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# \*\*IMPACT SCENARIOS\*\*

## Econ Collapse

#### Economic decline in an interconnected world collapses the global economy, results in multiple scenarios for war.

Pamlin and Armstrong 15 – Dennis Pamlin, Executive Project Manager, Global Challenges Foundation, Stuart Armstrong, James Martin Research Fellow, Future of Humanity Institute, Oxford Martin School & Faculty of Philosophy, University of Oxford, 2015 (“Global Challenges: 12 Risks that Threaten Human Civilization,” *Global Challenges Foundation*, February 2015, http://www.astro.sunysb.edu/fwalter/HON301/12-Risks-with-infinite-impact-full-report-1.pdf)

Often economic collapse is accompanied by social chaos, civil unrest and sometimes a breakdown of law and order. Societal collapse usually refers to the fall or disintegration of human societies, often along with their life support systems. It broadly includes both quite abrupt societal failures typified by collapses, and more extended gradual declines of superpowers. Here only the former is included.

The world economic and political system is made up of many actors with many objectives and many links between them. Such intricate, interconnected systems are subject to unexpected system-wide failures due to the structure of the network311 – even if each component of the network is reliable. This gives rise to systemic risk: systemic risk occurs when parts that individually may function well become vulnerable when connected as a system to a self-reinforcing joint risk that can spread from part to part (contagion), potentially affecting the entire system and possibly spilling over to related outside systems.312 Such effects have been observed in such diverse areas as ecology,313 finance314 and critical infrastructure315 (such as power grids). They are characterised by the possibility that a small internal or external disruption could cause a highly non-linear effect,316 including a cascading failure that infects the whole system,317 as in the 2008-2009 financial crisis.

The possibility of collapse becomes more acute when several independent networks depend on each other, as is increasingly the case (water supply, transport, fuel and power stations are strongly coupled, for instance).318 This dependence links social and technological systems as well.319

This trend is likely to be intensified by continuing globalisation,320 while global governance and regulatory mechanisms seem inadequate to address the issue.321 This is possibly because the tension between resilience and efficiency322 can even exacerbate the problem.323

Many triggers could start such a failure cascade, such as the infrastructure damage wrought by a coronal mass ejection,324 an ongoing cyber conflict, or a milder form of some of the risks presented in the rest of the paper. Indeed the main risk factor with global systems collapse is as something which may exacerbate some of the other risks in this paper, or as a trigger. But a simple global systems collapse still poses risks on its own. The productivity of modern societies is largely dependent on the careful matching of different types of capital325 (social, technological, natural...) with each other. If this matching is disrupted, this could trigger a “social collapse” far out of proportion to the initial disruption.326 States and institutions have collapsed in the past for seemingly minor systemic reasons.327 And institutional collapses can create knock-on effects, such as the descent of formerly prosperous states to much more impoverished and destabilising entities.328 Such processes could trigger damage on a large scale if they weaken global political and economic systems to such an extent that secondary effects (such as conflict or starvation) could cause great death and suffering.

#### Economic decline leads to nuclear war

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#### Economic collapse ensures global war – numerous triggers

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## Food Wars

#### Food shortages kill billions and spark global wars

Julian Cribb, principal of JCA, fellow of the Australian Academy of Technological Sciences and Engineering, 2010, The Coming Famine: The Global Food Crisis and What We Can Do to Avoid It, http://books.google.com/books?id=Tv0zXxbQ7toC&printsec=frontcover&dq=the+coming+famine&hl=en&sa=X&ei=RR\_mT7OYFKeq2gXP5tHZCQ&ved=0CDUQ6AEwAA#v=onepage&q=the%20coming%20famine&f=false

