We Affirm.

Contention one is landmines.

Irin News reports in 2013 that Al-Shabaab uses landmines as a means to secure territory and strategic locations. Michael Moore of the Landmine Monitor furthers in 2011 that extensive minefields exist in nearly every East African country, making land unusable. Professor Adinoyi of the University of Nairobi furthers in 2013 that these landmines have paralyzed development efforts in East Africa by cutting off access to water, farmlands, and urban markets.

Unfortunately, Steinar Essen of the Landmine Action Review explains in 2015, East African removal programs received only one-seventh of the funds they needed to operate, causing most activities to be suspended.

Landmine clearance is effective. The State Department explains in 2017, past US efforts have helped over 16 war-torn countries declare themselves mine-free.

Contention two is Al-Shabaab.

Wachira Maina at The East African reports in 2017 that Trump intends to withdraw the US from the fight against Al-Shabab, which will prompt Ethiopia and Kenya to withdraw and allow Al-Shabab to grow strong again. Additionally, Jonathan Masters at the Council on Foreign Relations explains in 2017 that the UN peacekeeping mission AMISOM is pulling out of the region and transferring responsibility to the local Somali forces, risking the full collapse of the Somali government. Bronwyn Bruton at the Council on Foreign Relations explains in 2010 that a collapsed Somalia would provide fertile ground for terrorism, drug trafficking, and a host of other ills that would spill beyond the border.

We solve in three ways.

1. Direct engagement. Hassan Mohamud at Al Jazeera explains in 2013 that increased US counterterrorism is essential in the fight against Al-Shabab, as it has historically helped reclaim territory and cut off Al-Shabab's supply of fighters, funding, and materials.
2. Second, drones. Cathy Haenlein at the Royal United Services Institute explains in 2015 that US drone strikes against Al-Shabab have been empirically effective at weakening the group, with a single strike killing 30 of the group's members, including key leaders. Additionally, Philip Attuquayefio at the University of Ghana finds in 2014 that in the context of proliferation across the continent, increased drone use in Africa provides vital intelligence on terrorist groups like Al-Shabaab to gauge the capabilities of groups and avoid devastating miscalculations. He furthers, African governments don't have the capacity or political will to gather intel, while traditional US ground forces can't due to lack of infrastructure, the multi-country geographical spread of terrorist groups, and inevitable sovereignty conflicts over border crossings.

3. Third, special operations. Linda Robinson at the Council on Foreign Relations explains in 2013 that currently special ops are currently focused on “direct action”, which entails an endless and ineffective game of terrorist whack-a-mole, whereas “indirect action” would fund an approach in which the US works with local militaries to achieve lasting outcomes. Sam Ehrlich at the Council on Foreign Relations explains in 2015 that implementing this multilateral project in East Africa would require more financial backing, which is why prioritization is key. Ehrlich continues that higher funding would create more governmental accountability and allow the US to train host nations, resulting in better civilian protection and effectively fighting back groups like Al-Shabab.

Failure to beat Al-Shabaab causes three impacts.

1. First, worsening humanitarian crises. Mark Hanrahan at NBC News explains in 2017 that conflict and violence in Africa both create humanitarian crises and prevent aid from ever reaching the people who need it. Moreover, Jason Burke at the Guardian reports in 2017 that US laws require that no aid ever reach terrorist groups like Al-Shabab, creating a chilling effect where humanitarian aid organizations don’t risk sending aid to areas with terrorism.
2. Nuclear terror. Lisa Saenz at the University of Texas explains in 2013 that because many African countries have nuclear reactors with enriched uranium and the entire continent is built on uranium ore, the probability of Al-Shabab conducting a nuclear terrorist attack against the US is continually increasing. John Mutua at the African Security Review furthers in 2015 that this is uniquely likely due to poorly secured nuclear materials across the continent, ease of trafficking due to porous borders, the proliferation of nuclear expertise, and terrorist controlled land in East Africa providing a prime location for nuclear weapons development, testing, and launch. Empirically, counter-terrorism stops nuclear terrorism, as Shalev Meir at the Strategic Intelligence Service finds in 2015 that US intelligence teams working with Kenya stopped Al-Shabab from using several backpack-sized nuclear weapons that were destined for a massive attack. Strategic studies professor Robert Ayson concludes in 2010 that a nuclear terrorist attack would cause US leaders to assume the worst and put the nuclear arsenal on high alert, in turn causing Russia and China to anticipate US retaliation, creating incentives for both sides to preemptively strike and start a full nuclear war.
3. Bioterror. Bob Feldman at the US Army explains in 2014 that frightening diseases like Ebola are in insecure African labs that are an easy target for terrorists. Maria Kelley at American Military University explains in 2012 that because Al-Shabaab has huge funding from numerous state sponsors, support from Al-Qaeda and Boko Haram, and territorial control, it’s in the perfect position to acquire or create bioweapons for an attack. Amanda Teckman at the Council on Foreign Relations furthers in 2013 that an Ebola bioterror attack would be uniquely devastating in East Africa because of the high fatality rate and infectiousness, lack of a cure, and huge flow of investors, tourists, students, and NGOs in the region that would result the disease spreading globally.

Underview

Stuart Armstrong at the University of Oxford explains in 2015 that low probability high magnitude impacts are often ignored because humans are psychologically biased against scenarios that are outside our experience and are thus difficult to comprehend, which justifies overcompensating and taking preventative action since our gut response will be ill-calibrated.

FRONTLINES

Summary OV

Impact calc – extinction first means we prioritjize all lives cx, there's not low risk they dropped the impact – psych bias is armstrong and dropped bioterror

BIOTERROR

Al-Shabaab has the funding and territory to steal ebola from unguarded labs or create a bioweapon in their own facilities - that's Feldman and Kelley - means it's TRY OR DIE for stopping ebola bioterror - an East African attack would go global due to huge flow of travelers and high infectiousness, lethality, and lack of a cure means it would either cause extinction or end civilization as we know it - that's Teckman and Keating

Bioterror outweighs - a pandemic would end civilization and risk extinction, and it turns case even if the disease gets contained - borders would be closed and travel to ground zero in East Africa would be banned which means no more aid, and aid organizations would be too busy recovering from the disease to solve the grid, landmines, food, vaccines, DCTs.

PICK ONE

We solve - Attaquayefio says US drones are the only way to gather intelligence about the weapons capabilities of terrorist groups and stop attacks - neither US conventional forces nor local governments can gather the same high quality intel as drones, - BUT successes like the Meir evidence won't continue because the Maina evidence says the US is withdrawing from the fight which will cause Al-Shabaab to resurge which is why prioritization is necessary and also non-uniques their link turns.

We solve - Ehrlich says renewed funding trains local forces in conjunction with special ops to stop Al Shabaab and Robinson says that form of indirect action creates lasting change and eliminates the threat for good.

Line by line framing issue is that the intel internal link is insulated from the question of whether the Aff totally solves for Al-Shabaab because even if they still exist if we have drone intel it stops bioterror attacks from succeeding so most of their arguments don't answer this scenario.

THEY DROPPED THE IMAPCT and all the turns case stuff

AT: uq

1. Pullout now – that's Maina – their al jazeera ev is unspec – and amisom pullout now

All the turns – inev they already hate us only question is if we stop attacks

Powers Wood Bergen not about Africa or CTE

Bruton card saying they solve isn't about hum assistance

AT: Turns to drones:

1. These are just disads - they don't turn our internal link about drone intelligence stopping nuclear terror from Attuquayefio
2. No link - the Attuquayefio ev says the vast majority of drone usage in Africa is for intel, not killing.

AT: Special ops trains govts that abuse human rights

1. We solve - The Ehrlich evidence says that more funding means more supervision of government forces which stops human rights abuse.
2. Just a disad - doesn't disprove that Special ops can crush Al-Shabaab and nuclear terror massively outweighs human rights violations.

CASE TAKEOUTS

We'll concede we don't solve Al-Shabaab - that takes out their case

1. Somali government collapse causes terror and drug trafficking spillover to the region which makes aid delivery impossible - that's Masters and Bruton.
2. Al Shabaab resurgence means A, terrorists steal food aid which causes war - that's Knack and Keaton and offense for us, B, aid organizations are legally barred from sending aid to the region - that's Burke, C, grid development is impossible, and D, the landmine problem gets worse.

Extend Anderson - aid means governments spend less on helping civilians and more on war, - that means the net amount of assistance stays the same which takes out all their offense but it also turns the whole case - war exacerbates hunger destroys infrastructure and means new landmines.

REBUTTAL

Nuclear terror outweighs -

1. Extinction is the only truly irreversible impact and its magnitude is infinite since it precludes all future generations from existing, which means a 1% risk of it is still an infinite impact so probability is mostly irrelevant and you should prioritize our impacts because you're psychologically biased to deny them - that's Armstrong.
2. Turns case -
    a. Evan Montgomery at the CSBA in 2009 writes that the US public would panic and demand retaliation to a nuclear terrorist attack which would result in a major interstate war - this means the US would blame Al-Shabaab's state sponsors and start an Iraq style intervention which creates new humanitarian crises like food shortages and wrecks local infrastructure which turns their grid impacts.
    b. Professor Owen Toon explains in 2007 that a single nuclear terrorist attack would cause international economic chaos - that makes other countries stop sending aid to East Africa and turn inwards to fix domestic problems.

Bioterror also outweighs

1. Magnitude and reversibility - Joshua Keating at Foreign Policy explains in 2009 that because globalization would make the disease spread rapidly, a global ebola outbreak would have a civilization ending impact.
2. Turns case
    a. Countries would react to outbreak by closing their borders which means total aid cutoff since East Africa would be seen as ground zero so no aid organizations would be allowed to travel there
    b. Aid organizations would be too busy desperately trying to contain the disease to worry about grid development, landmine removal, or food shortages.

MIGHT NOT BE NECESSARY

3. They can't solve our impact - they can only stop future terrorists from existing by solving poverty hunger etc, but current members of Al-Shabaab will stay terrorists and keep planning nuclear attacks.
4. Aid doesn't solve terrorism - Attaqueyefio from case explains that human security approaches to reducing terrorism will fail because Africa-based terrorists don't care about domestic concerns and are focused on pursuing a hard line anti-west global jihad.

TOP SHELF STUFF

Our uniqueness arguments short circuit their solvency and turn case.

1. Somali government collapse causes terrorism and drug trafficking to spike which make aid delivery in the whole region impossible - that's Masters and Bruton.
2. Not stopping Al Shabaab means A, it's impossible to get aid to the people without terrorists stealing it, and B, US organizations are legally barred from sending aid to the region - that's Hanrahan and Burke from the first impact.

BIG TURNS

1. Dambisa Moyo at the Wall Street Journal explains in 2009 that US aid to Africa is not free - recipients go into debt that must be repaid in full later, which forces governments to cut spending on education and healthcare.
2. Aid causes war. Michael Shank at US News finds in 2013 that empirically, US aid to East African countries like Ethiopia and Kenya has been used to repress civil society, crackdown on dissent, reduce civil rights, and torture refugees. Mary Anderson at the Collaborative for Development Action finds in 1999 that aid substitutes for the government's obligation to help civilians, and thus frees up government resources to be spent on war efforts - that substitution means the net amount of assistance civilians receive remains the same, AND war wrecks infrastructure, causes food shortages, and the reason Africa has landmines is because of past wars so this turns the whole case.

AT: Power Africa

1. Low probability - most aid isn't in the form of electricity aid, and the fact that Power Africa is an Obama era program means Trump probably won't want to fund it.
2. Al-Shabaab turns it - if they control more territory it stalls grid development in the areas that need it the most so beating them is key.
3. Too slow - Pilita Clark at the Financial Times writes in 2016 that any African power project inevitably takes 5 to 10 years due to lack of governmental expertise and widespread corruption - she finds Power Africa specifically has been incredibly slow, and has brought far fewer megawatts online than originally promised - corruption also independently takes out solvency

AT: Landmines

1. Not topical - removing landmines is not humanitarian assistance
2. We solve better. Our case evidence from Irin News proves Al-Shabaab is using land mines to secure territory. Land mine removal is a low probability form of humanitarian aid, but removing landmines would be a necessary part of any counterterrorism effort AND absent counterterrorism the landmine problem will persist because of Al-Shabaab.
3. Wash this argument since we both probably solve some of it so the differences are marginal either way.

AT: Food Aid

1. Turn, Zeweld of Mekelle University writes in 2013 food aid crowds out remittances from first-world countries and employment, creating a substitution effect that ultimately outweighed the benefits of food aid. He concludes that removing food aid would increase employment by up to 4%.

2. Turn, Stephen Knack of the World Bank writes in 2000 that food aid makes control of the government a more valuable prize and thus causes political instability. He contextualizes that Somalia's civil wars can be blamed on competition for control over large-scale food aid. Joshua Keaton at Foreign Policy confirms in 2012 that empirically, food aid increases the likelihood of civil conflict since rebel groups steal as much as 80% of the aid.
3. Turn, The International Food Policy Research Institute writes in 2014 that food aid reduces incentives for local farm production in the long run, hampering the ability of African countries to be sustainable.

AT: Trump cutting food aid now will kill people

1. Tim Worstall of Forbes writes in 2017 that Trump's cuts to the food aid budget are part of a reform that previous presidents like Obama and Bush have tried to pass to make food aid more effective and efficient - the cuts won't kill people.

Uniqueness takeout:

4. Intervening actors solve - The Crisis Group in 2017 finds that other developed countries like Japan and Britain have scaled their aid funding up to an unprecedented level to stop the current famine in East Africa.

