkata, Mumbai, Dhaka, and Bangkok are all being impacted by sea level rise today. The total population of these cities metropolitan areas equals 296 million people or roughly the same population of the United States. If only 1% were impacted by climate change, it would equal 3 million people or 1,000 times the number who were killed on 9/11. Chances are it will be many millions more.

The Asia Development Bank believes over 12 million people are already at risk from flooding associated with sea level rise in East Asia alone.[322] By 2020, countries with extensive coastlines like Philippines, Vietnam, Indonesia and Thailand need to spend $5 billion a year in climate adaptation measures. And most worrisome is what happens when Southeast Asia, which produces over 80% of the world's rice supply, finds its groundwater turning brackish with the anticipated 1-meter sea level rise.[323] These countries interest in ensuring the free passage of United States warships through the region will probably become secondary to ensuring its people are fed and infrastructure remains functional in the face of climate changes on the environment.

Interest in partnering with the United States is likely to wane even more if Americans continue to dismiss anthropogenic climate change as a Chinese hoax and rely on a fossil fuel economy that accelerates the climate change impacts of sea level rise, flooding and groundwater salinization.[324] Rather than offer up their countries as battlegrounds for the United States A2AD operational plan, these "inner islands chain" countries will likely increase trade and technology transfers with China, especially in the area renewable energy. Not only does China produce 80% of the compact fluorescent bulbs and 74% of all the solar cells in the world, but it is the world's largest investor in renewable energy technology accounting for $106 billion dollars in 2015 alone.[325]

Outer Islands Chain



Of course, the United States can continue to strategize over the A2AD complexities with the outer islands chain that stretches from Tokyo-Guam-Palau-Waigeo. But here too, the impacts of climate change will likely sink the American strategy of expeditionary advanced bases and continual forward presence. The reason is that the islands that make up the backfield of the United States A2AD plan are sinking because of climate change and will soon look beyond America for help.

The United States Affiliated Pacific Islands (USAPI) are made up of 6 nations and territories that include the three United States flag territories of American Samoa, Guam and the Commonwealth of Northern Mariana Islands (CNMI) and the three independent nations of the Republic of Palau, Republic of the Marshall Islands (RMI) and the Federated States of Micronesia (FSM). The dotted red line on the map above represents the "outer islands chain" of the A2AD strategy.[326]

Sunk Costs

While the three nations of Palau, Federated States of Micronesia (FSM) and the Republic of the Marshall Islands (RMI) gained independence in 1979, they have remained in a unique relationship with the United States called the Compact of Free Association (COFA) where the United States provides funds for the government to continue operating and provides for the defense of the nation. COFA inhabitants can travel to and from the United States without a visa and the individual states are required to allow COFA citizens access to their individual State education, medical and social services.

All the low lying Pacific islands have been identified as extremely vulnerable to the climate change impacts of sea level rise by the Intergovernmental Panel on Climate Change (IPCC) and have been singled out for special consideration. By the IPCC's Second Assessment Report in 1995, scientists forecast that 80% of the Majuro Atoll, the capital of the Marshall Islands would be submerged with 1-meter sea level rise.[327] This is disconcerting given the estimates of 0.75 to 1.9 meters by the 2100. [328] Using these estimates many, if not most, of the small Pacific islands will be submerged by the end of the century. This has a variety implications for the island nations, the United States and the region itself.

Shifting Sands

From the Pacific island nations perspective, they are in a race with time as recent research is showing an exponential rather than linear increase in sea level rise, meaning the Earth's oceans could increase several meters in a "time-scale of 50-150 years."[329] Because the United States political leadership remains ambivalent about the concept of anthropogenic climate change and the Department of Defense is mistaken in its definition of the phenomena, island leaders have had difficulty in convincing America to help them take the same climate change adaptation measures, as is being done in the Asian mega-cities like Tokyo, Jakarta, Manila, Shanghai, and Seoul. When United States funding ceases with the expiration of the Compact of Free Association (COFA) in 2023, the Federated States of Micronesia (FSM), Republic of Palau, and Republic of the Marshall Islands (RMI) will need to find other sources of funding. The obvious country to approach would be China.