The character of human conflict has also changed: since the early 1990S, more wars have been triggered by disputes over food, land, and water than over mere political or ethnic differences. This should not surprise US: people have fought over the means of survival for most of history. But in the abbreviated reports on the nightly media, and even in the rarefied realms of government policy, the focus is almost invariably on the players—the warring national, ethnic, or religious factions—rather than on the play, the deeper subplots building the tensions that ignite conflict. Caught up in these are groups of ordinary, desperate people fearful that there is no longer sufficient food, land, and water to feed their children—and believing that they must fight ‘the others” to secure them. At the same time, the number of refugees in the world doubled, many of them escaping from conflicts and famines precipitated by food and resource shortages. Governments in troubled regions tottered and fell. The coming famine is planetary because it involves both the immediate effects of hunger on directly affected populations in heavily populated regions of the world in the next forty years—and also the impacts of war, government failure, refugee crises, shortages, and food price spikes that will affect all human beings, no matter who they are or where they live. It is an emergency because unless it is solved, billions will experience great hardship, and not only in the poorer regions. Mike Murphy, one of the world’s most progressive dairy farmers, with operations in Ireland, New Zealand, and North and South America, succinctly summed it all up: “Global warming gets all the publicity but the real imminent threat to the human race is starvation on a massive scale. Taking a 10—30 year view, I believe that food shortages, famine and huge social unrest are probably the greatest threat the human race has ever faced. I believe future food shortages are a far bigger world threat than global warming.”2° The coming famine is also complex, because it is driven not by one or two, or even a half dozen, factors but rather by the confluence of many large and profoundly intractable causes that tend to amplify one another. This means that it cannot easily be remedied by “silver bullets” in the form of technology, subsidies, or single-country policy changes, because of the synergetic character of the things that power it.

## Growth

#### Growth prevents extinction

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#### Recommendations for rapid collapse of economic industrialization distract us from more important solutions – their impact turns are misguided environmental alarmism

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#### Growth key to the environment

Goklany ‘7 – PhD, science and tech policy analyst for the US Dept of the Interior

Indur M, M.S. and Ph.D are from Michigan State University, “the improving state of the world”, page number below in [brackets]

Yet another view, formalized as the environmental transition hypothesis, is that for any specific country, **the forces of technological change and economic growth**, acting in conjunction, **can initially cause environmental degradation, but eventually an** "environmental transition" **takes place after which those forces become necessary for** reversing **that** degradation.38 This view, however, acknowledges that because economic growth and technological change are not inevitable, environmental cleanup is, likewise, not a foregone conclusion. So in this regard, **the environmental transition hypothesis provides a reason to be hopeful,** without necessarily being optimistic. Basic assumptions underlying the environmental transition hypothesis are that **society is always trying to improve its quality of life and** that **there is a mechanism for converting that desire into action**. **At** relatively **low levels of economic development, a society may** justifiably **conclude that its quality of life would be advanced through economic development,** because such development provides the means for reducing poverty and the numerous problems that follow in its wake, for example, hunger, malnutrition, lack of access to safe water and sanitation, malaria, lack of education, and lack of public health services, to name just a few. Thus, **in the early stages of development, a society would likely emphasize economic development over the environment**. However, over time, **as the society gets wealthier, it solves**—or starts to solve—**its most urgent public health problems**. Even as other aspects of environmental quality deteriorate, **it begins to realize that poor environmental quality detracts from its quality of life**. Accordingly, **it begins to give greater emphasis to environmental quality**. **Over time,** society goes through a transition during which environmental deterioration, which had initially been growing, **is** first halted**, and then** reversed. Hence the term, the "environmental transition." **During this transition, economic growth and tech**nology **go from being causes of environmental problems to solutions for those very problems.** However, it should also be kept in mind that, at all times— before, during, and after the environmental transition—the focus of society is to improve its quality of life. It just so happens that at low levels of economic development, quality of life is approximated by such development, while at higher levels of development, it's environmental quality that's a better surrogate.<page 10-11>

####

## Heg

#### Even if US heg is bad, other powers are worse and we still get a transition wars impact

Zachary Keck, 1-24-2014, ("America's Relative Decline: Should We Panic?" http://thediplomat.com/2014/01/americas-relative-decline-should-we-panic/)