REBUTTAL CARDS

“Please, Don’t Send Food” Joshua Keaton, Foreign Policy Magazine, June 18, 2012, http://foreignpolicy.com/2012/06/18/please-dont-send-food/

There’s been plenty of debate in recent years about whether humanitarian aid actually helps rid the world of extreme poverty. The inability of developed countries to make a dent in the problem, despite spending billions of dollars each year, is what economist and noted aid skeptic William Easterly calls the "second tragedy" of global poverty. But a recent study takes this skepticism to a whole new level, suggesting that food aid not only doesn’t work, but also can prolong the violent conflicts it’s meant to help resolve. Looking at a sample of developing countries between 1972 and 2006, economists Nancy Qian of Yale University and Nathan Nunn of Harvard University found a direct correlation between U.S. food aid and civil conflict. **For every 10 percent increase in the amount of food aid delivered, they discovered, the likelihood of violent civil conflict rises by 1.14 percentage points. The results confirm anecdotal reports that food aid during conflicts is often stolen by armed groups, essentially making international donors part of the rebel logistics effort. According to some estimates, as much as 80 percent of the food aid shipments to Somalia in the early 1990s was looted or stolen**. In her book The Crisis Caravan, journalist Linda Polman reported how Hutu rebels who fled Rwanda after the 1994 genocide appropriated aid given out in refugee camps in neighboring Democratic Republic of the Congo, further fueling conflict in the region. Polman also estimated that Nigeria’s 1967-1970 Biafran war — one of the first African humanitarian crises to get global media attention — may have lasted 12 to 16 months longer than it otherwise would have because of the international aid seized by rebel groups.

Extinction

Keating, 9 -- Foreign Policy web editor

[Joshua, "The End of the World," Foreign Policy, 11-13-9, www.foreignpolicy.com/articles/2009/11/13/the_end_of_the_world?page=full, accessed 9-7-12]

How it could happen: Throughout history, plagues have brought civilizations to their knees. The Black Death killed more off more than half of Europe's population in the Middle Ages. In 1918, a flu pandemic killed an estimated 50 million people, nearly 3 percent of the world's population, a far greater impact than the just-concluded World War I. Because of globalization, diseases today spread even faster - witness the rapid worldwide spread of H1N1 currently unfolding. A global outbreak of a disease such as ebola virus -- which has had a 90 percent fatality rate during its flare-ups in rural Africa -- or a mutated drug-resistant form of the flu virus on a global scale could have a devastating, even **civilization-ending** impact. How likely is it? Treatment of deadly diseases has improved since 1918, but so have the diseases. Modern industrial farming techniques have been blamed for the outbreak of diseases, such as swine flu, and as the world’s population grows and humans move into previously unoccupied areas, the risk of

exposure to previously unknown pathogens increases. More than 40 new viruses have emerged since the 1970s, including ebola and HIV. Biological weapons experimentation has added a new and just as troubling complication.

Even without retaliation a small attack causes mass death and international economic failure

Toon et al. 07 – (2007, Owen, PhD from Cornell, Director and Professor, Department of Atmospheric and Oceanic Sciences Fellow, Laboratory for Atmospheric and Space Physics (LASP) University of Colorado, Boulder, Alan Robock, PhD from MIT, Professor II Department of Environmental Sciences School of Environmental and Biological Sciences Rutgers University, R. P. Turco, C. Bardeen, L. Oman, and G. L. Stenchikov, "Atmospheric effects and societal consequences of regional scale nuclear conflicts and acts of individual nuclear terrorism," Atmos. Chem. Phys., 7, 1973–2002, 2007) //CJC

To an increasing extent, people are congregating in the world's great urban centers, creating megacities with populations exceeding 10 million individuals. At the same time, advanced technology has designed **nuclear explosives** of such small size they can be easily transported in a car, small plane or boat to the heart of a city. We demonstrate here that **a single detonation in the 15 kiloton range can produce urban fatalities approaching one million in some cases, and casualties exceeding one million**. Thousands of small weapons still exist in the arsenals of the U.S. and Russia, and there are at least six other countries with substantial nuclear weapons inventories. In all, thirty-three countries control sufficient amounts of highly enriched uranium or plutonium to assemble nuclear explosives. A conflict between any of these countries involving 50-100 weapons with yields of 15 kt has the potential to create fatalities rivaling those of the Second World War. Moreover, even a single surface nuclear explosion, or an air burst in rainy conditions, in a city center is likely to cause the entire metropolitan area to be abandoned at least for decades owing to infrastructure damage and radioactive contamination. As the aftermath of hurricane Katrina in Louisiana suggests, the economic consequences of **even a localized nuclear catastrophe would most likely have severe national and international economic consequences**. Striking effects result even from relatively small nuclear attacks because low yield detonations are most effective against city centers where business and social activity as well as population are concentrated. Rogue nations and **terrorists would be most likely to strike there**. Accordingly, an organized attack on the U.S. by a small nuclear state, or terrorists supported by such a state, **could generate casualties comparable to those once predicted for a full-scale nuclear "counterforce" exchange in a superpower conflict**. Remarkably, the estimated quantities of smoke generated by attacks totaling about one megaton of nuclear explosives could lead to significant global climate perturbations (Robock et al., 2007). While we did not extend our casualty and damage predictions to include potential medical, social or economic impacts following the initial explosions, such analyses have been performed in the past for large-scale nuclear war scenarios (Harwell and Hutchinson, 1985). Such a study should be carried out as well for the present scenarios and physical outcomes.

Human security approach doesn't solve African terror

Attuquayefio 14 – Philip Attuquayefio, Doctor of Philosophy in Political Science and a Master of Philosophy in International Affairs from the University of Ghana, Legon, currently a Research Fellow at the Legon Centre for International Affairs and Diplomacy, University of Ghana, 2014 ("Drones, the US and the New Wars in Africa," *Journal of Terrorism Research*, September 2014,

The Centre for the Study of Terrorism and Political Violence, http://ojs.st-andrews.ac.uk/index.php/jtr/article/view/942/757) //CJC

CONSIDERING THE ANTI-DRONE SCHOOL The argument has been made that using drones against terrorists is not the most lasting way to fight the enemy. To the holders of this opinion, the targeted-killing of terrorists does not deter their fomentation. If a top operative is killed, for instance, it is just a matter of time before he is replaced. Also, the point is made that the more terrorists are attacked with drones, the more they pursue a correction of the asymmetry by targeting innocent civilians as they are in no position to hit back at the drones or their operators (Whetham, 2013). Consequently, **it is argued that, to effectively fight terrorism** particularly in Africa, **the *human insecurity* generators of terrorism must be eliminated** or at least, reduced considerably through transparency and accountability as well as equitable distribution of the national cake to primarily reduce internal dissent likely to fuel insurgencies. This position is sound and undoubtedly reflective of the multivariate causes of terrorism in Africa. As indicated above, for instance, **the post-independence corruption and mal-governance-filled narratives of the Africa State is proven to be one of the creators of terrorism in Africa**. It therefore stands to reason that the search for strategies takes into consideration aspects that rectify the challenges indicated above. **Unfortunately, part of the local dynamics influencing terrorism on the continent may point to the *ineffectiveness of such human security and governance-inspired strategy***. Presently, for instance, **the leitmotif for Africa-based terrorists has shifted or is shifting from out-and-out domestic concerns to a hard lined anti-west agenda**. In such a situation, **one can only be dodgy about whether the terrorists remain interested in pressurising their home governments into pursuing good governance**. If governance in Nigeria improves, for instance, will Boko Haram disband? Will the group abort its objective of de-secularisation of the state? In responding in the negative, this paper suggests the presence on the continent, some **terrorist organisations whose evolution and motive have no relation to Africa's governance challenges, or who have moved *beyond those challenges to represent a global jihad* against the West and values largely considered as of western orientation**. Thus, in reality, such **terrorists are a bunch of 'all or nothing' intransigent killers not willing to meet anybody halfway and as such can hardly be satisfied through negotiations** or good governance. **This unfortunately reduces the human security and governance-inspired strategies** to effective add-ons to multidimensional strategies much the same way as drones. As Olojo (2013) points out, the sources and causes of terrorism in Africa are multiple in nature and as such the best way to counter terrorism on the continent is to pursue a multi-dimensional approach. Using drones as part of the cocktail of strategies for confronting terrorism in Africa must factor in the Pak syndrome. Civilian deaths and abuse of territorial sovereignty resulting from drone usage are legitimate concerns. Notwithstanding, they are bearable opportunity costs in the war on terrorism. Although the death of non-combatants cannot be justified in absolute terms, comparatively, **incidents of terrorism are resulting in the *death of more civilians than American drones have accidentally killed***. Moreover, the point has been made that the civilian-casualties argument against drone usage has largely arisen due to the well-publicised quality of 'precision' drones are supposed to have. Thus, even one civilian casualty is seen as a preventable case. Such a standard cannot be achieved by any ground combat operation. Beyond the attack functions, the intelligence-gathering utility of drones is a practical tool to fight terrorism in Africa. For instance, after Boko Haram abducted about 200 girls from a high school in Chibok, China offered help by providing satellite imagery to help Nigeria track the location of the abductees. America supported with same, as well as surveillance, intelligence and reconnaissance assets. The excellence of these capacities is undoubtedly essential to combatting terrorist attacks such as the Chibok kidnapping incident.

No cure

Cara May 11 2018 [Ed Cara at Gizmodo, "E**bola's Back Again—Why Don't We Have a Cure for It Yet**?", *Gizmodo*, https://gizmodo.com/ebolas-back-again-why-dont-we-have-a-cure-for-it-yet-1825958505]
Ebola has once again resurfaced. On Friday, the World Health Organization reported that there have been at least 34 suspected cases of the viral disease and 18 deaths since early April in the Bikoro District of the Democratic Republic of the Congo (DRC). But Ebola's resurgence, hardly unexpected, can't help but bring a question to mind: **Why haven't we found a surefire way to cure or prevent it yet?**

Al-Shabaab Strong now

Kelley May 1 2018 [Kevin Kelley at the Daily Nation, Africa: Al-Shabaab Ranked Continent's Deadliest Militant Group", http://allafrica.com/stories/201805020234.html]. //CJC

Al-Shabaab is responsible for more than half the reported attacks carried out in Africa by militant Islamist groups during the past 12 months, a think tank associated with the US Defence Department said on Tuesday. **Shabaab also ranks as the deadliest insurgency on the continent. It killed 4,834 persons in the 12-month period** ending on March 31, according to the Washington-based Africa Centre for Strategic Studies. IN**CREASED ATTACKS The intensifying violence in Somalia is consistent with an upsurge in attacks by militant Islamist group**s in eastern, northern and western Africa, the think tank noted in an "infographic". Nearly 3,000 attacks were reported in Africa in the past 12 months -- a **38 per cent increase over the same period spanning 2016 and 2017. Shabaab was able to step up its lethal actions despite a greater frequency of US drone attacks since President Trump's inauguration at the start of 2017.**

Delivery into the US is impossible to stop – too many border crossings

Bunn and Wier 06 (Matthew Bunn & Anthony Wier, on the staff of the Managing the Atom Project at Harvard University's Kennedy School of Government, are the coauthors of Securing the Bomb: An Agenda for Action (2004). "The Seven Myths of Nuclear Terrorism," Harvard Belfer Center, available for download here: http://belfercenter.ksg.harvard.edu/publication/658/seven_myths_of_nuclear_terrorism.html) //CJC

While some investment in improving **border detection** capabilities is certainly worthwhile, this last line of defense **will always b**e a **very porous** one. The physics of nuclear materials and nuclear weapons, the geography of the huge and complex American borders, and the economics of the global flow of people and goods conspire to make the terrorists' job easy and the defenders' job very difficult. **Once stolen**, the **nuclear materia**l for a bomb **could be any- where**, and **it is very difficult to detect,** especially if shielding is used to limit radiation emissions. **Typical nuclear weapons are not large, and could readily be smuggled across America's or other nations' border**s. The nuclear material needed for a bomb could easily fit in a suitcase. Even an assembled bomb could fit in a van, a cargo container, or a yacht sailed into a US harbor. Or the materials could be smuggled in and the bomb built at the site of its intended use. Terrorists have routinely used truck bombs that were physically larger than even a crude terrorist nuclear bomb would need to be. **America's borders stretch for thousands of miles, and millions of trucks, trains, ships, and airplanes in which nuclear material might be hidden cross them every year**. Hundreds of thousands of illegal immigrants and thousands of tons of illegal drugs cross US borders every year, despite billions of dollars of investment in trying to stop them. (Some have said that the easiest way to bring nuclear material into the United States would be to hide it in a bale of marijuana.) Every nation's border is vulnerable to various types of illicit movement, be it drugs, terrorists, or the material needed to unleash nuclear terror. The **radiation from plutoniu**m, and especially from HEU**, is weak and difficult to detect at any significant distanc**e, particularly if the material is surrounded with shielding. Technology does exist, and is being further developed, to make it possible to detect HEU or plutonium in objects right in front of the detectors (as might be possible at controlled border crossings), including finding hidden nuclear material in everything from airline

baggage to cargo containers. Programs are now under way to put these kinds of detection capabilities into place at an increasing number of sites. But these capabilities should not be exaggerated. While US Customs officers have been equipped with "radiation pagers," these would have essentially no chance of detecting HEU with even minor shielding, even if it were in a bag directly in front of the inspector. More sophisticated equipment that can detect both HEU and plutonium is being purchased—but it will be years before such equipment is installed and in use at all the major ports and border crossings into the United States. Two points are crucial to understand. First, **inspecting cargo as it arrives in the United States is not good enough: if a bomb were on a boat sailing into a major US harbor, it could wreak horrible devastation before the ship ever pulled up to the dock to be inspected**. That is why many of the new initiatives after the 9-11 attacks involve putting detectors in place at foreign ports that ship to the United States. But it will take an immense and continuing effort to ensure that detection at these ports is effective, that there are no ready possibilities for bribing a customs official to let a container through uninspected and that already inspected containers cannot be tampered with. Second, and more fundamentally, **the number of possible pathways to smuggle a nuclear bomb or its ingredients into the United States is immense**, and intelligent adversaries will choose whichever pathway remains undefended. If an effective system were put in place to make it very difficult to get nuclear material into the country in a cargo container without detection—and the country is a long way from that point today—then terrorists would bring their bomb in on a yacht, a fishing boat, or by some other means.