Not only is China the largest investor in renewable energy and climate change research in the world, but it has shown an ability create islands, as has been done in the South China Seas. And the relationship wouldn't be one of charity, as Palau, FSM and RMI have a sea territory claim of over 5 million km^2 that could help feed the Chinese, who consume over 20 million tons of fish a year.[330,331] This alliance between the COFA nations and China would invalidate the entire A2AD strategy overnight.

Open Backfield

By having Chinese assets between the outer islands chain and Pacific Command (PACOM) headquarters, it would put push the engagement zone 4,000 km eastwards. Official relations with the Peoples Republic of China (PRC) would result in Palau and the Republic of the Marshall Islands abandoning official recognition of the Republic of China (ROC) or Taiwan, a long-standing goal of mainland China. Chinese merchants have already exploited this opportunity buying Marshallese passports to gain free access to the United States and setting up businesses in the Pacific islands to gain a larger voice within the local government.[332] Finally, strong relations with the COFA states could result additional votes in the United Nations for China or at least abstentions rather than support of the United States.

Besides the obvious benefits of engaging in climate change adaptation and mitigation programs with China, the Marshallese might want to end the long-suffering relationship they have with the United States. Despite United States responsibility to "promote the political, economic, social, and educational advancement" of the Marshallese at the end of World War II, one of the United States' first acts was to use the islands as a nuclear testing ground.[333] Between 1948 and 1968,

the United States detonated 67 nuclear devices in the Marshall Islands, completely vaporizing one island and exposing hundreds of people to radiation in 20 of the tests.[334,335]

Since 1968 there have been an ongoing series of legal battles dealing with the clean-up of the contaminated islands, reparations for the nuclear survivors and payments for use of the islands as American military facilities. The semi-colonial COFA status is reflected by the Marshall Islands being administered by the Department of Interior in the Office of Insular Affairs, instead of the Department of State, as any other country would. When disasters hit the COFA islands, the Marshall Islands receives assistance from both US Agency of International Development (USAID), designated for overseas responses, as well as Federal Emergency Management Agency (FEMA), responsible for domestic responses, which might seem beneficial at first, but in practice diminishes the personal sense of responsibility of both agency. This schizophrenia carries over to the status of COFA citizens who can serve in the United States military but are unable to receive Veterans Affairs (VA) benefits upon returning home.

Maritime Maginot Line

This creates the Kafkaesque scenario of a Pacific islander (whose home is being submerged by climate induced sea level rise) joining the military of the United States (the greatest contributor to man-made climate change) going to Iraq (the country with the fifth largest oil reserves in the world) to protect America's dependence upon fossil fuels (the number one contributor to man-made climate change). Upon returning home, the soldier is ineligible for medical care for injuries received in the line of duty because he is not an American citizen and cannot find a job because he has been disabled fighting. Meanwhile, his home island is being submerged by sea level rise while the United States denies that climate change is manmade.

What will it take to cause someone snap? Who knows. The Pacific island culture prioritizes community harmony and forgiveness. But it wouldn't cost much to ensure it never comes to that. There are probably fewer than 500 COFA veterans who would need health care. Even at an average cost of $1 million dollars over their remaining lifetime, it would only cost $500 million dollars to show our allies and the rest of the world how the United States takes care of its veterans. The question is how to get America to honor its commitments to COFA service members.

The alternative is to ignore the COFA nations grievances, dismiss the COFA veterans past sacrifices and continue questioning the climate change impacts the people are suffering today. But if the United States takes this approach, there will be consequences down the road. Not only will the American military find the inner islands chain countries more interested in protecting themselves against climate change impacts than ensuring the United States has freedom of movement in the East and South China Seas, but the outer islands chains will be less willing to host American troops deploying to the region and increasingly rely on China to help build climate adaptive infrastructure to protect their islands. In this way, climate change and the aftermath of the Global War on Terrorism will turn the A2AD strategy into a Maritime Maginot Line, an indefensible concept because climate change has reprioritized what constitutes national defense for the rest of the world.

Looking Back

The purpose of the research was to examine three different hypotheses.

1. Warfare is not a one-dimensional process but should be fought in many fronts, with environmental issues fully considered.
2. Climate impacts have caused political destabilization and the collapse of empires in the past and potentially will again in the future.
3. There are recognizable climate response indicators which can be acted upon to reduce the threats of conflict.