Still, China’s relative rise and the United States’ relative decline carries significant risks, for the rest of the world probably more so than for Americans. Odds are, the world will be worse off if China and especially others reach parity with the U.S. in the coming years.¶ This isn’t to say America is necessarily as benign a hegemon as some in the U.S. claim it to be. In the post-Cold War era, the U.S. has undoubtedly at times disregarded international laws or international opinions it disagreed with. It has also used military force with a frequency that would have been unthinkable during the Cold War or a multipolar era. Often this has been for humanitarian reasons, but even in some of these instances military action didn’t help. Most egregiously, the U.S. overrode the rest of the world’s veto in invading Iraq, only for its prewar claims to be proven false. Compounding the matter, it showed complete and utter negligence in planning for Iraq’s future, which allowed chaos to engulf the nation.¶ Still, on balance, the U.S. has been a positive force in the world, especially for a unipolar power. Certainly, it’s hard to imagine many other countries acting as benignly if they possessed the amount of relative power America had at the end of the Cold War. Indeed, the British were not nearly as powerful as the U.S. in the 19th Century and they incorporated most of the globe in their colonial empire. Even when it had to contend with another superpower, Russia occupied half a continent by brutally suppressing its populace. Had the U.S. collapsed and the Soviet Union emerged as the Cold War victor, Western Europe would likely be speaking Russian by now. It’s difficult to imagine China defending a rule-based, open international order if it were a unipolar power, much less making an effort to uphold a minimum level of human rights in the world.¶ Regardless of your opinion on U.S. global leadership over the last two decades, however, there is good reason to fear its relative decline compared with China and other emerging nations. To begin with, hegemonic transition periods have historically been the most destabilizing eras in history. This is not only because of the malign intentions of the rising and established power(s). Even if all the parties have benign, peaceful intentions, the rise of new global powers necessitates revisions to the “rules of the road.” This is nearly impossible to do in any organized fashion given the anarchic nature of the international system, where there is no central authority that can govern interactions between states.¶ We are already starting to see the potential dangers of hegemonic transition periods in the Asia-Pacific (and arguably the Middle East). As China grows more economically and militarily powerful, it has unsurprisingly sought to expand its influence in East Asia. This necessarily has to come at the expense of other powers, which so far has primarily meant the U.S., Japan, Vietnam and the Philippines. Naturally, these powers have sought to resist Chinese encroachments on their territory and influence, and the situation grows more tense with each passing day. Should China eventually emerge as a global power, or should nations in other regions enjoy a similar rise as Kenny suggests, this situation will play itself out elsewhere in the years and decades ahead.¶ All of this highlights some of the advantages of a unipolar system. Namely, although the U.S. has asserted military force quite frequently in the post-Cold War era, it has only fought weak powers and thus its wars have been fairly limited in terms of the number of casualties involved. At the same time, America’s preponderance of power has prevented a great power war, and even restrained major regional powers from coming to blows. For instance, the past 25 years haven’t seen any conflicts on par with the Israeli-Arab or Iran-Iraq wars of the Cold War. As the unipolar era comes to a close, the possibility of great power conflict and especially major regional wars rises dramatically. The world will also have to contend with conventionally inferior powers like Japan acquiring nuclear weapons to protect their interests against their newly empowered rivals.

#### Unipolarity key to international cooperation

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#### American hegemony is foundationally sound and egalitarian – it promotes social, economic and political equality for all

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#### No decline - American still dominates- even if other countries now model

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## Iran Strikes

Strikes cause extinction

Masko, 12

(2/9, Air Force News Veteran & Columnist for European Stars and Stripes, The Washington Post, Rolling Stone, From 1977-1999 he was a reporter for the Defense Department, http://www.huliq.com/10282/iran-nuclear-ambitions-alarming-israel-brink-war-say-experts)