Physicists conclude that it's easy, material is available – terrorist weapons don't require the same high standards that make regular weapons so complex

Zimmerman and Pluta 06 – (2006, Peter, PhD, experimental nuclear and elementary particle physics, Emeritus Professor of Science and Security at King's College London, former Chief Scientist of the Senate Foreign Relations Committee, and Anna, researcher, Center for Science and Security at King's College London, PhD candidate, "Nuclear terrorism: A disheartening dissent," Survival: Global Politics and Strategy Volume 48, Issue 2, 2006, taylor and francis) //CJC

It seems certain that **at some price nuclear explosive material is available to well funded terrorists, even if there have been no documented incidents** in which nuclear explosive material has been sold in useful quantities. With access to fissile materials, in particular HEU or reasonably clean Pu-239, many authors have claimed that improvised nuclear devices[29] are comparatively easy to build.[30] The principal physicists who are exponents of the 'easy-to-build' idea are Theodore B. Taylor, a former fission-weapons designer at Los Alamos Scientific Laboratory, and Nobel Laureate Luis Alvarez. Alvarez notably suggested that a nuclear explosion could result if one appropriately sized and shaped piece of U-235 metal were dropped on a second properly sized and shaped piece;[31] **Taylor**, in John McPhee's The Curve of Binding Energy, **claimed that, given the material, building a bomb is 'very easy**. **Double underlined. Very easy'**.[32] It is likely that both experts spoke somewhat loosely for effect, because at the time they wrote the official position was that no terrorist could build a nuclear device because constructing a nuclear weapon required an effort on the scale of the Manhattan Project together with a team of scientists of the calibre of those at Los Alamos from 1942 to 1945. Time has shown that states can go nuclear with smaller projects, and certainly with less brilliant scientists. In part this reduction in required effort and talent is because very large amounts of information about the construction of nuclear weapons as well as the fast-reactor physics needed to compute the behaviour of nuclear devices have become public. This publication sometimes occurred deliberately, as in the historic 1954 Atoms for Peaceconference or the 1970s-era International Nuclear Fuel Cycle Evaluationstudy. Sometimes the information oozed out, as in the McPhee book, and sometimes it was effectively re-invented.[33] Many details can now be found in the physics literature.[34] **There are crucial differences between nuclear weapons built by a state for use in a military stockpile and devices**

constructed by groups for use in single dramatic acts of terror. A military device must be **reliable**(it must explode when detonated); it must be **predictable**(the yield attained must be substantially the same across a complete production run of weapons so that troops using the weapons can choose the one which will best do the job); **and** it must be **safe**(a military weapon must be safe to handle and not detonate in common accidents; above all it must not detonate with nuclear yield when the detonation has not been authorised).**A bomb built by a terrorist need not be especially reliable, and it certainly need not be particularly predictable**. That is, any yield falling somewhere between 100 tonnes (0.1kt) and 20,000 tonnes (ZOkt) of TNT will almost certainly be considered adequate by the terror group concerned. Surely the strike group would prefer a larger yield to a smaller one, all things being equal; but a 100-tonne explosion will be very nearly as effective as a tool of terror as a 20kt one. Most importantly, it will be perceived as nuclear, and it will contaminate a very large area with radioactive fallout (some, of course, being the unfissioned nuclear material itself). We assume that the terror cell will be concerned with its own safety while assembling the device and transporting it to target, but **we do not believe that any terrorist group would or even could attempt to reach the safety levels demanded of an American weapon** 35In 1977 the US Congress's Office of Technology Assessment (OTA) studied nuclear proliferation and safeguards. In its report the OTA panel concluded that a**n appropriate technical team for building an improvised nuclear device was two people**, **one** of whom was a skilled **machinist and** the other a **physicist**.36 If the fissile fuel for the device is uranium enriched to 50% or more, this is a plausible, if stressing, scenario that has been explored in some detail in fiction.37

Dambisa Moyo, 2009, “Why Foreign Aid is Hurting Africa”,
http://www.wsj.com/articles/SB123758895999200083

Over the past 60 years at least $1 trillion of development-related aid has been trans- ferred from rich countries to Africa. Yet real per-capita income today is lower than it was in the 1970s, and more than 50% of the population – over 350 million people – live on less than a dollar a day, a figure that has nearly doubled in two decades. Even after the very aggressive debt-relief campaigns in the 1990s, African countries still pay close to $20 billion in debt repayments per annum, a stark reminder that aid is not free. In order to keep the system going, debt is repaid at the expense of African *education* and health care. Well-meaning calls to cancel debt mean little when the cancellation is met with the fresh infusion of aid, and the vicious cycle starts up once again. In Zambia, former President Frederick Chiluba (with wife Regina in Novem- ber 2008) has been charged with theft of state funds. ENLARGE In Zambia, former President Frederick Chiluba (with wife Regina in November 2008) has been charged with theft of state funds. AFP/GETTY IMAGES In 2005, just weeks ahead of a G8 conference that had Africa at the top of its agenda, the International Monetary Fund published a report entitled “Aid Will Not Lift Growth in Africa.” The report cau- tioned that governments, donors and campaigners should be more modest in their claims that increased aid will solve Africa’s problems. Despite such comments, no serious efforts have been made to wean Africa off this debilitating drug. The most obvious criticism of aid is its links to rampant corruption. Aid flows destined to help the average African end up supporting bloated bureaucracies in the form of the poor-country governments and donor-funded non-governmental

organizations. In a hearing before the U.S. Senate Committee on Foreign Relations in May 2004, Jef- frey Winters, a professor at Northwestern University, argued that the World Bank had participated in the corruption of roughly $100 billion of its loan funds intended for development. As recently as 2002, the African Union, an organization of African nations, estimated that corruption was costing the continent $150 billion a year, as international donors were apparently turning a blind eye to the simple fact that aid money was inadvertently fueling graft. With few or no strings attached, it has been all too easy for the funds to be used for anything, save the developmental purpose for which they were intended.

US aid gets used to crackdown on HR—empirics

Shank 2013 [Michael Shank is a writer for US News. “Aid Gone Awry in Africa: America must be far more careful about who winds up on the receiving end of its military aid”. 18 June 2013. <http://www.usnews.com/opinion/blogs/world-report/2013/06/19/how-american-military-assistance-goes-wrong-in-africa>] //CJC

This "Western money" and "African boots" approach to security assistance programs is increasingly seen by Washington as an innovative alternative to large- scale wars – one that allows for "sharing" the burden of security and empowering foreign forces to address their own problems. But without careful accountability and rigorous evaluation, its implementation looks a lot more like short-sighted Cold War policies in Latin America than local empowerment. Take a look at how bad it's gotten as part of the mission creep on the African continent's northern half. **Human Rights Watch released a report last month documenting the abuse, rape and torture of at least 1,000 Somali refugees by U.S.-backed Kenyan police forces as retaliation for supposed terrorist attacks.** This follows a report by the Open Society Justice Initiative released last November that connected U.S. counterterror assistance and influence to systemic human rights abuses in Kenya and Uganda, and another account of U.S.-backed torture in Mauritania. And then there's always **the Ethiopian government, another major recipient of U.S. assistance, which has used anti-terrorism laws to actively repress civil society, crack down on peaceful dissent and limit the civil rights of Muslims and others.**

Aid frees up resources for crackdowns

Mary **Anderson, President of the Collaborative for Development Action**, Inc, DO NO HARM: HOW AID CAN SUPPORT PEACE OR WAR, **1999**, p. 49-50

In some circumstances external aid can fill so great **a proportion of civilian needs for food, shelter, safety, and health services that significant local resources are thereby freed up for the pursuit of war**. This economic substitution effect of aid has a further political impact. **When external aid agencies assume responsibility for civilian survival, warlords tend to define their responsibility and accountability only in terms of military control.** Even if they started with a commitment to peacetime political leadership**, as the international aid community takes over the tasks of feeding and providing health services** and shelter for civilians these **military-oriented leaders increasingly relinquish responsibility for civilian welfare.** They focus on military ends and, over time, define their roles solely in

terms of physical control (and the violent attainment and maintenance of that control). As this occurs, warriors struggling for victory over space and people lose all interest and competence in civilian affairs and become increasingly ill prepared to assume broad, responsible leadership in a postwar period.

Food aid erodes long term food security for the poor

Transitioning from Humanitarian Assistance to Development in Protracted Refugee Situations." (n.d.): n. pag**. International Food Policy Research Institute**, May **2014**. Web. 4 Oct. 2015.http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/128135] //CJC

"Of all the different types of humanitarian aid, **food aid** is probably linked most closely to food security and has received much debate and analysis in the literature. In general, food aid improves food availability and can mitigate sharp increases in prices of aid-related food items in the short run (del Ninno, Dorosh, and Subbarao 2007; Kirwan and McMillan 2007). However, depending on whether it is directed only to refugee camps or to nearby households in the host community as well, it will have varying distributional impacts. Often the **poorer households of the host population are disfavored if the supply is not sufficient to prevent local food price hikes, and in these circumstances the aid likely erodes their capacity to build resilience and long-term food security** (Chambers 1986).

Food aid means less local farming — worse in long term

Transitioning from Humanitarian Assistance to Development in Protracted Refugee Situations." (n.d.): n. pag**. International Food Policy Research Institute**, May **2014**. Web. 4 Oct. 2015.http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/128135] //CJC

"Whether food aid is procured locally, regionally, or from overseas is another aspect of food aid that has been debated in terms of its implications for food security of the host community, in both the short run and the long run. **If food aid is imported from overseas and is not procured from local markets, it may reduce the incentives for farm production in the long run, thereby hampering the ability of the host community to transition from humanitarian aid to development.** This generic effect of overseas imported food aid is reinforced in refugee settings because food production is often hampered by conflict and lack of security, and by the lack of production capacity and price incentives once the security conditions improve."

Power Africa fails

Clark 2016 [Pilita Clark at Financial Times, "Barack Obama's Power Africa initiative makes slow progress", *Financial Times*, <https://www.ft.com/content/96dac28a-49c9-11e6-8d68-72e9211e86ab>] //CJC

When Barack Obama unveiled a $7bn plan to double access to electricity across sub-Saharan Africa it was hailed as game-changing step that could transform millions of lives. Crumbling, mismanaged energy systems have long been an oppressive brake on economic growth in the region's 49 countries, which have less grid-connected electricity than South Korea and about 600m power-starved people. However, three years after Mr Obama promised to bring "light where currently there is darkness" and "clean energy to protect our planet", **progress on the ground is proving painfully slow**. T**he Power Africa programme**, which the president

launched in 2013, is **supposed to add 30,000 megawatts of electricity by 2030, equal to nearly a third of sub-Saharan Africa's existing generating capacity. But only 374MW from six sizeable power projects is up and running so far,** according to data provided to the Financial Times by the US Agency for International Development, co-ordinator of the multiple government agencies and companies involved in Power Africa. Other large power schemes are due to come online soon and the programme is backing several ventures providing smaller household solar panel systems to more than 450,000 customers. But the rate and nature of progress is raising pressure on an initiative that follows a spate of other well-intentioned efforts to transform a continent blighted by some of the world's most intractable development problems. Concerns about Power Africa's progress have started to surface in some of the companies involved in the initiative, including General Electric, the US conglomerate. Power Africa is a "well-intentioned effort with a lot of smart people," John Rice, GE's vice-chairman, told a conference in Rwanda in May. "But **if you look today at the number of megawatts that are actually on the grid directly related to the Power Africa initiative, it is very little**," he said. GE was an early backer of the programme, which has garnered more than $31bn in private sector commitments. But Mr Rice said it had taken 1**6 months to get Ghana's parliament to approve an agreement for an emergency power scheme**. "I don't know how long it would take if it wasn't an emergency," he said. Defenders of the initiative urge patience for a programme intended to do more than simply act as another type of foreign aid venture building new projects from scratch. USAID says the total pipeline of projects that have either reached financial close or will do so shortly accounts for more than 5,600MW of capacity. Power Africa has deployed a team of experts acting as "transaction advisers" to work with companies and governments to accelerate work on often complex power schemes that many countries have never attempted before. Gayle Smith, USAID's administrator, says the idea is to create an energy market in Africa that can "run on its own". "I would say on that metric we're doing very well," she told the FT. "I don't think there was any expectation that we were going to in some way instantly close a lot of deals and build energy production facilities on the cheap or quickly." Some of the new Power Africa electricity is from renewable energy projects, such as a $24m utility scale solar plant in Rwanda that officials say is the first of its kind in East Africa. But more than half is from fossil-fuelled power plants, including one in Senegal using heavily polluting fuel oil. Development experts, however, say it would be hypocritical for wealthy western countries still dependent on fossil fuels to criticise this move. "Energy shortages are so tremendous in Africa that countries are desperate for whatever power sources they can get," says Todd Moss, a former state department official who is chief operating officer at the Center for Global Development, a think-tank. A**frican power schemes can typically take five to 10 years from inception to completion, experts say.** Some analysts say Power Africa should put greater focus on the rapidly expanding off-grid solar panel businesses, which can put electricity in people's homes much faster. **"I think they [Power Africa] are just way, way behind the curve**," says Kevin Watkins, executive director of the Overseas Development Institute, a UK think-tank. But other renewable energy developers say the slow progress of the initiative is to be expected. **"Things take longer in Africa**," says Eddie O'Connor, whose Mainstream Renewable Power company has been operating in Africa since 2009. **Lack of government experience is one problem, and so is corruption**, he says. Mainstream was once asked to pay for a political leader's new Humvee when it was seeking approval to use land for a new wind farm. Mainstream refused the request.

Substitution effect outweighs, removing food aid increases employment

Woldegebrial Zeweld, Department of Agricultural and Resource Economics, Mekelle University. January 2013, "Impact of Food Aid on Household Food Security: Empirical Evidence." https://www.researchgate.net/publication/287865891_Impact_of_Food_Aid_on_Household_Food_Security_Empirical_Evidence

Various studies have been conducted on whether food aid enables the poor and unemployed to effectively use their labor because the unemployed and the poor are highly dependent on food aid. Schultz argued that food aid causes a disincentive effect for labor supply and domestic production (Holder 1993). The disincentive effect of food aid on labor supply exists but mainly remains in the agriculture sector (Isenman and Singer 1977). **Food aid crowded-out informal** insurance **arrangement like relative remittance and household labor exchange** (Lentz and Barrett 2008). Tadesse (2009) observed that FFW in Ethiopia has provided food today for the food-insecure recipients but at the expense of tomorrow because it hinders labor in productive investment.