Fait Accompli Victory …and Defeat

Warfare is not a one-dimensional process but should be fought in many fronts, with environmental issues fully considered. Being successful on the battlefield has never been the end of wars, but the construction of a better political reality that provides more benefits to all the stakeholders. In the last stages of the Vietnam War, American and Vietnamese leaders met to negotiate the end of fighting.[336] "You know, you never beat us on the battlefield," the American remarked "That may be so," said his Vietnamese counterpart, "but it is also irrelevant."

In the Art of War, Sun Tzu comments that to fight and win all your battles is not supreme excellence but rather supreme excellence consists of breaking the enemy's resistance without fighting. From an evolutionary perspective, this means that the plants, animals or empires that survive are those already evolving for the climate change conditions of the future and those that disappear are unable to transition from the disappearing conditions of past. If Sun Tzu and evolution are correct, the fossil fuel economy made the United States great in the 20th century will make it a dinosaur in the 21st. It also means that no matter how many times Americans can beat their enemies on the battlefield, the United States will eventually collapse because its oil based economy is reliant on fossil fuels that will eventually run out.

The Sun Never Sets on the (Akkadian, Mayan, Mongol, British, American…) Empire

Climate impacts have caused political destabilization and the collapse of empires in the past and potentially will again in the future. Over thousands of years there have been endless numbers of governments that have resisted adapting to climate change and lost. As more cross-disciplinary studies between human history and the scientific geological record are reinterpreted, the stronger these correlations are becoming. The threats of collapse are increasing.

The national debt exceeding the GDP and the inability of the United States Government to pay for military retirement, Medicare or Social Security are issues of concern. The global perception that the United States is the greatest threat to world peace reflects the disconnect between American policies and the rest of the world. Perhaps most worrisome is the fact that 2/3rd of Americans think the government is on the wrong track and 3/4th believe the American Dream is suffering. The attacks that bring about the end of the United States could just as easily come from external opposition to American oil policies overseas as internal opposition from disenfranchised citizens who no longer feel their government represents their best interests.

Eppur si Muove

There are recognizable climate response indicators which can be acted upon to reduce the threats of conflict. The problem is that, much like Galileo's forced recantation of heliocentricity, questions of climate change have been enveloped in arguments of religion, economics, politics, and American exceptionalism. So long as economics or politics supersede scientific truth, the ability to adapt existential threats is retarded.

There are ample warning signs for the United States to consider. Shrinking of lakes and rising seas; changing planting seasons and shifting cultivation zones; and the increasing concentration levels of CO_2 in the atmosphere all point to massive environmental changes. Even more immediate is the ineffectiveness of the military to solve the climate driven challenges of droughts, famines, flooding, and mass migration.

Ironically, most of the technology and equipment used to detect and measure climate change was initially created by for warfare. If the United States were to focus on solving the scientifically verified climate change challenges facing billions of people around the world today using its technologies to maintain access to foreign oil, Americans could achieve the A2AD objectives without utilizing military force. And by transforming the military industrial complex into the human security network, Americans would once again be invited to foreign countries as honored guests instead of being infidel occupiers to be killed by suicide attacks if necessary.

DoD Directive 4715.21 Climate Change Adaptation and Resilience

Will this happen? Whatever America decides will be multi trillion-dollar answer. While the military may currently have an incomplete definition of climate change, the newly issued Department of Defense policy provides an opportunity for exactly this sort of initiative to succeed.

The military directs its service members to begin assessing and managing the risk associated with climate change and engage in deliberate preparation and coordinated planning with federal, State, local, tribal, private sector, and nonprofit entities engaged in improving climate preparedness and resilience. Furthermore, it directs the Army, Navy, Air Force and Marine Corps to nominate climate change concepts that could enhance Department of Defense mission effectiveness as well as integrate climate change adaptation and resiliency efforts into military education and training programs.[337] Working in this manner, the Department of Defense would not only protect the continuity of operations of its military bases and protect American cities against the impacts of climate change, but also our partners' economies, urban infrastructures, and eco-systems. So, what happens next?

Looking Forward

In 2016, the American people chose Donald Trump, the oldest presidential candidate ever to elected as President of the United States. A climate change skeptic and China antagonist, president-elect Trump immediately identified several senior military generals to serve in his Cabinet, signaling a continuation of status quo American policies. With fracking technologies promising to extend cheap oil until 2035, it's unlikely that any change will be made in the

coming Administration. What does this mean for the United States policy towards climate change?