There’s always been the danger of something “going nuclear” in our fragile world where countries such as Iran and Israel seem to like rattling sabers at each other was once viewed as “same old, same old,” by political science experts when referring to these countries threats of war remaining the same. However, it’s not same old, same old, when President Obama told NBC News in a TV interview Feb. 5 that while he does not think Israel has decided whether to attack Iran, the United States is “going to be sure that we work in lockstep as we proceed to try to solve this… hopefully diplomatically.” Thus, **if Israel does attack Iran’s nuclear facilities and war breaks out**, “**even a small-scale, regional nuclear war could produc**e **as many direct fatalities as** all of **W**orld **W**ar **II and disrupt the global climate** for a decade or more, **with environmental effects that could be devastating** **for everyone** on Earth, university researchers have found,” stated a report on the University of California Los Angeles website aasc.ucla.edu; while pointing to “a team of scientists” at Rutgers, the State University of New Jersey; the University of Colorado at Boulder and UCLA who’ve researched the implications of such an attack. What's at stake for the world? Overall, the stakes could not be any greater for a world that fears war after more than 20 years of sabre rattling by Israel over Iran’s nuclear ambitions. In turn, President Obama and other world leaders seem very concerned that it’s not if but when “**an Israeli** military **attack** on the Islamic Republic of Iran” **will leave** in its wake **a** new **war in the Middle East**, with **more terrorism worldwide laced with** even broader **economic woes** at a time **when many countries are** already **at a breaking point**. Moreover, the top U.S. intelligence official told Congress Jan. 31 – in an annual report about threats facing the nation – that “Iran’s leaders seem prepared to attack U.S. interests overseas, particularly if they feel threatened by possible U.S. action.” Jim Clapper, director of National Intelligence, also told the Senate Intelligence Committee Jan. 31 in an MSNBC TV report that America “now faces many interconnected enemies, including terrorists, criminals and foreign powers, who may try to strike via nuclear weapons or cyberspace, with the movement's Yemeni offshoot and ‘lone wolf’ terror attacks posing key threats.” Middle East nuclear confrontation feared “While **a regional nuclear confrontation** – such as the one feared between Iran and Israel – among emerging third-world nuclear powers **might be geographically constrained,**” report this noted team of U.S. scientists, “**the environmental impacts could be worldwide**.” Thus, even **the** great **Atlantic** Ocean – that sits between the U.S. and the Middle East – **would not** **buffer the “fallout**” that will be in the “global atmosphere” impacting an already fragile world climate situation. While these conclusions of dark days ahead for the world if the so-called “nuclear genie gets out of the bottle” -- by U.S. scientists during a meeting of the American Geophysical Union – was back in 2006, the UCLA website that presented **these** **nuclear war fears**, has **update**d such conclusions about a **clear and present danger of possible nuclear confrontation if Israel attacks Iran**, and as of Feb. 9, 2012, **the news from Israel is not good** at all, state experts.

## Warming

#### Global warming is real and has serious consequences

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#### Emissions past climatic tipping elements cause disastrous ecological and social consequences

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#### Warming is anthropogenic and causes extinction

**Adams 16** --- has a degree in agriculture and cites studies done by NASA and the IPCC
(Andrew, Prince George Citizen, 4/16/16, “There is no debating scientific facts,” http://www.princegeorgecitizen.com/opinion/columnists/there-is-no-debating-scientific-facts-1.2229437)//ernst

Last week I wrote about the signs of early spring and put a few jabs at climate change deniers. This column did exactly what I had hoped. It sparked conversation on the topic. Those who commented on the article were in fact climate change deniers, stating random outliers of data in the overall trend, which is akin to the Republican senator of Oklahoma who brought a snowball to the senate floor as evidence that global warming was a hoax. I am so glad this type of outlandish behavior has not manifested itself in Canadian politics as of yet. Weather is what you get and climate is what you expect. This week I hope to explain climate change to those who don't fully understand the science behind it. I write this column with a mere bachelor of science and only a handful of classes in a human and environmental interaction masters program before I left school to tackle other adventures that I felt academia would only prevent me from doing all the while furthering my student debt. So while I am not an expert on this topic I do however have an understanding of the scientific process and natural processes that allow us to understand climate change. Glancing into my personal library one could reasonably make the statement that I may have a better understanding than your average Joe. **It's true the climate has always been changing.** While observed records of our climate indeed are not extreme in age, pollen in lake sediment, trapped air bubbles and neutrons in glaciers can give us a reasonable degree of accuracy (of the past 800,00 years according to NASA) when looking to the past climate fluctuations. **In our last century of climatic observations we have observed an overall increase of approximately .74 degrees Celsius increase in global temperatures according to NASA and the IPCC.** While this number does not seem significant, it is when you live in an extreme environment such as the arctic. Think back to your history book's description of the Franklin expedition, now remember last week's stories from CBC on the cruise ships traveling the Northwest Passage with thousands of people aboard the ships. **97 percent of climate scientist agree that this warming (which is happening) is not caused by orbital variation nor sun spots or solar flares. These experts agree this climate change is anthropogenic.** While I believe Prince George has no doubt its share of scientific geniuses, I don't believe that there is a scientific genius in P.G. that is more informed on climate change than the leading 97 percent of top climate scientists. It is true that the climate has been warm before and this is not the problem. The problem is the rate at which the change is occurring. **According to NASA, "As the Earth moved out of ice ages over the past million years, the global temperature rose a total of four to seven degrees Celsius over about 5,000 years. In the past century alone, the temperature has climbed 0.7 degrees Celsius, roughly ten times faster than the average rate of ice-age-recovery warming.**" We are now in the sixth great extinction on Earth. In fact geologists are now calling our current Epoch the Anthropocene as our industrial existence has now left its mark geologically on Earth forever. **In 1750, there was 250 PPM of carbon dioxide (the most important greenhouse gas) in our atmosphere now there is 400 PPM.** If you were to drive a car somehow up through our atmosphere for 100 kilometres you would then be in outer space. This is how small our atmosphere is. **It is ludicrous to think that all of our industrial emissions have not been able to change the composition of our thin veil of an atmosphere** It saddens me that some still deny these dire facts because we have work to do and no time to waste. There is no one to blame but ourselves. To those who think this is a nefarious plot against the common man from the government and scientists, I think you must first assume our government is intelligent enough to push such a plot as this onto the public and ask yourself, why would they do such a thing, what would be the benefit, and also, "Have I been spending too much time on YouTube watching conspiracy theories?" P.s. The Earth is not flat.