Salisbury (1992) found that since **the substitution effect of food aid overweighed the income effect of food aid-based programs, it siphoned productive inputs away from local private production creating a labor distortion** (Harvey et al. 2010). **With removal of any food aid, employment in agriculture has increased by 4% and non-agriculture sectors by 2%** (Gelan 2007). **Households that received food aid for two consecutive years have a higher probability of dependence syndrome than households who received less than two years or didn't receive at all.** Food recipient households have spent less time in supplying labor to permanent crops and non-agricultural own business activities. Households not receiving food aid have worked many times than those households who received. Male labor supply of non-agriculture own business went down with receipt of food aid, but it was rising for a female labor time. Thus, **food aid caused labor to divert from private works to food-based community works** (Daniel and Hoddinott 2007). Harvey et al. (2010) opined that food aid has made hard working people prefer more leisure and unintentionally discourage them from working and reduce labor supply. Jayne et al. (2001) questioned whether past receipt of food aid reflects chronic needs or inertia using the Tobit model in Ethiopia and Impact of Food Aid on Household Food Security 116 found Tigray region contained 33% more people in need than other regions due to the bias that has existed since the 1980 famine period in the region. Food aid has altered the behavior of the recipients because they have unwittingly allocated less time in their own farm and business works (Barrett and Maxwell 2006).

Food aid increases incentives to control the government, causes civil war

Stephen **Knack** (World Bank) "Aid Dependence and the Quality of Governance" July **2000** http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2000/08/26/000094946_00081406502627/Rendered/PDF/multi_page.pdf] //CJC

As Rodrik (1996: 31), notes, however, external resources can help bad as well as good governments survive, by reducing the cost of doing nothing as well as reducing the costs of reforming. By providing an alternative source of revenues, aid can relieve pressure on recipient governments to establish the efficient policies and institutions necessary for attracting private capital. Large-scale foreign aid was originally justified largely as a means of overcoming capital shortages, yet many aid recipients maintain policies that have the effect of restricting inflows of private capital (Bauer, 1984: ch. 3). Similarly, the end of U.S. aid - which had been generous in the 1950s -- is often credited for the Korean and Taiwanese reforms of the 1960s (Rodrik, 1996: 31). **Aid can even increase political instability, by making control of the government a more valuable prize. Instability shortens time horizons, leading regimes to grab everything they can for themselves and their supporters during their turn in power. For example, Maren (1997) 3 blames Somalia's civil wars on competition for control of large-scale food aid.** Political scientists have argued that aid weakens governmental accountability, by retarding the development of a healthy "civil society" underpinning democracy and the rule of law. The evolution of democracy and the rule of law in the West was critically related to monarchs' needs for tax revenues, particularly for fighting wars (Karl, 1997: 60).

Unprecedented increase in funding

Crisis Group, May 9, 2017, "Instruments of Pain (III): Conflict and Famine in Somalia." https://www.crisisgroup.org/africa/horn-africa/somalia/b125-instruments-pain-iii-conflict-and-famine-somalia — MW

Donors and humanitarian agencies, including the UN, were better prepared and quicker to respond to warnings of impending famine in early 2017. Since January, **the UN estimates that the Somalia humanitarian appeal received "unprecedented levels of funding", with close to $600 million raised in direct donations or pledges.** In early March, the UN launched an $825 million appeal. Although precise figures remain unclear, the overall funding gap has substantially narrowed in recent weeks, thanks notably to significant pledges from the UK, Japan and Germany. Turkey and UAE likewise significantly upped their aid operations, typically conducted outside the UN aid system. The #TurkishAirlinesHelpSomalia and #LoveArmyforSomalia social media campaigns garnered the support of many international celebrities, helped draw attention to the food crisis and raised more than $1 million. Turkish Airlines eventually fulfilled its promise and delivered 60 tons of humanitarian aid to Mogadishu. More recently, a campaign by the Emirates Red Crescent Society reportedly raised $45 million for drought relief. **Altogether a massive emergency relief operation is underway bringing together many foreign and local NGOs.** Improvements in coordination and management of humanitarian operations partly reflect lessons learned from the 2011 famine. The "Access Taskforce", set up in 2015 by aid agencies operating in Somalia to negotiate better access with the patchwork of different authorities and minimise official red tape, helped create far more favourable aid delivery conditions. That said, coverage varies regionally, with better results in most of the north east and north west, and more limited ones in the south-central region.

CASE CARDS

AFRICOM general calling for use of CVE in East Africa

Rodriguez 14, March 5, 2014 "Statement of General David M. Rodriguez of the United States Africa Command, Before the H**ouse Armed Services Committee** Posture Hearing." http://www.defenseinnovationmarketplace.mil/resources/AFRICOM-RodriguezUSAD-20140305.pdf —MW

In spite of many upward trends, Africa's security environment remains dynamic and uncertain. While the continent's expanding political, economic, and social integration are positive developments as a whole, they are also contributing to Africa's increasing role in multiple transnational threat networks, including the global al-Qa'ida network and drug trafficking networks reaching into the Americas, Europe, the Middle East and South Asia. Countering the growing activity of the alQa'ida network in Africa and addressing instability in key nations are our primary near-term challenges. The collective aftermath of revolutions in Libya, Tunisia, and Egypt, including uncertain political transitions, spillover effects, and exploitation by violent extremist organizations of under-governed spaces and porous borders, are key sources of instability that require us to remain vigilant in the near term. In the long term, our military-to-military engagement can help to reinforce and shape relations with those countries that have the greatest potential to positively influence security on the African continent, now and in the future. Growth of the al-Qa'ida Network in Africa. Instability in North and West Africa has created opportunities for extremist groups to utilize uncontrolled territory to destabilize new governments. The network of al-Qa'ida and its affiliates and adherents continues to exploit Africa's under-governed regions and porous borders for training and movement of fighters, resources, and skills. Like-minded extremists with allegiances to multiple groups increasingly collaborate in recruitment, training, operations, and financing across Africa and beyond. Terrorists are learning their trade abroad, returning to their countries with hardearned skills that increase their lethality. North Africa is a significant source of foreign fighters in the current conflict in Syria. Syria has become a significant location for al-Qa'ida-aligned groups to recruit, train, and equip extremists, who may also present threats when they return home. The increasingly syndicated and active violent extremist network in Africa is also linked to core al-Qa'ida, which is on a downward trajectory, and al-Qa'ida in the Arabian Peninsula, which is resurging and remains intent on targeting the United States and U.S. interests overseas. Multinational efforts are disrupting terrorist training, operations, and the movement of weapons, money, and fighters, but the growth and activity of the violent extremist network across the African continent continue to outpace these efforts. Additional pressure in east Africa and the Sahel and Maghreb regions, including efforts to counter violent extremist ideology and promote improved governance, justice, and the rule of law, are required to reduce the network.

What is CVE?

HRF 2015, Human Rights First, May 2015, "How to Counter Terrorism by Supporting Civil Society in the United Arab Emirates." http://www.humanrightsfirst.org/sites/default/files/UAE-Blueprint-Final.pdf —MW

New U.S. Ambassador to the UAE Barbara Leaf should assist relevant U.S. agencies to implement the September 2014 presidential memo directive that "Each [U.S. government] agency abroad shall incorporate inclusive outreach to civil society in their international engagement." Ambassador Leaf should help facilitate this engagement between civil society and U.S. agencies. Whether Department of Defense officials are visiting the UAE to monitor progress or Department of Commerce representatives are exploring new investment opportunities, or if any other U.S. agency visits the UAE, the Embassy should endeavor to facilitate contacts between U.S. government officials and the UAE's beleaguered civil society representatives. Offer resources to local civil society figures and other community-based stakeholders to counter violent extremism and develop programming designed and/or implemented by those local groups. Countering violent extremism, or CVE, aims to reduce the number of terrorism supporters by addressing the reasons people become attracted to terrorism in the first place: poor social, institutional, and economic conditions, political and/or religious repression, and the influence of terrorist leaders who promise to improve these conditions and provide greater meaning and purpose to new recruits' lives.

CVE reduced terrorism by around 85%, had a 2% recidivism rate when used in Saudi Arabia

William Sheridan Combes, Small Wars Journal. July 9, 2013, "Assessing Two Countering Violent Extremism Programs: Saudi Arabia's PRAC and the United Kingdom's Prevent Strategy." http://smallwarsjournal.com/jrnl/art/assessing-two-countering-violent-extremism-programs-saudi-arabia%E2%80%99s-prac-and-the-united-king — MW

Despite the successes of the aforementioned operations in neutralizing some of the main proponents of this ideology, these ideas still exist. Due to the ubiquity of these ideas and their penetration into civil society, a few nations have sought to take a more comprehensive and non-violent approach to tackling violent extremism. Authorities label these programs as countering violent extremism (CVE), and they exist in both Muslim and non-Muslim majority states. Two such programs have gained notoriety for their effort to tackle militant Islamist extremism: Prevention, Rehabilitation, and After Care (PRAC) program in Saudi Arabia and the Prevent Strategy in the United Kingdom (U.K.). Through an analysis of PRAC and Prevent, we can contrast two different ideological approaches to CVE, see the importance of social welfare in implementing these programs, and understand the difficulty in evaluating the efficacy of CVE programs. An analysis of these case studies—one found in a Muslim majority state and one not—will benefit the national security of the United States as policy makers implement and assess the country's nascent CVE program. […] PRAC also strengthens social bonds during the rehabilitative process by including a detainee's family and offering social services to him and his family. The Advisory Committee typically includes family members during de-radicalization. Families "are briefed on the condition of their sons, their experiences, and how they have been affected. Families are counseled on how to talk to their sons and persuade them to repent."[16] To accommodate the social need of a detainee, the Saudi Government will provide financial support in the form of lost salary, family healthcare, and children's schooling for a detainee and his family during the detainee's incarceration. This vast array of psychological and financial support represents PRAC's strong insistence on the social welfare of its detainees and that the Saudi Government "cares deeply about each person and that it will therefore do whatever it takes to support and care for someone."[17] Despite its comprehensive approach to CVE, one must wonder about the success of the program. The Saudi Government has rated the program's success at around 80 to 90 percent and acknowledged that 10-20 percent failure rate does not distinguish between detainees that failed or those that refused to participate. These dubious numbers imply that PRAC's only failures are those individuals that did not participate. PRAC authorities also have not indicated how the Saudis truly measure success. Saudi officials boast that "a vast majority of prisoners who complete the program are not acting on their previously held beliefs" manifests itself in a recidivist rate of merely 1 to 2%. Yet, recidivism does not gauge how a person has undergone cognitive de-radicalization—just that person may not associate with terrorists or engage in illicit behavior. Disengagement, therefore, does not truly measure de-radicalization. Like PRAC, the U.K.'s Prevent Strategy seeks to counter militant Islamist ideology. Prevent's ideological approach, however, finds its roots in British values—not Islamic theology. When British Home Secretary, Theresa May, introduced the new Prevent Strategy in 2011, she placed it in the context of the previous strategy's failure: An inability to separate a policy of integration from a policy of counterterrorism.

Al Shabab uses mines

Irin News, 2013, "Landmine danger persists in Somalia", http://www.irinnews.org/news/2013/02/01/landmine-danger-persists-somalia

Thousands of landmines and other unexploded ordnance (UXO) scattered in parts of Somalia over past decades of conflict are emerging as a threat to the relative security now being enjoyed there, with inadequate demining expertise posing a challenge, say officials. "[Land]mines are planted everywhere. Even mosques are not safe," Lt-Col Farah Dhiblawe, a demining expert with the Somali National Army, told IRIN. "We were trained to use the mines to defend the country and the religion, but now Somalis are using it to harm their own citizens, which is unfortunate." The eastern Somalia-Ethiopia border region is among the areas heavily infested with UXOs, which were planted during the 1977 border war. Cities that witnessed more recent clashes between government troops and the insurgent Al-Shabab militia group are similarly affected. "Explosive stockpiles, abandoned weapons and ammunition caches, and improvised explosive device (IED) factories are emerging as new threats as the [Somalia] government gains control of new areas," notes the UN Mine Action Service (UNMAS) on its website. **"The laying of mines by Al-Shabab has been reported as a means to secure strategic**

locations. This is in addition to the detritus of war left after decades of civil conflict, and the minefields laid during the Ogaden and Somali National Movement conflicts." According to UNMAS, most communities in south-central Somalia suffer "from a degree of explosive remnants of war (ERW) contamination; few have the support or capacity to deal with these threats." Dhiblawe, who has since 2007 helped destroy some 67 landmines, concurs: "Somalia did not produce enough trained people to deal with this problem of landmines for the last two decades, [and getting] professional Somalis with the right equipment is the biggest challenge."

Overview of mines in East Africa

Michael P. Moore, Landmines in Africa. August 5, 2011, "Landmines and the Famine in East Africa." https://landminesinafrica.com/2011/08/05/landmines-and-the-famine-in-east-africa/ — MW

Much of the Horn of Africa is polluted by landmines and explosive remnants of war. Djibouti, Eritrea, Ethiopia, Somalia and Somaliland all have extensive minefields and ERW contamination **from wars dating back to** the Italian invasion in **the 1930s. The recent war (1998) between Eritrea and Ethiopia placed more mines and ordnance along the countries' borders and the near-permanent state of civil war in Somalia has meant that two decades' worth of explosive material litters the areas** around Mogadishu and 10% of the communities in Bakol (or Bakool) have landmines and ERW. Surveys in Somalia have been limited, but according to the Landmine Monitor, in 2009 Somalia had 126 landmine and ERW casualties on top of the 116 in 2008. Ethiopia saw 21 casualties over the same years, Eritrea 102, Somaliland 81 and zero for Djibouti. **The Horn of Africa represented 40% of all landmine casualties in Africa** in 2009 and the Monitor believes **the numbers are under-reported**, suggesting many more incidents went undocumented. As a result, I expected to find significant reporting on the plight of landmine victims as a vulnerable population within the famine-affected region. Instead, I've seen no mention of landmine accidents or reports from mine action organizations (specifically the HALO Trust, Mines Advisory Group and Handicap International) about how their work has been constrained by the famine. The civil war in Libya has dominated headlines about landmines in Africa along with the deaths of four United Nations peacekeepers in Abyei in Sudan.