In the near term, the United States Government will probably continue to reject the science of man-made climate change because admitting that fossil fuels accelerate climate change would make their continued use immoral. Thus, by denying the facts, Americans can continue its climate changing activities in good conscious. Unfortunately, given the results of the 20th Conference of Parties (COP) which pushed towards divesting from fossil fuels, America's approach is likely to further alienate the United States from the rest of the world. The near term result will be the United States diving deeper into the National Intelligence Council's Stalled Engines approach, rather than the Fusion alternative reality where the United States and China work together as one.

As Europe, Asia, Africa and other regions of the world recognize the impacts of climate change driven famines, floods, and droughts, they will eventually attempt to block the United States continued use of fossil fuels. If not by refusing to sell oil, as was done by OPEC in the 1970's, overseas opposition groups will attack the United States directly, as was done by Osama bin Laden in 2001. A future wildcard attack will be the expansion of cyberwarfare and ransom ware against industrial control systems where cyber-terrorist may attempt widespread attacks against America's fossil fuel industries as supposedly happened during the presidential elections. So long as the United States retain a death grip on a fossil fueled "American Way of Life" these attacks will continue to increase until America changes or is stopped.

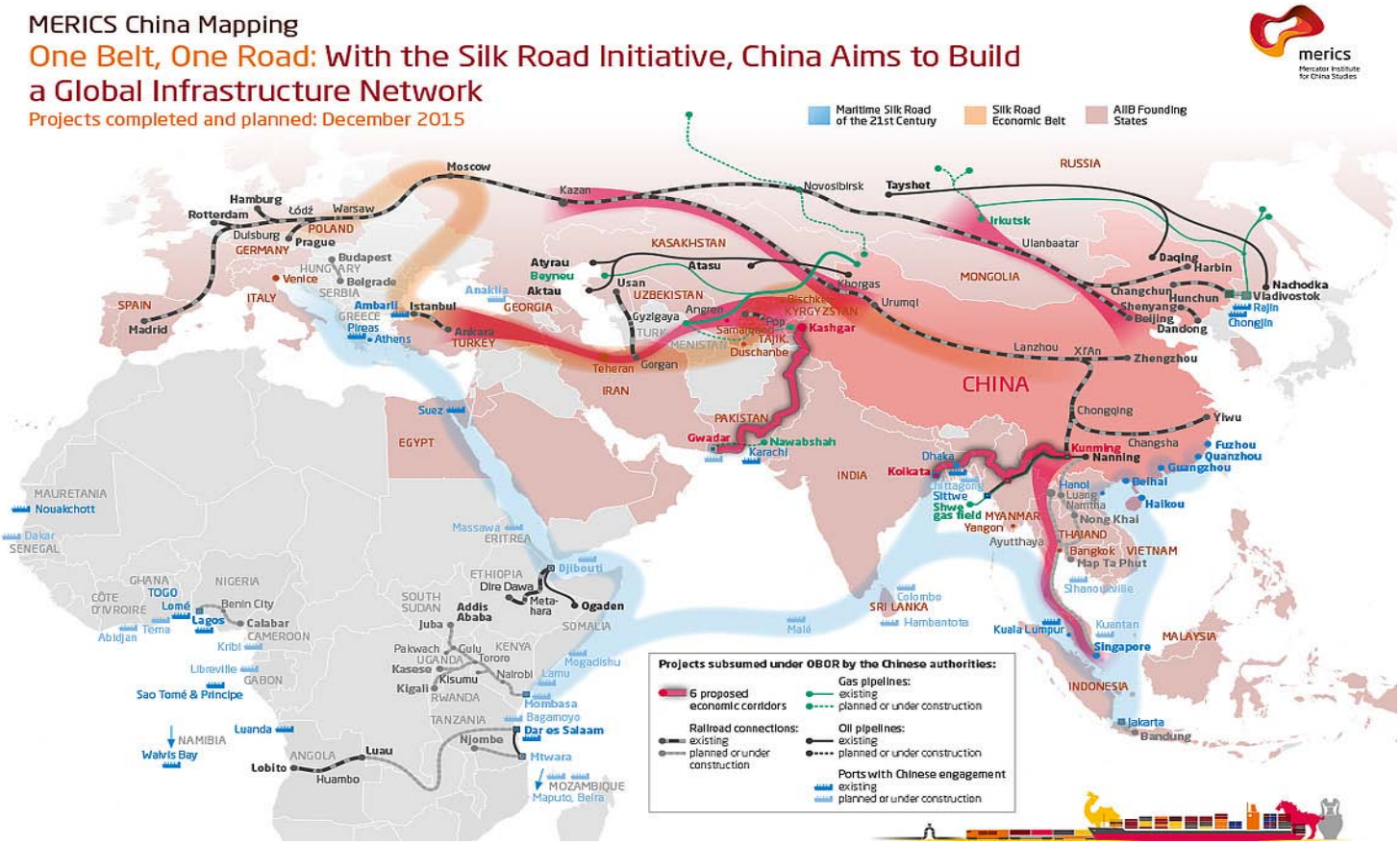
American Exceptionalism

This will force countries to make a choice between the United States, the powerhouse of the 20th century or China, the up and coming leader of the 21st century. And given that the United States has signaled that it will act in its own interests regardless of the impact on other nations, other nations may not have a choice in the matter. If the Trump Administration follows through on policies like exiting from the Trans-Pacific Partnership, former American allies may be forced into working with China by default. This will probably suit China just fine.

One Belt, One Road

In 2013, China announced a renewal of the old Silk Road through the One Belt-One Road (OBOR) project that represented a 60-plus nation trading bloc that includes over half the population of the world. Investing nearly $890 billion dollars in roughly 900 separate economic deals, China's program would not only increase trade between itself and Southeast Asia, but build a trading partnership with South Asia, Central Asia, East Africa, Europe and the Middle East.

Section 9 Closing the Circle



China's OBOR programs include a wide range of massive infrastructure programs including: a transcontinental railroad running from Zhengzhou, China to Hamburg, Germany, a $7 billion dollar shipping port at Bagamoyo, Tanzania, and a $46 billion dollar investment in Pakistan's energy and transportation infrastructure.[338] Current estimates make the OBOR project twelve times the size of the Marshall Plan in terms of development assistance and create six different transnational economic corridors centered around China to benefit a total of 4.4 billion people today.[339]