#### Warming swamps the benefits of CO2, cutting food production by 10 percent and locking in price spikes

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#### Even if CO2 helps plants – The negative effects outweigh

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## A2 Ice Age

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#### Their studies are bunk – prefer actual science

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# \*\*IMPACT DEFENSE\*\*

## A2 Arctic War

#### Zero risk of Russia war---neither side will escalate

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## A2 Asian War

#### Asia will remain peaceful – economic interdependence, effective deterrence, and no escalation

Alagappa 14 – Muthiah Alagappa, Nonresident Senior Associate, Carnegie Endowment for International Peace, Washington, D.C., Ph.D. in international affairs from the Fletcher School of Law and Diplomacy, Tufts University, Visiting Professor at Columbia University; a Senior Fellow at the Institute of Strategic and International Studies, Malaysia; and adjunct faculty at the University of Malaya, Director of the East-West Center Washington, 2014 (“International Peace in Asia: Will it Endure?” *The Asan Forum*, December 19th, <http://www.theasanforum.org/international-peace-in-asia-will-it-endure/>)

Inter-state peace in Asia will endure due to the increasing international legitimacy of countries, a continued focus on economic growth and development, growing national resilience and state capacity, and maintenance of effective deterrence. The political map of Asia has been relatively stable over the last thirty years. Increasing international legitimacy along with respect for the principles of territorial integrity and political independence implies that the Asia political map will change only gradually. Changes will be a consequence of internal political developments, not inter-state war. Fundamental change (the appearance of new countries or disappearance of existing ones) will be driven by the outcome of domestic contestation over the type of political system and the identity of the national political community. Only minor territorial changes may occur as a consequence of inter-state armed conflict. Invasion, conquest, and domination through war have become features of the past, but that does not mean obsolescence of the use of force.

For various reasons (political legitimacy, poverty eradication, resolution of domestic conflict, desire to achieve developed country status, the need to end stagnation, aspirations for national power and influence), economic growth will continue to be the priority for several more decades. Participation in regional and global economic systems to mobilize factors of production and access markets will remain key features of the economic policies of Asian countries. Internationalist orientations argue for a peaceful and stable environment. State capacities can be expected to increase and, along with rising nationalism, to make countries less vulnerable to international intervention. Resorting to war to resolve inter-state disputes with no certainty of success will be costly. Deterrence will continue to inform national security strategies of most countries in the region. It has prevented war even in acute conflicts on the Korean Peninsula, across the Taiwan Strait, and between India and Pakistan. Deterrence (especially nuclear deterrence) will play a key role in preventing the outbreak of war between China and the United States, China and India, China and Japan, and Japan and Russia. Constant efforts must be made to review, renew, and upgrade it, including extended deterrence in the context of changing political and strategic circumstances, changing military technology, and development of new capabilities. While strategic deterrence can prevent major inter-state wars, it cannot prevent minor wars, military incidents, or militant activities by non-state actors. Military capabilities and confidence building measures must be developed to deal with these situations. General and specific deterrence strategies, capabilities, and crisis management among key players must command greater attention.

The claim that peace in Asia will endure is not a linear projection. The political map is not a constant. Further, as states become weaker and do not have monopoly over the legitimate use of violence, the number of non-state actors employing violence as a means to achieve their political purposes could multiply and become an even more significant part of the international system. Military technology also does not stand still, affecting the content and means of international interactions and their outcomes. Yet, factors that have contributed to peace in Asia over the last three decades are likely to continue into the foreseeable future.