Uniqueness: only 1/7th of the funding goals met, suspended activities

Steinar Essen, Department for Humanitarian Disarmament. 2015, "CLEARING THE MINES: Report for the Fourteenth Meeting of States Parties to the Anti-Personnel Mine Ban Convention."
http://www.mineactionreview.org/assets/downloads/NPA_Clearing_the_Mines_2015.pdf — MW

In June 2015, a representative from NMAC stated that Sudan was committed to meeting its National Mine Action Plan clearance deadline of 2019, but re-emphasised that it faced large challenges due to lack of funding and ongoing conflict in Blue Nile and South Kordofan. **UNMAS reported that, as of early 2015, nearly all mine clearance activities were suspended due to lack of funding.** It stated that US$6 million was necessary to complete land release in the eastern states and emergency clearance in the southern states, as a result of **Sudan's mine action programme being "seriously underfunded" in 2014, when total funding requirements were estimated at $7 million, while total funding received from multiple sources amounted to $1.1 million.** In June 2015, UNMAS reported that its operations in Abyei were fully funded through 30 June 2016 and that UNISFA had allocated $25.4 million in support of its activities in Abyei and along the Safe Demilitarized Border Zone for the period of 1 July 2015 to 30 June 2016.

Specific impacts on inhibiting development, infrastructure

Adinoyi Adavize Julius, Institute of Diplomacy and International Studies, University of Nairobi. July 2013, "Terrorism, Weapon of Mass Destruction, Landmines and Counterinsurgency." https://www.academia.edu/4096823/terrorism_landmine_weapon_of_mass_destruction_and_counterinsurgency — MW

Both anti-personnel and anti-vehicle mines have caused great suffering in the past decades. Every day, people die or lose limbs from stepping on a landmine. Mostly in countries at peace - and the majority of victims are civilians. **Landmines have extensively been used in internal conflicts also, thus directly affecting the civilian population in the form of terror, hampered economies and prevention of mobility.** Mines other than anti-personnel mines (MOTAPMs), or anti-vehicle mines, are designed to incapacitate or destroy vehicles, containing a larger explosive charge than antipersonnel mines. They are commonly used on roads to prevent traffic. **As with personnel landmines, MOTAPMs kill and mutilate a large number of people every year and prevents people from using roads, leaving many rural communities completely isolated. Delivering humanitarian aid becomes difficult and dangerous – as an end result, populations are denied access to health care, food distribution and clean water.** The exact number of people who suffer from this causality cannot be calculated, but for example in 2003, the UN Mine Action Service reported that 16 anti-vehicle mines had affected the delivery of humanitarian assistance to almost 300,000' people in Angola. In 2006 Landmine Action released a report identifying 56 countries affected by MOTAPMs. [...] **Landmine and unexploded ordnance (UXO) contamination have significant humanitarian implications. Mines can hamper reconstruction after conflict, perhaps by blocking the route of a new highway or a power line. Mines can deny the use of agricultural land or riverbanks.** They can even prevent tourism bringing in valuable foreign currency through denying access to cultural heritage sites. **Development project personnel who are not warned of the dangers can become casualties.** However, most of all, mines affect the poor. **Mine contamination denies the safe use of agricultural land. Many people leave the land and drift to the towns; others, often the poorest elements of society in mine-affected countries, have to take risks to survive: many people living in mine-affected countries engage in various kinds of deliberate risk-taking activities, such as gathering firewood or herding cattle in areas they know to be mined, simply because they have no choice.** Faced with stark economic imperatives, some people even take on "do it- yourself" demining to clear land for their own use or to salvage the metal cases of weapons for sale as scrap metal. [...] **Landmines cause many other costs: land that cannot be used, roads that cannot be used, loss of trade, and the costs of treating injured people.** Example is in Libya, where 27% of the total farming land cannot be used because of mines left behind from World War Two, more than 50 years ago; and **in Somalia grazing land and water sources have been badly damaged. Also without landmines agricultural production could more than double** in both Afghanistan and Cambodia. Delivering relief supplies can become much more expensive. In one part of Angola (1988) it cost the Red Cross $2,200 per tonne to deliver supplies by aircraft. If there were no landmines, they could have used roads and railways - the cost would have been about $89 per tonne. Similarly in Sudan in 1995, overland aid had to be replaced by air shipments costing $2,000 per tonne. **The presence of mines in agricultural areas not only impacts on the local community which relies on the land for a living, but the decreased food production may have widespread consequences for the country or region as a whole.** Andersson suggested that, without mines, agricultural production could be increased by 88–200% in Afghanistan, 11% in Bosnia, 135% in Cambodia, and 3–6% in Mozambique. **Landmines were seriously detrimental to the economy and food distribution in each of these countries. Post-war economic recovery suffers under the burden of amputees who often can no longer support themselves or their families. Frequently, refugees are unable to return home because their land has been mined.** Many of these people become permanent refugees, which places a severe economic and social strain on the community and country that took them in. The promotion of tourism as a boost to the local postwar economy can be severely hampered by the presence of landmines.

Empirics: America solved 16 countries for mines

Jerry Guilbert, April 4, 2017, Deputy Director of the Office of Weapons Removal, State Department's Bureau of Political-Military Affairs. "Five Things You Should Know About U.S. Support to Mine Action." https://state.gov/stories/2017/04/04/en/five-things-you-should-know-about-us-support-mine-action — MW

In the fight against the Islamic State of Iraq and Syria (ISIS), demining plays a pivotal role. As ISIS is defeated on the battlefield and displaced people return home, **restoring critical infrastructure is key** to ensuring that ISIS stays out once pushed out. However, ISIS is leaving improvised explosive devices (IEDs) and other explosive hazards in its wake, intentionally booby-trapping places like hospitals, schools, and places of worship. Removing these explosive hazards is the crucial first step in stabilizing these liberated areas, clearing the way for restoration of clean water, electricity, emergency health services, and education. Last year, the United States invested more than $30 million in Iraq alone to clear IEDs and other explosive hazards in areas liberated from ISIS control. This assistance, directed through several Iraqi and international nongovernmental organizations, has made significant progress toward countering ISIS, making possible the return of internally-displaced persons and refugees. Programs supported by the United States are restoring access to land and infrastructure and developing the capacity of the Iraqis to manage the programs over the long term. **Demining plays an essential role in stabilization both in Iraq and Syria as civilians seek to return to their homes.** This has been a priority of the U.S. government for some time, and will continue to be a priority as we go forward in our campaign to defeat ISIS. 3. Many Countries are Mine-free as a Result of U.S. Investment in Mine Action **Many countries have become free from the impact of landmines due to the efforts of the United States and our international partners. U.S. efforts have helped 16 countries declare themselves mine free, the most recent being Mozambique -- which had been one of the most heavily-mined countries -- in 2015. Despite this progress, much work remains to be done.**

Trump's also fucking up the counterterrorism measures

Wachira **Maina**, the East African. January 21, **2017**, **"What Trump's policies mean for Somalia** and security in East Africa." http://www.theeastafrican.co.ke/news/What-Trump-policies-mean-for-Somalia-and-East-Africa/2558-3781842-ehtu6u/index.html

News last week that President Donald Trump had asked for a review of the US role in Somalia should worry frontline states like Kenya and Ethiopia. Over the past three years**, President Obama's support for the 22,000-strong Africa Union Mission to Somalia, Amisom, has been crucial in the fight against Al Shabaab**, the Al Qaeda-affiliates trying to oust the Federal Government of Somalia. By providing intelligence, deploying Special Forces, airstrikes and drones, the US has degraded Al Shabaab's fighting capabilities and decapitated its leadership. In May last year, a US airstrike killed Abdullahi Haji Da'ud, a key military commander. He was one of many Al Shabaab leaders taken out by US drones and Special Forces in early 2016 among them Mohamed Dulyadin, architect of the 2015 Garissa University shootings; Yusuf Ali Ugas, an Al Shabaab recruiter; Mohamed Mire, the Al Shabaab governor for the Hiran region and Hassan Ali Dhoore, architect of both the 2014 Christmas Day attack on Mogadishu airport and the 2015 attack on Maka al-Mukarramah hotel, also in Mogadishu. If Al Shabbab seems less fleet-footed and lethal today than it did a year and a half ago, part of the credit must go to the US. It now looks like President Trump — who is breathtakingly naïve about the threat that Al Shabaab-like groups pose — wants the review in order to cut back US involvement in Somalia**.** This would be a strategic and costly long-run mistake for US policy in the Horn of Africa. The Red Sea It also means that **Kenya and Ethiopia, both allies of the US against Al Shabaab, could also soon bail out of Somalia**. Should they do so, A**l Shabaab will flourish**, at least in the short-run. The silver lining, though, is that in the medium-term, the retreat by the US, Ethiopia and Kenya would give the Africa Union an excellent chance to redesign Amisom, its otherwise doomed mission in Somalia. Here is why: To begin with, it is baffling that President Trump cannot see the strategic argument. The Red Sea — and so the Suez Canal — is vital to global commerce, a route not only for oil from the Gulf states to Europe but also for goods from Europe and North America to India, the Arabian Peninsula and China. The Red Sea shortcut — which carries about 8 per cent of global trade — eliminates 10 days and 8,900 kilometres (or 43 per cent) from the alternative route round the Cape of Good Hope. True, some oil tankers are now taking the long route but that is temporary, explained by low oil prices that offset the higher transport costs. On all accounts, then, the Suez Canal route will remain critical. But it is vulnerable. The entry to the Red Sea, past the point where the Horn of Africa juts into the Gulf of Aden, is a 32km wide maritime chokepoint, the Bab-

el-Mandeb, Arabic for the “Gate of Tears.” Looking north towards Suez, the strait lies athwart the Red Sea with Djibouti to the east, on the African coast and Yemen to the west, on the Arabian coast. Behind, the Red Sea funnels out to the Indian Ocean and on to the coast of Somalia. The strategic threat of a failed Somalia is obvious and has been for years. In imperial times, Britain and France split sentinel responsibilities over the strait, Britain taking Yemen and France Djibouti. Today, two states at or near both ends of the strait, Somalia and Yemen, have slipped into chaos. In Yemen, there is a proxy war raging between Saudi Arabia and Iran pitting pro-Saudi government forces against pro-Iran Houthi militias. The chaos has energised terror groups such as Al Qaeda in the Arabian Peninsula. The problem for global trade is that nearly 16,500 ships — a quarter of which are oil tankers — transit through the strait and the Suez Canal every year. These are tempting for terrorists. Somali piracy One may resent the US as a self-appointed global cop but its naval and air capability has kept the Red Sea route safe. Seen thus, **US withdrawal from Somalia poses risks. One, it will embolden Al Shabaab to regroup and escalate attacks against both Amisom and the Somali government. Two, other terror groups will see the retreat as a collapse of US military will**. A resurgence of Al Shabaab — or another terror group that targets the global maritime trade — would have a more lethal impact than what the world experienced over seven years of Somali piracy in the Gulf of Aden from 2005. Piracy is a good example. It arose from the same circumstances that spawned Al Shabaab: A failed state in whose lawless coves and creeks pirates found safe harbour. Using piracy as a touchstone gives perspective to the magnitude of the impact of maritime terror. To fix ideas, take the Somali piracy numbers for 2011 and 2012. The year 2012 marked the first time since 2005 that there was a significant drop in the threat level posed by Somali pirates. According to the World Shipping Council, 54 per cent — 237 of 439 — pirate attacks and 62 per cent — 28 incidents of 45 — merchant vessel hijackings in 2011 happened off the coast of Somalia in the Gulf of Aden, the gateway to the Bab-el-Mandeb. In the first quarter of 2012, another 51 out of a global total of 121 attacks took place off the coast of Somalia as did 11 hijackings out of 13 worldwide. And yet these episodes don’t give the full picture. According to The Economic Cost of Somali Piracy, a 2012 report by One Earth Future Foundation’s project, Oceans Beyond Piracy, Somali pirates got over $31 million in ransom in 2012, which, though large, was nonetheless a remarkable drop from 2011 when they got over $160 million dollars. These numbers do not include logistical expenses, such as the costs of recovering hijacked ships and paying negotiators. There were other costs too. In the same year, operations to combat piracy topped $1 billion. To hire on-board marshals and outfit vessels with additional security equipment cost between $1.65 billion and $2.06 billion. Evasive action, including rerouting vessels to avoid risky areas, cost another $290 million and the increase in hardship pay added another $471 million to the labour costs. And yet, for all that, piracy is not nearly half as disruptive as terrorism. Geopolitics Apart from geopolitics, a US retreat from Somalia would inevitably change the politics of the Horn. It must, for instance, lead to a retreat by Ethiopia, too. There are two reasons for this. One, there is an incipient rebellion in Oromia, Ethiopia’s largest, most populous and richest region. This will force the security-obsessed ruling party in Addis Ababa to re-deploy its armed forces. Late last year, Ethiopian troops withdrew from parts of central Somalia unannounced, in response, some say, to the Oromo rebellion back home. The unexpected move proved a boon to Al Shabaab who quickly occupied the towns that Ethiopia abandoned. The second reason is more complicated and has to do with Ethiopia’s tangled relationship with both the US and Somalia. Consular ties between the US and Ethiopia were established in 1903, paving the way for the first US ambassador to Ethiopia, Hoffman Philip, to present papers to Emperor Menelik II in 1908. Today, Ethiopia is one of the largest recipients of US economic and military aid. One justification for this US investment has been Ethiopia’s frontline role in the fight against terrorism, to commit soldiers against the Islamic Courts Union in early 2000 and mid-2006. Without an active US interest in Somalia, aid to Ethiopia will surely fall, if not immediately then in the medium-term. Without American money, Addis Ababa’s enthusiasm for military adventures in Somalia will wane. But there are deeper factors at play too. Ethiopia’s historical relations with Somalia are fractious and incandescent and can inflame Somali nationalism like no other factors. By some accounts, ties go back to time of the Prophet Mohammad. Emollient renderings of Ethiopian history say that the Aksumite Kingdom, the historical heartland of modern Ethiopia, gave refuge to relatives and family of the Prophet fleeing from persecution by the rulers of Mecca, the Quraishi family, ironically members of the same Banu Hashim clan as the Prophet. A grateful Mohammad is supposed to have decreed that the Abyssinian Christians were never to be harmed. But his injunction was ignored: Muslims from Somalia — and later Sudan and Egypt — regularly raided Abyssinia, at one point occupying most of the Aksumite highlands and nearly vanquishing the kingdom. Ethiopia’s fight-back began in the late 19th century when King Menelik II invaded the Ogaden and, with the connivance of the British, occupied the region for a short time. Fifty years later, in 1948, the British handed Ogaden back to Ethiopia, claiming to rely on an agreement with Menelik II from 1897. But Ogaden remained contested. From 1977 to 1978 the long cold war over the region turned hot, culminating in the defeat of Somalia, thanks to the Soviet Union’s turncoat diplomacy which saw them switch sides mid-stream, dumping their erstwhile ally Siad Barre of Somalia for Mengistu Haile Mariam of Ethiopia. Later still, in 1996 and then in 1999, Ethiopian forces made incursions into Somalia. Throughout the 2000s, Addis Ababa tried to stoke insurrections against the shaky Transitional National Government in Mogadishu. In July 2006, Ethiopia launched a full invasion, cherry-picked friendly warlords and, with the support of the US, arm-twisted them to set up the Transitional Federal Government, all against the vociferous opposition of the Islamic Courts Union, and many Somali nationalists. Ethiopia’s subsequent occupation was brutal: hundreds of thousands were displaced, civilians were killed and others brutalised. Frequent Ethiopian spoliations were eventually repaid in the same coin: A radical and breakaway youth faction of the Islamic Court Union soon morphed into Al Shabaab, a bigger menace than the comparatively moderate ICU that the US and Ethiopia had battled so ruthlessly. Ethiopian forces eventually withdrew in 2009, 4,300 of them came back in 2014 as part of Amisom. This charged matters profoundly. All considered, it would be best if Ethiopia withdrew from Somalia and stayed away for good. What of Kenya? A US and Ethiopian withdrawal would weaken the Federal Government of Somalia — the 2012 successor to the Transitional Federal Government. But a weaker Somali government would, ironically, tighten Kenya’s grip on Somali affairs even as it deepens Somali distrust of Kenya. Left the top dog by the exit of its allies, Kenya would be tempted to play the advantages of dominance. That would be a mistake; it would only add fuel to the mouldering resentments that Al Shabaab appeals to every time it attacks Kenya. Bluster and bullying would imperil Kenya’s security without removing the sources of threat. Kenya invaded “to stabilise Somalia so that state-building could start.” Instead, by relying on imprudent and self-serving advice from politically connected Somalis, it exported Somali clan politics to Jubaland. Some security experts now argue for Kenya’s extended stay in Somalia pointing out that since 2015, Al Shabaab, attacks on Kenyan soil have dropped sharply. This, they say, is proof that military intervention has paid off. Not so fast: it is just a year after the deadly El Adde attack. A more convincing explanation is better intelligence gathering, thanks to the new Director-General of Kenya’s National Intelligence Service, Maj-Gen Philip Kameru. Kameru’s quiet and methodical style — a sharp contrast to the style of Maj-Gen Michael Gichangi, his predecessor — appears to be