Recommendations

The Future of Climate Change and National Security

The greatest challenge to the United States is not from terrorist attacks on the homeland, a rising Chinese economy or even the immediate climate change impacts on buildings and infrastructure, but something much simpler. It's the ability to achieve the enduring principles of "Life, Liberty, and the pursuit of Happiness" using imported fossil fuels that degrade the carrying capacity of the planet. Given what we know about climate change impacts on past empire and species that failed to adapt, it is a certainty that as a nation, the United States will eventually evolve or go extinct.

With greater than 90% certainty, scientists see no future where a business as usual approach benefits humanity. This means that each day the United States maintains its climate change denial and fossil fuel energy policy, the more enemies it makes and the harder a transition to renewable energy will be when cheap foreign oil is no longer available. If Americans continue to subordinate climate change science to political influences, the unipolar world where the United States rules as the sole superpower could look much different by 2030 and certainly will by 2050.

Over the past 50 years, the United States has had at least three opportunities to be ready for a fossil free economy.

1. After the 1973 OPEC oil embargo, the United States could have accomplished Project Independence and become import free. Instead it chose to use military force to control access to oil in the Middle East.
2. In 1990, as scientific data was showing the impacts of fossil fuels on climate change acceleration, the United States could have invested heavily in developing renewable energy technologies, as the Chinese are doing today. Instead the United States relinquished a leadership role to other countries like Germany.
3. In 2000, the world came together to eradicate hunger, ignorance, and disease through the Millennium Development Goals, the United States said that overseas development assistance was ineffective and when successful turned other countries into commercial competitors. Instead, America pursued a Global War on Terrorism that cost more than the shortfall needed to accomplish all the UN MDG objectives.

The United States has been unwilling and/or unable to transform itself because of its national policies have prioritized individual short term profits over humanity's long term survival. And with the election of Donald Trump in 2016, it seems that Americans are looking back to the past glories for future inspiration, rather than adapting to the geopolitical and climate change realities of the new century. Transformational evolution is likely to occur slowly over the next four years, if at all. The problem is that every day that the current leadership delays transitioning to a fossil fuel free, the greater the handicap they place on the next generation to adapt in time.