## A2 Influenza

#### No extinction

Adalja 16 — (AMESH ADALJA is an infectious-disease physician at the University of Pittsburgh, 6-17-2016, "Why Hasn't Disease Wiped out the Human Race?," *The Atlantic*, http://www.theatlantic.com/health/archive/2016/06/infectious-diseases-extinction/487514/, Accessed 7-30-2016, HWilson) \*\*\*we do not endorse the problematic language in this evidence

Any apocalyptic pathogen would need to possess a very special combination of two attributes. First, it would have to be so unfamiliar that no existing therapy or vaccine could be applied to it. Second, it would need to have a high and surreptitious transmissibility before symptoms occur. The first is essential because any microbe from a known class of pathogens would, by definition, have family members that could serve as models for containment and countermeasures. The second would allow the hypothetical disease to spread without being detected by even the most astute clinicians.

The three infectious diseases most likely to be considered extinction-level threats in the world today—influenza, HIV, and Ebola—don’t meet these two requirements. Influenza, for instance, despite its well-established ability to kill on a large scale, its contagiousness, and its unrivaled ability to shift and drift away from our vaccines, is still what I would call a “known unknown.” While there are many mysteries about how new flu strains emerge, from at least the time of Hippocrates, humans have been attuned to its risk. And in the modern era, a full-fledged industry of influenza preparedness exists, with effective vaccine strategies and antiviral therapies.

## A2 Heg

**Military power doesn’t resolve any conflicts**

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**No impact to U.S. decline**

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#### US hegemony is uncontested and inevitable – no shift in power balance for the foreseeable future

Cohen 14(Michael A., fellow at the Century Foundation, former columnist for Foreign Policy and the New York Times, former senior fellow at the New America Foundation and the American Security Project, master’s degree from Columbia University where he is also an adjunct lecturer in the School of International and Public Affairs, “It’s Coming from Inside the House,” in *A Dangerous World?: Threat Perception and U.S. National Security*, 2014)

Today, America’s military, economic, and diplomatic power is unparalleled, and its global hegemony is uncontested.

The United States confronts no plausible existential security threats, no great power rival, and no near-term military competitor. The U.S. military is far and away the world’s most potent, and it is able to effectively project power to every corner of the globe. America maintains a vast coterie of allies, friends, and like-minded nations with similar values and political systems. Moreover, its position as the world’s preeminent superpower is unlikely to change any time soon, because no country has the ability or inclination to challenge it. China is its closest military rival—and China spends a fraction on armaments compared with the United States. Even emerging from a sustained economic downturn, the U.S. economy remains the largest in the world—with China, at best, two to three decades away from surpassing it. Although the United States faces global challenges to its interests, they pose little actual risk to the overwhelming majority of American citizens or to the country’s security.

Quite simply, the United States is the world’s most dominant nation, unchallenged and more secure than any other great power in history—and it will almost certainly remain so for the foreseeable future.

# \*\*IMPACT TURNS\*\*

## A2 Biodiversity

#### Unique marine expansion of bioprospecting coming now – Biodiversity collapse eliminates necessary profit motive

Sabal 7

Megan Sabal (M.A. Miami Ohio in Ecology and Evolutionary Biology, “The Future of Marine Resources as Pharmaceutical Products” May 20, 2007 http://webcache.googleusercontent.com/search?q=cache:CMOhsrVoJxIJ:jrscience.wcp.miamioh.edu/fieldcourses07/PapersMarineEcologyArticles/TheFutureofMarineResource.html+&cd=6&hl=en&ct=clnk&gl=us&client=firefox-a