paying off. He has restored professionalism. It is important that Kenya does not become complacent because terror groups are often most lethal when they seem weakest. More important, the military's triumphalist account of its mission doesn't match with events in Somalia. Since September 2016, Al Shabaab has stepped up attacks, in part to disrupt presidential elections in Somalia. Premature announcements that it is dead are ill-informed. Options If, in fact, Ethiopia and the US do pull out, Al Shabaab will, in the shortrun, grow strong again. That is a strategic menace to Kenya: an Al Shabaab re-energised may be tempted to attack Kenya this year, an election year, which would make credible elections impossible. What to do? Kenya has no good options in Somalia. It really is the "Devil's Alternative." Kenya could stay on, engaged in an inept military mission that continues to inflame Somali nationalism and stoke Al Shabaab resentment. Or, it could withdraw and fret sleeplessly that Somalia will collapse back into the lawlessness that bred terror in the first place. Kenya's ability to do good in Somalia has been eroded by partisan politicking in Jubaland. It is now reaping the very things it dreaded: A border as porous as before and a Somalia no safer than before.

Somali govt will collapse in squo

Masters 2017 [Jonathan Masters at the CFR, "Al-Shabab", *Council on Foreign Relations*, <https://www.cfr.org/backgrounder/al-shabab>] //CJC

The UN Security Council authorized the African Union to lead a peacekeeping force in Somalia, which is known by its acronym, AMISOM, in early 2007. Its primary mandate was to protect the country's transitional government, which was set up in 2004 but had just returned to power in Mogadishu. Uganda was the first nation to send forces into Somalia under AMISOM, and, as of early 2018, it maintains the largest contingent in the regional force, at more than six thousand troops. Other forces come from Burundi, Ethiopia, Kenya, Djibouti, and Sierra Leone. In total, AMISOM comprises around twenty-two thousand troops. Al-Shabab struck outside of Somalia for the first time in 2010, when coordinated suicide bombings killed seventy-four people in the Ugandan capital of Kampala. "We are sending a message to every country who is willing to send troops to Somalia that they will face attacks on their territory," said the group's spokesman at the time. In 2013, al-Shabab fighters claimed responsibility for an attack on a Nairobi shopping mall that killed 67 people, and in 2015 the group killed 148 in an attack on a university in the city of Garissa. The latter was the deadliest attack in Kenya since the 1998 bombing of the U.S. embassy in Nairobi, in which more than two hundred people died. **While al-Shabab maintains a strong presence in Somalia a decade after AMISOM's creation, the UN-backed mission has begun the first phase of a drawdown**, withdrawing a thousand troops by the end of 2017. **The African Union and United Nations have said the withdrawal will allow Somali security forces to take the lead, but some experts say Somalia's government could face collapse as AMISOM pulls out.**

Conditions in Somalia are uniquely bad - fertile ground for terrorism that spills over into the regions

Bruton 10 (Bronwyn E. Bruton, a democracy and governance specialist with extensive experience in Africa, was a 2008–2009 international affairs fellow in residence at the Council on Foreign Relations. She was born in Swaziland and spent most of her childhood in Botswana. Prior to her fellowship appointment, Bronwyn spent three years at the National Endowment for Democracy, where she managed a $7 million portfolio of grants to local and international nongovernmental organizations in east and southern Africa (priority countries included Somalia, Ethiopia, Eritrea, Uganda, Kenya, Zimbabwe, and Sudan). Council on Foreign Relations' Center for Preventative Action, "Somalia: A New Approach", www.cfr.org/content/publications/attachments/Somalia_CSR52.pdf+&cd=1&hl=en&ct=clnk&gl=us,] //CJC

Somalia stands apart. **A country of some nine million, it has lacked a central government since** the fall of Mohamed Siad Barre's regime in **1991**. **Poverty and insecurity are endemic. Less than 40 percent of Somalis are literate, more than one in ten children dies before turning five**, and a person born in Somalia today cannot assume with any confidence that he or she will reach the age of fifty. **Failed states provide fertile ground for terrorism, drug trafficking, and a host of other ills that threaten to spill beyond their borders. Somalia is thus a problem** not just **for Somalis** but for the United States **and the world**. In particular, the specter of **Somalia's providing a sanctuary for al-Qaeda has become an important concern, and piracy off Somalia's coast**, which affects vital international shipping lanes, **remains a menace.** In this Council Special Report, Bronwyn E. Bruton proposes a strategy to combat terrorism and promote development and stability in Somalia. She first outlines the recent political history involving the Transitional Federal Government (TFG) formed in 2004 and its Islamist opponents, chiefly the Shabaab, which has declared allegiance to al-Qaeda. She then analyzes **U.S. interests in the country, includ**ing **counterterrorism, piracy, and humanitarian concerns, as well as the prospect of broader regional instability**. Bruton argues that the current U.S. policy of supporting the TFG is proving ineffective and costly. The TFG is unable to improve security, deliver basic services, or move toward an agreement with Somalia's clans and opposition groups that would provide a stronger basis for governance.

Al-Shabaab is weak now — military action is empirically successful, no emboldening effect, and anti-extremism education (CT) solves the root cause

Mohamud 2013 [Hassan Mohamud is the president of Somalia, "How to win the war against al-Shabab", *Al Jazeera*, <http://www.aljazeera.com/indepth/opinion/2013/10/how-win-war-against-al-shabab-201310119652136824.html>] //CJC

Much of the commentary in the aftermath of the Westgate atrocity has **suggested the attack emboldened al-Shabab**. Allow me to argue that it demonstrated **precisely the opposite.** It is often said that the media has a short attention span, but one does not need a great memory to recall how, **before 2011, al-Shabab controlled** a great majority of Mogadishu, in addition to the strategic port cities of Merka and Kismayo, which served as their financial and logistical hub, and **whole swathes of Somalia.** Most of my country was then victim to their perverted form of "governance" - beatings, beheadings, amputations, extortion, and a complete betrayal of Islamic practice. There is no such thing as a legitimate al-Shabab government. Their rule was human

rights abuse plain and simple. **Those who do not know Somalia may have been fooled into thinking**, both by al-Shabab's bombastic propaganda, and the terrible events at Westgate, **that the extremist group is more powerful than ever**. Yet **even a cursory glance across the country will tell you that we have driven them out of Mogadishu, expelled them from Kismayo and degraded their capabilities so extensively that they have only dwindling supplies of men, materiel and funding. They have been forced underground. Are they down? Certainly. They are on their last knees. Have we eradicated them completely? Not yet**. We now need the tools to finish the job and **we must strike while the momentum is with us, as our American partners did** at Barawe on October 4. As the UN's Special Representative of the Secretary General has argued powerfully in recent weeks, paying a small price now to increase the capacity of Somali and African Union forces will save us all paying a much higher price later. The fact, for example, that neither the African Union Mission in Somalia (AMISOM) nor the Somali National Army has a single helicopter in a country the size of Afghanistan is simply not good enough. **We must continue to ruthlessly deny our enemies territory. Military action is essential in this fight**. But let no one think we believe for a minute there can be a military solution. **We know we have to go right back to the start of the terrorist production line to halt the supply of innocent young men into the arms of unscrupulous militants for whom are used as nothing more than cannon fodder**. We have not backed up our military success with sufficient progress in the information war. We must now do much better in the battle of ideas. Considering we are facing an enemy whose ideology is considered completely redundant by 99 percent of the population, we begin with an important advantage. When I read one comment from the Shabaab leadership that the Westgate slaughter of innocent and unarmed men, women and children was one of the "epic battles" in the history of Islam, it reminded me how badly educated they are, how divorced from reality they have become and how utterly irrelevant they are to Somali aspirations for a better future. We must highlight these problems vigorously and remorselessly. The struggle against extremism needs to take place on the broadest possible front, from the parched Somali desert to flourishing American cities, from mosques to internet chat forums. It must be prosecuted on digital and social media, on the airwaves and in the newspapers, in schools and universities. Just as poison requires an antidote, extremist ideology must meet with innovative strategies, cutting-edge technologies, comprehensive education and vigorous communications. Education is key The education of our people must be a national priority. Now that the military campaign is almost over, education must become the new frontline. Two decades of fighting have denied a generation of Somalis from even the most basic education. The education of our people must be a national priority. We must fight al-Shabab in the classroom, defeating them with books as well as with bullets on the battlefield. The government's recently announced "back to school" campaign aims to get one million young girls and boys into the classroom, where they will enjoy the most fundamental human right and learn the skills needed to build productive careers and fulfilled lives. That will be another blow to the extremists' ability to recruit vulnerable youth. Extremism is like a cancer that needs treatment. International **cooperation is essential,** especially considering we have Somalis living all over the world. As US Congressman Keith Ellison, whom I had the pleasure of welcoming to Mogadishu earlier this year, wrote recently, the best way to neutralise al-Shabab is to support Somalia. **We need the US** and UK **government**s, for example, **to work directly with our government**, take advantage of our pool of highly educated diaspora Somalis, **and collaborate on deradicalisation and countering violent extremism programmes.**

Al-Shabab growing in strength — ISIL wants them to join, US drone strikes empirically effective (could also argue this card goes neg and says strikes cause expansion)

Haenlein 2015 [Cathy Haenlein is a research analyst on national security and resilience studies at the Royal United Services Institute (RUSI) and deputy editor of RUSI Newsbrief. “How severe is the terror threat in East Africa?”, *BBC*, <http://www.bbc.com/news/world-africa-33535404>] //CJC

Al-Shabab poses the major terrorist threat in the region and is adapting its tactics as pressure mounts on home soil in neighbouring Somalia. Here, **the group has been weakened by concerted military efforts by** the African Union Mission in Somalia (AMISOM) and **US covert action**. Most recently, **30 militants - including key leaders - were killed in a US drone strike in southern Gedo region last Thursday**. The loss of strategic territory and

personnel has seen **al-Shabab expand its operations into Kenya and beyond**. This has complicated the landscape of violent extremism in East Africa. The group has long threatened to repay Kenya for military operations in Somalia - and since 2011 has gruesomely followed through. Yet this shift is more thoroughgoing and strategic in nature. Long a territorially focused group with quasi-governmental ambitions to impose Sharia law at home, **al-Shabab is now becoming a more mobile, networked regional presence.** This has brought it a number of benefits. Al-Shabab's growing reach along the African coast is providing valuable new sources of funding and recruits. This is a logical adaptation: **enhanced global counter-terror finance efforts have strangled funding from the Somali diaspora**, amongst other international sources.

In terms of recruitment, as foreign fighters have been drawn to Syria, the group has been overshadowed on the global stage. Yet al-Shabab has stepped up its Swahili-language propaganda - which plays on deep-seated social, economic and political grievances in East African states. Growing radicalisation In Kenya, an expanding al-Shabab presence has combined potently with growing radicalisation among Muslim youth and separatist tension along the coast. In Tanzania, there are fears that growing disaffection and domestic extremism could potentially intersect with a greater al-Shabab presence. Meanwhile, enhanced collaboration with organised criminal groups - themselves a growing security concern - is allowing **al-Shabab to diversify its income.** The incentives for this engagement have only expanded as East Africa has grown as a hub for illicit trafficking - from South Asian heroin to Yemeni arms to Tanzanian ivory. The direction in which **this more mobile terrorist model of financing and recruitment develops will have long-term implications for East African security**. Its evolution will depend on two sets of factors in particular. The first relates to tensions within al-Shabab's leadership over the group's strategic direction. Traditionalists favour a focus on strengthening the group in Somalia. Internationalists - including **former leader Godane, killed last year in a US drone strike** - see al-Shabab as a transnational jihadist organisation. With the rise of the self-styled Islamic State (IS) in Iraq and Syria, tensions also persist over global allegiances. **An affiliate of al-Qaeda since 2012, al-Shabab is now courted by IS, which has received pledges from groups across North and West Africa. Rumours have abounded that al-Shabab could soon follow suit.**

Drones kill Al Shabaab — stop attacks

Gaffey 2016 [Conor Gaffey is a writer for Newsweek, “AFRICA: U.S. DRONE STRIKE KILLS 150 AL-SHABAB MILITANTS”, *Newsweek*, <http://www.newsweek.com/al-shabaab-us-drone-strikes-somalia-434288>] //CJC

A U.S. drone strike on an Al-Shabab training camp in Somalia has killed more than 150 members of the militant group, according to the Pentagon. The strike, which took place on Saturday, targeted a camp about 195km (120 miles) north of the capital Mogadishu where **Al-Shabab militants were planning a “large-scale” attack**, according to Pentagon Spokesman Captain Jeff Davis, the BBC reported on Monday. Davis said that **the militants posed an “imminent threat”** to both U.S. and African Union (AU) forces stationed in Somalia. **Al-Shabab, which is affiliated to Al-Qaeda**, have carried out several high-profile attacks in recent months. Militants targeted an AU base in El Adde, near the Kenyan border with Somalia, in

January, killing up to 200 Kenyan soldiers, according to Somali President Hassan Sheikh Mohamud. The group have also continued to pepper Mogadishu with bombings and gun attacks, killing 20 people in an attack on the popular Lido beach in January.