Now that we know that climate change is a critical national security issue and the United States political and economic priorities are currently aligned against acknowledging it, how do we prepare appropriately?

Future Research Questions

The MGeo research question was initiated with the assumption that it would be incomplete and that the true value of the exercise would be to outline a conceptual map for the next research to revise, refute and improve upon. The following thoughts are offered as starting points for improving our approach.

Rethinking Thinking

In discussions with subject matter experts, a recurring theme was the need to expand thinking beyond "Western" linear thinking of cause and effect relationships and zero sum warfare to "Eastern" or indigenous understandings of circular interdependence and negative sum warfare. Discussions about the value of money and material possessions or what constitutes a "good life" need to be addressed if the survival of humanity is going to be prioritized over short term individual indulgence. Concretely, the rejection of the conspicuous consumption that defines today's "American Way of Life" and return to the spiritual roots of the Founding Fathers, Declaration of Independence and Four Freedoms which believe that development assistance *is* security assistance and "that subversion and revolt around the world fed on social injustice and economic chaos."

Given the amounts of money allocated to the military and entertainments like the Super Bowl or NASCAR versus public K-12 education that's likely to be an uphill battle. But even if the United States can't change thinking, there are concrete climate change issues that will increase chronic stresses and set the stage for catastrophic shocks. These primarily center around the urbanization process that the fossil fuel and industrial agriculture system has made possible. Perhaps the greatest challenge facing the United States and other urban countries is the impacts of climate change on their inhabitants.

Resilient Cities

As the A2AD concept illuminated, the existential threat to most industrial nations will not come from an invading military force, but the ability to provide food, water, sanitation and power to its urban population. By 2050, the population of the world is expected to have reached 9 billion with 2/3rd of humanity or 6 billion people living in cities.[340] While the collapse of Tell Leilan or Mayan civilization could be easily solved with modern technology, the inability to address the famines in Somalia or prevent the food shortage exacerbated uprisings during the Arab Spring reflect the limitations that still exist. The Department of Defense's inability to establish a lasting peace after spending $49 billion in Iraq and $61 billion in Afghanistan highlight the difficulties of using a battle axe to plow fields or soldiers to act as policemen.

3 Block War in a Coastal Mega-City

The problem of deploying the United States military in the Pacific century is one of scale. In 1999, the Marine Corps outlined the strategy for winning the peace in an urban environment through a "Three Block War" concept, where combat operations, humanitarian assistance and nation building activities might be occurring simultaneously within in three adjacent city blocks.[341] But with coastal cities like Tokyo, Osaka, Jakarta, Manila, Singapore, Seoul, Shanghai, Guangzhou, Hong Kong, Hanoi, Ho Chi Minh City, Karachi, Kolkata, Mumbai,

Dhaka, and Bangkok all battling sea level rise and the climate change impacts, how will the United States military utilize its 3-block war concept in sprawling metropolitan areas of 10 and 20 million people?

Given estimates of needing 250,000 rounds of ammunition to kill each insurgent during the Global War on Terrorism, how many rounds of ammunition would be needed in coastal mega-city battleground?[342,343] Given the 82 ton carbon footprint of every American service member, how many additional barrels of oil would be needed to support the troops with a F-22, that costs $30,000 an hour to fly?[344] And with the $2 million dollars spent for the lifetime of each injured soldier, how would the United States pay for veteran care, when the military retirement obligations cannot be currently met?

Could the $100 million dollars per F 22 be spent instead on working together to solve the pressing challenges of the world? Could money be made by building the estimated $90 trillion dollars' worth of climate adaptive infrastructure needed by 2030? Could this hardened infrastructure reduce the anticipated 200 million climate refugees by 2050? These are all questions that still need to be answered. More worrisome that ensuring cities work is what happens if we get it wrong.

Preventing the Pan-Pacific Pandemic

The greatest threat to humanity is the potential of a pandemic outbreak in the Pacific region. With 6 billion people packed in the cities by 2050, 3 billion of them in the Asia Pacific region, providing clean water, health services and sanitation facilities is not a nice to have or riot prevention measure, but matter of life and death for millions of people.