Coral Reefs have long been considered the rainforests of the oceans. This is a reference to the extensive biodiversity which is found in both of these unique ecosystems. The high level of primary productivity, due largely in part to the intense solar radiation in the tropics, accounts for the variety of organisms found in these areas. Although the high biodiversity in rainforests is generally known, the general public is unaware of the extensive plethora of organisms on coral reefs. Part of this is because humans are land-dwelling organisms and tend to invest more time and energy into terrestrial research and conservation methods. This is unfortunate as marine organisms have greater pylogenetic diversity than terrestrial organisms whose unique characteristics are lost through this selective research. Some classes of organisms found only in marine environments are corals, tunicates, mollusks, bryozoans, sponges and echinoderms (Bruckner). A recent value of biodiversity has been the resources for chemicals which could be utilized in pharmaceutical products. With the great biodiversity and unique adaptations of marine organisms, “The prospect of finding a new drug in the sea, especially among coral reef species, may be 300 to 400 times more likely than isolating one from a terrestrial ecosystem” (Bruckner). Despite the great potential, marine bioprospecting has lagged behind terrestrial efforts because harvesting these compounds is more difficult, more dangerous and more expensive (Tangley). In order to take advantage of the potential medicinal benefits to be found in marine organisms, cooperation among researchers, companies and indigenous people must be obtained. Further technological advancements in harvesting methods which are more cost-effective and ecologically sustainable must also be developed (Allison). Although the potential is immense, there are various obstacles which researchers need to overcome in order to utilize these pharmaceutical benefits. Accounting for the immense potential for medicinal benefits in marine bioprospecting is due to the unique adaptations of these organisms themselves. Many of marine organisms are sessile and live firmly attached to coral reefs and therefore cannot escape environmental stressors or predation by simply moving to a safer area. Instead they have evolved defense mechanisms which rely on bioactive compounds to deter predation, fight disease and prevent overgrowth by competing organisms (Bruckner). Chemicals with these unique properties have a high potential to yield medicines which could end up saving lives. One problem with utilizing these chemicals economically is that they are usually produced in minute amounts and only under specific stressors. In terrestrial environments many of these chemical-producing mechanisms are unnecessary for organisms and this is why bioprospecting in marine environments holds such untapped potential. The search for pharmaceutical products from coral reef ecosystems has been in existence for many years, although it has not been widespread. Part of this is due to the obstacles presented through various harvesting methods as they are typically very expensive and yield a small amount of the desired chemical. Compounds will enter the drug market only if a cost-effective source of large-scale supply is available (Mendola). With this pressure there are a variety of harvesting methods in order to reach the highest efficiency and output. One method is chemical synthesis which includes chemically forging the desired chemical compound. In order for this to be economically feasible this process generally must take less than 30 chemical reactions (Mendola). Many companies rely on wild harvest, where the costs include the SCUBA equipment and boat, but an example shows that this process averages only 2 grams of substance per kilogram of sponge which means that 75 tons of sponge would need to be harvested yearly! This method is highly unsustainable and would wreak havoc with coral reef ecosystems over the long term (Mendola). Mariculture which is also known as aquaculture is controlled marine agriculture. These have potential for being an ecologically sustainable harvesting method, although start up costs are high and there is trouble finding suitable areas to start these sponge farms (Mendola). Ex Situ Culture consists of the cultivation of sponges outside of the sea in a laboratory setting. This allows for scientists to control the specific parameters such as water temperature, light, food and nutrients. There have been some small successes of ex situ culture, but no large-scale production has yet been achieved (Mendola). Another possibility is developing a sponge cell culture, but this has not been achieved yet due to complexities with many associated organisms such as bacteria, algae and fungi which live in close proximity with sponges and make up more than 40% of all sponge biomass (Mendola). Genetic modification holds potential, as the genetic code which codes for the specific chemical could be transferred into a laboratory-friendly microorganism which could then turn out the desired compound. Limitations with this method are that many of the bioactive compounds are not single proteins, but products of extensive metabolic pathways which are hard to transfer into a different organism (Mendola). Semi-synthesis is a final method which is comprised of the biotechnological production of an earlier chemical step and then followed by a limited number of synthetic chemical reactions in order to obtain the final product. Of these various harvesting methods mariculture is currently the most feasible, while ex situ culture holds the greatest potential for future bio-production (Mendola). Despite the imposing obstacles in harvesting chemicals for medicinal benefits, there have most certainly been success stories. Algae have been used for cancer therapy, venom from cone snails for painkillers and chemicals from extracts of sponges for antiviral drugs (Bruckner). There are various potential pharmaceuticals, nutritional supplements, enzymes, pesticides, cosmetics and other commercial products all from marine resources. Over the last decade, Japan has been the leader in marine biotechnology investing between $900 million and $1 