Round ender - drones are key to intel to avoid massive miscalc on nuclear terror - only drones can solve, local govt and ground forces fail

Attuquayefio 14 – Philip Attuquayefio, Doctor of Philosophy in Political Science and a Master of Philosophy in International Affairs from the University of Ghana, Legon, currently a Research Fellow at the Legon Centre for International Affairs and Diplomacy, University of Ghana, 2014 ("Drones, the US and the New Wars in Africa," *Journal of Terrorism Research*, September 2014, The Centre for the Study of Terrorism and Political Violence, http://ojs.st-andrews.ac.uk/index.php/jtr/article/view/942/757) //CJC

Just like the terrorist threats, the approaches for US interventions on matters of national security have also evolved. From conspicuous full-scale military actions in the Bush and Clinton years to the "light footprints" favored by the Obama administration. The latter has involved the use of Special Forces, and other relatively more discreet approaches. **A *critical element* of the Obama administration's counterterrorism approaches is the use of** Unmanned Aerial Vehicles (UAVs) popularly known as ***Drones***. UAVs are remotely controlled aircrafts designed with a capacity to carry a wide variety of accessories for both civilian and military use. These include long range and wide angled cameras, communication and target detection sensors and military hardware such as missiles. Added to this is the stealth ability of some drones. Consequently, they are typical for reconnaissance, surveillance and target engagement missions (Washburn & Kress, 2009). Although, it's been suggested that experimentation with drones have been ongoing since the early 1990s, its first deployment in a context of war was in the former Yugoslavia in the mid–1990s where they were reportedly used as surveillance equipment (Turse & Engelhardt, 2012). Subsequent evolution of drones saw its emergence as armaments for target engagement particularly in post 9/11counterterrorism activities of the US. One of the early cases in this regard was reported in Yemen in 2002, where six alleged Al Qaeda operatives were killed by drone fire (Kretzmer, 2005). Since then, it is fast gaining notoriety as the armament of choice from the options available to the US. The use of drones has however not been without controversy both in host countries where it has, for instance, garnered political fallouts generally deemed as unfavorable to US moral leverage in global affairs, and within the domestic politics of the US, where the administration has been accused of arbitrarily authorising execution of people including some US citizens. The latter has constituted a legal conundrum that continues to attract negative publicity to the use of drones. The tactical fallouts have been suggested as far direr, namely, an increase in volunteers ready to launch a global jihad against the US and its western allies following the fabrication of drone casualties in countries such as Pakistan, Afghanistan and Yemen. (Taj, 2011) The readiness of the **US to deploy drones towards** prosecuting **the war on terror in Africa** has long gone beyond the assumptive phase. In 2001, the US acquired and renovated *Camp Lemonnier from the armed forces of Djibouti* and subsequently, in May 2003, designated the facility as the base for the Combined Joint Task Force – *Horn of Africa* (CJTF-HOA). Since then, Camp **Lemonnier has earned the reputation as a *critical base for drone operations*** around the Horn of Africa and Yemen. In March 2013, President Obama announced further plans to set up another base in the West African country of Niger. Djibouti and Niger have been officially confirmed, yet, reports suggest that the US has access to a lot more operational ranges for drones than publicly acknowledged (Whitlock & Miller, 2011). In terms of operability however, the first reported use of drones within the continent was a 2007 incident in which drones guided antitank missile gunships to blow down a convoy carrying one of Al Qaeda's top operatives and suspected hideout in Somalia (Axe, 2012). Since then, the US is reported to have operated drones from a number of sites in Africa including Djibouti, and Burkina Faso. This paper utilises open source data to interrogate the state of terrorism in Africa (conceptualised as new wars) and the options applicable to the African context. It is argued that **one of the ways the US can make *game-changing interventions* through surveillance and intelligence-gathering in several hotspots in Africa,** without compromising its own national security **is through the use of drones**. The paper begins by briefly discussing the 'new wars' in Africa before making a case for the complementary utility of drones in fighting terrorism in Africa. It concludes by suggesting policy options to counter balance the utility-blighting publicity currently surrounding the use of drones in Africa. A caveat underpinning this paper is an admission by the author that the causal and sustaining factors of terrorism in Africa are multi-faceted and in most cases derive from threats to aspects of human security palpable in terrorists-generating communities. Consequently, the phenomenon can only be addressed through a multidimensional approach – one i**n which *drones can actively feature mainly* through surveillance and intelligence-gathering**. TERRORISM: THE NEW WARS IN AFRICA In the aftermath of the independence wars, the second major wave of conflicts on the continent - the civil wars of the post-Cold War era between the late 1980s and early 1990s saw countries like Liberia, Sierra Leone, Rwanda and Cote D'Ivoire among others witnessing a succession of violent conflicts. The consequence of these conflicts were abductions, systematic rape, genocide and a host of actions that fall within the generic description of terrorism. These acts were mainly domestic in nature and perpetrated by ethnic and political groups. It was therefore not surprising that the US maintained a general disinterest in activities in Africa during that period. The latter part of the 1990s witnessed a marginal rise in terrorist incidents on the continent of Africa. Unlike the previous period, an overwhelming majority of these acts were attributed to the activities of Islamic extremists. The manifestations of these acts were undoubtedly ruthless yet somewhat limited to relatively few countries in East and the Horn of Africa. In the 1998 attacks on the US Embassies in Nairobi and Dar es Salaam, for instance, two hundred people are on record to have been killed and over a thousand injured. Yet in comparison to the global numbers, it was insignificant. In fact during that period, Africa placed a mere fifth, behind Latin America, Western Europe, Asia and the Middle East, as the most targeted regions for international acts of terrorism (Botha & Solomon, 2005). In the 21st century, **acts of terrorism in Africa have *gone up exponentially*** (Hough, 2002). This is attributable to a number of events. One of these has had to do with the post–9/11 War on terror, and the military actions in Iraq and Afghanistan by the US and its allies. Statistics have, for instance, shown dislocation and relocation of suicide terrorist cells and training camps as well as the death or detention of several top operatives of Al Qaeda following the commencement of the US led War on terror (Cronin, 2003). With the disruption of its activities, A**l Qaeda has**

adopted a more *diffused approach*, one that has seen the centralised command and control previously held by Osama bin Laden diffuse to other parts of the world in line with the objective to strike soft targets of the US and its western allies. With Africa playing host to monumental commercial and state interests of the US and a number of Western countries, strikes against these targets have sought to demonstrate that al Qaeda and its affiliates still retain the will and the capacity to operate around the world (Crenshaw, 2011). Relatedly, the diffusion indirectly caused by the war on terror has made the identification and neutralising of terrorist cells more difficult. The post-independence narrative of a host of African countries has also been dominated by human insecurity arising out of the multivariate effects of poverty and general economic insecurity, environmental degradation, inadequate management of health related threats to survival as well as erosion in the significance of jealously guarded indigenous culture primarily through modernisation. These effects have been attributed to political instability occasioned mainly by the politics of coup d'états as well as the tradition of woeful governance and corruption that defines leadership in many of these countries. Consequently, elements of human security have traditionally not been accorded superlative positions in the thought processes of African States relative to the desire by successive regimes to hold on to power; and where they have, in such lopsided proportions that parts of the polity are palpable left out of development. Responses to these local dynamics have evolved from largely tame protests to outright militancy and terrorism. The surge towards the terrorism end of the continuum have within the last two decades obtained motivation from the relative successes of militant groups such as the Movement for the Emancipation of the Niger Delta (MEND) in locking down national and sometimes global attention to their causes. It is therefore not surprising that Somalia, Mali and Nigeria, three of the countries in Africa severely challenged by the activities of organised terror groups have had infamous records of human insecurity in specific parts of their territories. In Nigeria for instance, Uzodike and Maiangwa (2012) describe the governance challenges as "a cocktail of widespread failures of state policies, inefficient and wasteful parastatal, and endemic corruption, poverty, unemployment, and extensive underdevelopment in the North of Nigeria". Within that context, it is not surprising that Boko Haram emerged and galvanised active membership among segments of the Northern population. The franchising of Al Qaeda has also contributed to the *increase in terrorist activities* on the continent. Out of these loose arrangements, terrorists' organisations in Africa continue to adopt and adapt the modus operandi of Al Qaeda. One of the foremost organisations depicting this franchise is Boko Haram. Operating mainly from the Northern parts of Nigeria since 2002, *Boko Haram* claims to be fighting for the institution of Islamic rule in Nigeria. Beyond their objective, their modes of operation; a combination of suicide attacks and car bombs in civilian areas, is dangerously similar to Al Qaeda's mode of operation. Elsewhere on the continent, **a number of terrorist organisations** have engineered actions that fit within the anti-western agenda of Al Qaeda but **also indicate**, in some cases, the **localised grievances of these groups**. In North Africa for instance, Al Qaeda in Islamic Maghreb (*AQIM*) has been engaged in some of the high profile terrorist actions against the West and its interests as well as supporters of western ideals (Masters, 2013). Their versatility, coupled with the porous borders and vast territories in the region as well as their collaboration with other like-minded organisations in the area has resulted in an *expanding trans-regional terrorist network*, fast gaining reputation not just for its adopted Al Qaeda tag but also a conspicuous résumé of terrorist activities. The West African Sub-Region is also home to two relatively recent terrorist organisations. Boko Haram operates mainly in Northern Nigeria and Cameroon, while Ansar Dine operates from Northern Mali. The former was formed in Maiduguri in 2002 as the Congregation and People of Tradition for Proselytism and Jihad (Onuoha, 2010). It is however known as Boko Haram, a Hausa moniker accorded to the group mainly on the basis of their proscription of western education. Similarly to AQIM, at foundation, the leaders of Boko Haram exploited Nigeria's governance challenges particularly relating to corruption as well as socio-economic vulnerabilities which are more evident in the northern region to mobilise a base of followers, discontented with the status quo. With known links to AQIM (United Nations Security Council, 2014), and operating in a region with porous borders, the fear of Boko Haram expanding their influence is justified. In May 2013, a military offensive was launched against the group in Nigeria's three northern states. Aided by the declaration of curfews in some cities and air strikes on identified training camps, the military indicated that the insurgents had been "halted" (Abrak, 2013). In spite of this, experience with terror cells in other parts of the world suggest that once the underlying motif is active, the dislocation arising through the decimation is merely temporal as groups and cells relocate and often hit back in a variety of revised ways. Moreover, in the particular case of Nigeria, the military has gained a reputation for exaggerating successes while downplaying setbacks (Waddington, 2014). It is therefore not surprising that subsequent to the May 2013 offensive, Boko Haram has proven to be even more organised and effective, striking key targets and conducting high profile operations such as the abduction of 200 girls from a Nigerian government secondary school in April, 2014. A further threat to the region is the presence of Ansaru, a breakaway of fringe elements in Boko Haram. Ansaru has since January, 2012 sought to enforce the fight for Islamist rule. Though a smaller group, it has sought, and perhaps obtained, recognition through high profile kidnapping and execution of western targets (Onuoha, 2013). Mali has provided another platform for brewing terrorism in Africa. With the fall of the Gaddafi regime in Libya, mercenaries armed with weapons, proliferated during the war, moved into Northern Mali where ethnic Tuaregs have been engaged in a long-running rebellion with the government in Bamako over the independence of Azawad in the North. Mobilised under the name Ansar al-Dine, this group has since 2012, engaged in various acts of terrorism, thus earning the US State Departments' categorisation as a terrorist organisation. In the Horn of Africa, ***Al Shabaab* continues to attract attention as arguably the continent's most *prominent terrorist organisation*** both in terms of its links with Al Qaeda and **its *ability to strike at western targets* or targets considered as sympathetic to the western cause or detrimental to Islam**. While it is deemed as an outgrowth of the Al-Itihaad al-Islamiya (AIAI), a radical organisation that confronted the Siad Bare regime in the early 1990s, in 2003 it began its operation as the enforcing arm of the Union of Islamic Courts (ICU), when the latter took control over Mogadishu and tried to exert a level of law and order in the Somali capital that is most notable. Following the Ethiopian intervention in December 2006, ICU was all but disbanded except for the Al Shabaab that withdrew to the south Central region of the country and launched what has become a long running insurgency first, against the Ethiopians and subsequently, troops serving under the African Union Mission in Somalia. While its objective resonates as the creation of an Islamic State of Somalia, its affiliation with Al Qaeda has meant that the group has also sought to hit targets deemed as affronts to the global jihad currently been pursued by Al Qaeda and its affiliates. The trend of terrorism around the continent is instructive of the intensifying wave of Islamic fundamentalism and the possibility of generating and sustaining training camps and recruits akin to the challenges confronted in Pakistan and Afghanistan. **It also *justifies the renewed focus of the US on Africa*.**