Since 1997, the world has seen at least 8 different viral outbreaks starting with highly pathogenic avian influenza (HPAI) in Guandong and Hong Kong and followed by severe acute respiratory syndrome (SARS) six years later. Counting the Middle East respiratory syndrome coronavirus (MERS CoV) and ebola outbreak in 2014, there have been a total of eight different outbreaks that might have gone global in the past 20 years.

1997	HPAI (H5N1)	Hong Kong, Guangdong
2003	SARS	Guangdong
2004	HPAI (H5N1)	Vietnam, Thailand
2009	H1N1	California, Texas
2012	MERS CoV	Saudi Arabia
2013	H7N9	China
2014	Ebola	Guinea, Liberia, Sierra Leone
2015	HPAI (H1N1)	United States

That is an average of one new outbreak every 2.5 years. And given the number of years between each new outbreak has been 6, 1, 5, 3, 1, 1, 1; it might seem indicate that the rate of viral mutation is increasing. More worrisome is that 6 of the 8 or 75% have originated in Asia or the United States.

The climate change connection to pandemics is, like the Little Ice Age being caused by European killing of native Americans resulting in reforestation of farmlands, counterintuitive. 70% of all emerging infectious diseases are zoonotic or transmitted from animals to humans. As natural habitats rainforests are cut down or degraded by shifting vegetation zones, previously isolated wildlife come in contact with domestic livestock and eventually humans. Diseases like Ebola and zika virus are passed from wildlife to domestic livestock and finally humans.

Humans living on the edge of poverty may have to live with their livestock and/or eat bushmeat to survive, increasing their exposure to disease. Without access to regular healthcare, the poor may use antibiotics improperly helping the disease develop resistance to existing cures. Small communities may develop asymptomatic resistance and become a reservoir for disease. As climate change destroys the ecosystem communities depend on, forced mass migrations are already spreading multi-drug resistant tuberculosis, antibiotic resistant gonorrhea, bovine spongiform encephalopathy (BSE) and HIV/AIDS across the globe.

Return of the 1918 Pandemic

The greatest threat would be the resurgence of a 1918-type Spanish influenza virus. Unlike terrorism, which killed 1 out of every 10,000,000 Americans each year or the risk of being crushed to death by your furniture or television, the 1918 pandemic killed as many as 3 out of every 100 people on the planet. The estimated death toll of a modern day 1918 pandemic ranges between 180 -360 million people dead. But even these estimates may be low when comparing the differences in demographics, urbanization and transportation with today.

	1918	**2018**	**2050**
Population	1.8 billion	7 billion	9 billion
Urbanization	15%	50%	>66%
Transportation	25 knots	450 knots	1,450 knot

In 1918, the total population of the world was only 1.8 billion people and roughly 50 million people died from the pandemic. The truth is researchers still don't know the final death toll because there were so many people in areas without hospital or morgues that cause of death was not accurately recorded. Using a direct extrapolation of 2.7% we can expect 190 million people dying today and 250 million deaths in 2050.

The difference between the population then and now is that world average is 50% urbanization today and is forecast to be as high as 70% in 2050. While it's impossible to use a straight line conversion for increased rates of death, industrial livestock practices have shown that infections within densely packed chickens and pigs require culling the entire farm.[345] While currently unthinkable from a human rights perspective, what are the political options when facing the choice of quarantining an infected population or allowing them to spread the disease across the country.

And all these factors have been complicated by increasing speed of transportation over the past century. Transoceanic passenger ships like the Titanic sailed at a maximum speed of 24 knots.

Today's 747 aircraft have a cruising speed of 450 knots and can transport the sickness from Boston to Bombay in 18 hours. New supersonic passenger airplanes are being developed that will fly over Mach 2, reducing the that travel time to 6 hours. This means that an infected person could cover all seven continents in the span of a single day.