billion each year. The United States has invested much less into these efforts and even so, “…U.S. marine biotechnology efforts since 1983 have resulted in more than 170 U.S. patents, with close to 100 new compounds patented between 1996 and 1999” (Bruckner). These extensive results encourage marine biotechnology to grow 15-20% during the next 5 years. Most of the funding for this research and development comes from universities, for-profit companies, government agencies and conservation groups. Once a drug is identified, it is patented and licensed to pharmaceutical companies to develop, test and market (Bruckner). Obtaining the economic benefits from marine resources is a lengthy process, but one with significant potential which leaders such as Japan and the U.S. are seeking to utilize. The potential economic profit which could be derived from these pharmaceutical products is immense and many believe will play a key role in the emerging business of ecotourism. Locals will then have a motive to protect the fragile ecosystems of coral reefs. Bruckner states that, “If properly regulated, bioprospecting activities within coral reef environments may fuel viable market-driven incentives to promote increased stewardship for coral reefs and tools to conserve and sustainably use coral reef resources”. Unfortunately, a large, initial financial investment is needed to start finding drug possibilities and this is followed by a long lapse of time before the drug is finally developed and available to consumers (Bruckner). Many local, indigenous populations do not have this money or time to invest in marine resources yielding economic products. Outside, affluent nations such as the United States, arriving in the waters surrounding these local nations and profiting from the biodiversity present without providing compensation or control of the resources to the locals (Tangley). This imperialist situation is rampant, but healthy relationships between outside companies and local communities do exist such as with the example of SmithKline Beecham Pharmaceuticals. This company is one of the largest players in bioprospecting world wide and they gather their products in South Africa and Fiji. In exchange for the permission to gather chemicals from these countries surrounding areas, SmithKline provides equipment, training and certification in advanced technical diving to local scientists who can then use them on their own products. They also provide the means for scholarships for local students who are developing marine natural products (Tangley). These wealthier nations have the potential to provide a new economic means and bring new technology and knowledge to poorer areas. The reason this does not occur everywhere is that the situation concerning sovereignty over marine resources is vastly complicated. Marine resources are generally considered common property resources which indicate that no one stakeholder hold exclusive rights to the area (Carter). This leads to a vast amount of competition and confusion over marine resources such as, oil wells, fisheries and the great diversity on coral reefs. There are vague boundaries which a centralized management has devised. Internal waters such as bays, estuaries and rivers are under the jurisdiction of the costal nation as well as the territorial sea which is the open ocean adjacent to the coast. Then extends an exclusive economic zone where special uses such as mining, fishing and dumping is allowed only for the coastal nation, but other nations may engage in non-destructive uses. Finally, waters outside theses designated areas are in the high seas and open to anyone (Cutter). Definitive boundaries are lacking in marine environments and there are many discrepancies and violations of these policies. These also allow for wealthier nations to come and utilize the marine resources found on coral reefs without consent of the locals (Honey). In 1993 the Convention on Biological Diversity created an agreement between industrialized and developing countries to start implementing guidelines over the access to coastal marine resources (Tangley). The aspects considered include conservation of biodiversity, sustainability and fair sharing of benefits with the source country (Bruckner). These are important steps in setting up a system which allows for marine bioprospecting to be beneficial to all countries involved. Coral reefs are amazing ecosystems that harbor drastic amounts of unique organisms. Many of these life forms have qualities which make them excrete bioactive compounds which can be harvested and utilized in various pharmaceutical products. Coral reefs are currently under many stressors and are dying across the earth. One possible method for the conservation of these magnificent ecosystems it through the knowledge of how many life-saving products could be derived from these areas. More technological advancements with harvesting methods need to be developed in order to make this economically profitable while avoiding destruction to the reef itself. Then more international policies need to be created and enforced between industrialized nations and local communities so that marine bioprospecting can serve as a positive example of ecotourism. Coral reefs are brimming with potential medicinal benefits if only a system can be created soon to preserve these wonderful marine ecosystems.

#### Bio-prospecting collapses the Antarctic Treaty System

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#### Collapse of ATS leads global nuclear war

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## A2 Growth (Dedev)

#### Growth is no longer sustainable – dedevelopment is key to prevent mass famine and extinction from climate change

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#### Collapse now avoids extinction – causes smooth transition to sustainable localized economies

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#### Economic growth inevitably causes extinction through environmental destruction – growth is unsustainable and the collapse is inevitable

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#### Economic growth causes nuclear war – increases military spending and nationalism

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