Here too, the choices of social equity and development assistance show the relationship to national defense. As wealth disparities increase and the access to healthcare services for the poor decrease, the ability to detect and stop the spread of the disease at the beginning stages will be diminished. And given that roughly 60% of vegetable farmhands in the United States are illegal migrants without adequate healthcare, it begs the question what "triple washed" lettuce means.[346]

These challenges will be multiplied for Hawaii being the most isolated island chain in the world importing 85% of its food and relying on tourism as its economic mainstay. A pandemic outbreak would essentially shut down the airports and cause massive bottlenecks at the docks and airports as everyone from baggage handlers to air traffic controllers reported in sick… or came in sick because they needed the money and infected everyone else. And with Pacific Command's headquarters in Honolulu, who would respond and how?
The fact is that we've seen what happens with the United States invests more on preventing terrorism than taking care of the health security of its former territories. Sitting at the intersection of climate change, infectious disease and national security, the 2007 zika epidemic in Yap provides an example of a missed opportunity to prevent what is now a global response effort.

First identified in 1947, zika went dormant for a decade until it reemerged in Central African Republic, Senegal, Pakistan, Burkina Faso, Cote D'ivoire, Cameroon, Sierra Leone, Gabon, Indonesia, Malaysia, Nigeria, Costa Rica, Nigeria, and Cambodia between 1960 and 1983.[347] Zika then went dormant for 24 years until 2007, when it reached epidemic proportions in Yap, Federated States of Micronesia. As a Compact of Free Association (COFA) state, the United States is responsible for the national security of the country. Yet the United States did nothing to quarantine and prevent the spread of the disease allowing it to spread five years later to French Polynesia, Easter Island, Cook Islands, New Caledonia, Malaysia, Philippines, Cambodia, Indonesia, and Thailand in 2012. After two years of incubating in those countries, zika finally made its way to Brazil, Vanuatu, Fiji, Colombia, Cabo Verde, Samoa, and the Solomon islands.

As it takes nearly 10 years for a vaccine to be developed. The $500 million dollars needed to develop a vaccine funding would have been less than 2-days expenses of the Global War on Terrorism. Had the United States started work in 2007, Americans would now be rolling out the first tests and be looked as a savior to the global health system.[348] Other choices were made and the rest is history. The question is what will happen when climate change and sea level rise forces mass migrations of these infected island populations around the world?

How will the United States prepare itself for pandemic outbreaks overseas when so many of its commercial goods are imported? How will rising sea levels in coastal cities like New York, Miami, and San Diego impact sewage infrastructure and spread disease? What happens when the American industrial livestock practices become a disease reservoir for the next pandemic? How will the Americans deal with pandemic quarantine and police response if mistrust continues to

grow? How will the reliance on fossil fuels impact hospitals and power plants in 2050, when the price of oil becomes too high?

Environmental Intelligence Unit

The bottom line is that we now know the impacts of climate change on human security and the potential for floods, droughts and famines to spark social unrest and conflict. We know the correlation between long term climate changes and the rise and fall of empires. And while we may not want to admit that these changes are caused by fossil fuels, we cannot ignore the utility of being able to predict which countries crops will fail because of changing rain patterns cause by El Niño or what cities will be vulnerable to infectious disease outbreaks because sea level rise is overwhelming their sanitation infrastructure.

Even if the military cannot build the capabilities to respond effectively to climate change driven instability, it should use the knowledge about potential for social disruption and conflict to better prepare its forces to respond. The easiest solution would be to include environmental intelligence in the various other intelligence disciplines like human intelligence, communications intelligence, electronic intelligence.
And even if the United States doesn't begin climate change intelligence, the Chinese absolutely will. This means that other nations will be better able to predict and prepare for climate change impacts on social revolutions, civil conflict, famines, disasters and wars. The reality of climate change is that the impacts are global and in the end, it doesn't matter if the United States decide they want to change or not.

The Earth Doesn't Care

As noted in the beginning, climate change is a unidirectional eco-evolutionary dynamic feedback loop that includes "atmosphere, hydrosphere, land, ice cover, biosphere and interactive relationships." When looking at this interlocking relationship, scientists James Lovelock and Lynn Margulis used the term Gaia or the image of Mother Earth to represent these systems as a unified whole. Margulis' comment that "Gaia is a tough b****." reflected the ability of Earth's integrated systems to self-regulate and bounce back to a new homeostasis, no matter what the scale of the imbalance. This means that even if humans make the world uninhabitable for themselves, the biosphere and the Earth will go on.

The choices are simple: adapt, evolve and survive… or die. Given all we now know, let's hope we make the choice to change from a fossil fuel model and survive as a species another 200,000 years.

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