NEGOTIATING DRONES FOR AFRICA The dynamics of terrorism in Africa are not lost to US policy makers. However, since the Somalia debacle in 1993, the US appears to have conceded to its relative weaknesses on the continent (Adebajo, 2003). This is related to the fact that it was not a colonial power and its actions on the continent during the Cold War were mostly limited to covert operations championed by the CIA. The history of US actions in Africa has therefore been more of covert 'drone-like' operations than open warfare such as witnessed in Iraq and Afghanistan. The current hyper predilection for drones in the US strategy is in line with the Obama Administration's "light footprints" and 'leading from behind policy'. Admittedly, the adoption of drones is confronted by some controversies. This can be compared to those surrounding waterboarding and other interrogation techniques applied in US detention facilities (Bellamy, 2006). Unfortunately, the debate on the utility of drones in the context of terrorism is significantly challenged by what can best be described as the 'Pak Syndrome'. This is the reality that debates on the utility of drones are *heavily influenced* by their application to the *war on terror in Pakistan and* Afghanistan. **Consequently, the application of drones are confronted by *utility-blighting propaganda* that merely portray drones as killer devices and negates the *intelligence gathering and surveillance relevance* and the impact of such intelligence to the war on terror.** This includes the fact that the intelligence gathered potentially leads to the

prevention of even more strikes, and by implication, more deaths by terrorists. The Pak syndrome also dilutes the complementary capacity of drones in the war on terror by highlighting legal conundrums particularly focusing on issues concerning the responsibility to fair trial for suspects and the application of principles of humanitarian law (Alston, 2010 & Sadat,2012) among others. **These objections are *often overrated*** and do not aptly reflect the reality that the war on terror is unconventional in many respects. Moreover, certain aspects of **the *African context* peculiarly requires the utility of drones**. In arguing the veracity of the latter, it is submitted that **an analysis of the trend of terrorism in Africa points to some continent-wide commonalities from the use of *guerilla tactics*, the exploitation of large expanses of geographical areas and the implications of Africa's infamous *porous borders* on the activities of terrorist organisations**. While these illuminate the nature of the terrorist threat in Africa, it is also suggestive of the strategies that are likely to make an impact in relation to managing the phenomenon of terrorism on the continent. A number of these commonalities and their implications for drone use are examined herein. A pronounced feature of the new wars relating to terrorism in Africa is the guerilla tactics (Onuoha, 2011) employed by the various terrorist organisations on the continent. The implication is that timeless principles of war, as espoused by the Geneva and Hague conventions, for instance, are not being adhered to. **For Boko Haram, Ansar Dine, AQIM and Al Shabaab for instance, civilian targets are legitimate targets and so are injured US soldiers**. The weapons of choice for terrorists have been decided more by availability and less by restrictions of Jus in Bello. A stark reminder of the abuse of legal principles is the attack on the US consulate in Benghazi, Libya, which, needless to say, was a violation of the inviolability of diplomatic premises; one of the preeminent provisions of post-Westphalia diplomatic relations. **The tendency for non-state parties or their state sponsors to adhere to these rules of war undoubtedly points to the presence of an *asymmetrical war***. Unfortunately, the US is bound to largely adhere to the rules that terrorist organisations, herein considered as unconventional combatants, flout with impunity. In such an unfavorably unbalanced terrain, **positive outcomes from the use of conventional security operatives** even with regard to *intelligence-gathering* **is dodgy**. Africa's disreputably **porous borders** and the prospects they offer for trans-regional terrorism is another reason why unconventional interventions by the US should be contemplated. As noted above, **almost all the Islamic fundamentalist groups straddle entire regions with *relative ease***. In the case of Mali, it has been indicated, for instance, that porous borders to the North have facilitated the migration of fighters from Algeria-based AQIM as well as vestiges of the Libyan conflict to move in and operate with reasonable ease. The fact of mercenaries crossing the porous borders of Africa means that mobilising terror for cross-country objectives of hitting US and Western interests is made much easier (Dehez, 2010). **The expanse of territory straddled, the multiplicity of countries** operated in **and the implications on sovereignty** that the US will have to be confronted with in pursuit of terrorist and networks **makes it more difficult for *conventional forces to gather terrorism-related intelligence***. On the contrary, the reconnaissance capacity of drones makes them ultimately efficient strategies in monitoring the flow of terrorist networks and illicit weapons as well as building of training camps in Africa. Thus essentially, managing the long porous borders could therefore benefit from the surveillance capabilities of drones. Related to the above is **the *lack of capacity of most African governments to gather and organise unimpeachable intelligence* on the activities of terrorists and their networks**. A number of factors account for this reality. The obvious being the **lack of political commitment** as manifested in the inability of governments to commit funds for developing intelligence databases countrywide and across regions. Additionally, terrorist organisations in Africa are operating on multiple fronts, adopting mutating strategies and enlisting combatants whose identities are at the least amorphous. This makes the collection of intelligence difficult and by implication, makes these wars generally less responsive to conventional deterrence strategies. In the absence of such intelligence, countries currently confronted heavily by the activities of terrorism such as Nigeria and Mali are having to depend on inadequate or inexistent intelligence to fight what is in reality, a lost battle ab initio (Amaraegbu, 2013). From the determination of terrorist cells to the identification of key members and their arrest or execution, the reality is that the war on terror is fought more on intelligence and less on brute force. As such, **the utility of the surveillance and intelligence-gathering capacity of drones to African governments grappling with terrorism *cannot be over-emphasised*. The proliferation of weapons in Africa also makes it impossible to gauge the strategic or tactical ability of terrorist organisations. This could lead to *significant miscalculations with unpredictable consequences***. Particularly in Libya, where the revolutionary forces violently confronted the Gadhafi regime, the end of the war has hardly seen any meaningful programme of Disarmament, Demobilisation and Reintegration of former combatants. A number of combatants also alluded to pro-US sentiments for as long as Gadhafi was the enemy, a simple case of the enemy of my enemy being my friend. The implications of this could be obvious - the existence of many armed people fluid enough to be manipulated, proliferated arms and a growing fundamentalist rhetoric that can be mobilised for running terrorist objectives. **A critical component of the US assistance to Africa** as regards the war on terror **must** therefore **relate to intelligence gathering and dissemination. *The surveillance capabilities of drones are absolutely needed* in these circumstances** (Drew, 2010). Related to the intelligence deficit in most African countries is an infrastructural deficit that can

forestall the progress of conventional troops yet can be effectively harnessed by radical groups employing guerilla-style tactics. With vast land areas virtually undeveloped, such as the Sahel Sahara region, conventional military tactics will be confronted by accessibility challenges. Such terrain however favors the guerilla tactics of Africa's terror networks who are prone to exploit such vulnerability of conventional troops through kidnapping and suicide bombings among others. **Drones on the other hand, are comparatively *less prone by design* to the hazards of Africa's infrastructural deficit.** In this light, **drones can better overcome Africa's infrastructural challenges to provide surveillance and intelligence data on terrorism.** Finally, one of the components of the war on terror since 2001 has been America's desire to win hearts and minds. Within the African continent, the US reputation appears to have floundered. Indeed, in terms of security, America's record suggests an opportunistic actor interested in the continent during the Cold War days yet quick to demarcate its interests in the aftermath of the Cold War. While this is undoubtedly symptomatic of the wiles of global politics, the re-entry of the US to Africa's security affairs based mainly on the assessed effects of African-bred terrorism and its impact on US national security should be approached with extreme caution, less funfair and more discretion. **Under the circumstances, what is required is a less visible approach to intervention, one that favors the *stealth operations of drones*.**

Direct action is the squo and fails, indirect action is better

Robinson 13 (Linda Robinson is a senior international policy analyst at RAND. In 2011–2012 she was an adjunct senior fellow for U.S. national security and foreign policy at the Council on Foreign Relations, and in 2013 she was a public policy scholar at the Wilson Center. A best-selling author and analyst, Robinson has reported on conflicts, political transitions, and other foreign policy issues around the world, including special operations in Afghanistan, Iraq, Colombia, and elsewhere., "The Future of U.S. Special Operations Forces" Council on Foreign Relations, http://i.cfr.org/content/publications/attachments/Special_Operations_CSR66.pdf, April 2013, JC) //CJC

For special operations forces to progress from a largely tactical tool to one that regularly **achieves** or contributes substantially to **decisive and enduring effects, they must adopt a new model** with two essential features. **The first is a shift to make developing and operating with partners**—political-military activity in all its diverse forms—**their central means** of achieving lasting effect. **The second is adoption of a systematic approach that** routinely **combines their diverse special operations capabilities—civil affairs, informational, advisory,** and so forth—**as needed** in deliberate campaigns executed over time, in concert with other military and civilian entities. **Several shortfalls in special operations** theory, organization, and institutional development **currently inhibit the forces' ability to plan and operate in this manner**. In its official posture statements and other documents, U.S. Special Operations Command has attempted to frame a theory of special operations using the terms direct and indirect, whereby the direct approach "buys time" for the indirect approach to work in a decisive fashion.11 In other words, raids and strikes are a means to disrupt a threat, while **political-military activities are undertaken by special operations forces (and others) to address the threat in a more lasting manner**. Though this formulation holds that the indirect approach is the decisive element, it has not been prioritized in practice. **The lion's share of attention, effort, and resources in the past decade has been devoted to honing and applying the direct approach.** In fact, both the general public and many policymakers now equate special operations forces almost exclusively with the direct approach. **The net result is that special operations forces are stuck conducting endless strikes on terrorist target lists that are consistently repopulated with new individuals**, **with no theory or measure to determine** whether or **when a network is sufficiently degraded to no[not] longer constitute**

a threat. And **the indirect approach languishes more as a bumper sticker or a random engagement tool than an overarching** Shortfalls in Special Operations Forces 14 The Future of U.S. Special Operations Forces game-changing **approach that effectively addresses conflicts** or emerging threats. **This is not a formula for the optimum employment of special operations forces.** The root issue is conceptual clarity about how these forces should be used to best effect (i.e., a scarce asset to be employed to accomplish ends that no other military force can achieve). **Without greater clarity, there is a serious danger that special operations forces will be employed in a permanent global game of whack-a-mole** and in other tactical and episodic ways, **rather than as part of deliberate campaigns that can achieve lasting outcomes**. In addition, the special operations community is not organized to implement such orchestrated and linked special operations activities, and it has not oriented its institutions to make this its central priority.

Multilateral indirect action solves better

Robinson 13 (Linda Robinson is a senior international policy analyst at RAND. In 2011–2012 she was an adjunct senior fellow for U.S. national security and foreign policy at the Council on Foreign Relations, and in 2013 she was a public policy scholar at the Wilson Center. A best-selling author and analyst, Robinson has reported on conflicts, political transitions, and other foreign policy issues around the world, including special operations in Afghanistan, Iraq, Colombia, and elsewhere., "The Future of U.S. Special Operations Forces" Council on Foreign Relations, http://i.cfr.org/content/publications/attachments/Special_Operations_CSR66.pdf, April 2013, JC) //CJC

Over the past decade, **special operations forces have honed their counterterrorism manhunting** ability and notched significant operational successes, **most prominently in the mission that killed** al-Qaeda founder and leader **Osama bin Laden. These unilateral manhunting skills represent only one of their two basic capabilities**—albeit the one that has understandably received the most attention and resources in recent years. **Their other capability is developing and working alongside indigenous forces to combat terrorists, insurgents, and transnational criminal networks through an orchestrated set of defense, information, and civil affairs programs.** Special operations **leaders** often **say that the unilateral or "direct" approach buys time for the longer-term "indirect" approach to work**, and that the latter is decisive in addressing a threat. **This indirect approach has been successfully applied over the past decade in Colombia and the Philippines, where small numbers of** army, navy, air force, and marine **special operators have worked with indigenous counterparts to greatly diminish the threats in both countries**, 4 The Future of U.S. Special Operations Forces **as part of a multifaceted country assistance program. To be successful, this application of special operations requires both sustained commitment and coordinated effort**, yet that is rarely achieved. **The "indirect approach" has not been prioritized**, and the orchestration of special operations capabilities in sustained efforts remains the most serious operational deficit. **Given that special operations forces have become the tool of choice to deal with many national security threats,** it is vital that this deficit be remedied to ensure that their unique and varied capabilities are employed to their fullest and most enduring effect. **An enormous investment has been made in expanding and equipping special operations forces over the past decade. They have doubled in size and**

been deployed more often and for longer periods than ever before. They have more generals and admirals leading their ranks—almost seventy, compared with nine a dozen years ago. However, **since these advances have been made, there has been no thoroughgoing official assessment of the results of this growth and increased employment**, due in part to the press of wartime demands. **Special operators often say that they are a tactical-sized force that can have strategic impact**, yet precisely how they are to achieve that impact and whether they do so remain undefined. **Despite the enormous growth** and increased pace of activity**, far too often special operations forces have been employed in tactical and episodic ways, and many opportunities for achieving greater cooperation** among their component parts or with others **have been missed. Adopting a new vision for special operations forces** that **shifts** from a tactical focus on removing individuals from a battlefield **to a focus on achieving sustained political-military effect will require a shift in priorities and** a concomitant **rebalancing of the budget. Without** these **improvements, special operations forces will remain largely a tactical force that achieves limited rather than enduring or decisive effects in confronting terrorism**, insurgencies, and other irregular threats.

Indirect action is more expensive but more effective - it solves govt accountability, civilian protection, and beats Al-Shabaab

Ehrlich 15 (http://blogs.cfr.org/davidson/2015/05/07/time-for-congress-to-reconsider-the-counterterrorism-partnership-fund/, Time for Congress to Reconsider the Counterterrorism Partnership Fund, May 7th, Sam Ehrlich is a research intern for defense policy at the Council on Foreign Relations. He is a 2013 graduate of the George Washington University., accessed 8/12/15) //CJC

In his address to West Point cadets last May, President Obama announced a new plan to combat the spread of terrorism in Africa and the Middle East, specifically through the use of a $5 billion Counterterrorism Partnership Fund (CTPF). By August 2014, the White House drafted a comprehensive approach to counterterrorism efforts in Africa. The statement included a **plan to partner with and train African militaries to fight against al-Shabab,** Boko Haram, and al-Qaeda, among others. U.S. Special Operations have shifted from relying heavily on door-busting, high tech "direct action"—at least publicly—to focusing on security force assistance. Linda Robinson, a Senior International Policy Analyst at RAND has endorsed the need to utilize U.S. SOF capabilities beyond direct kinetic action. This includes both host-nation training as well as other "indirect action" skills in the service of fostering stronger security partnerships. Meanwhile, the former commander of U.S. Special Operations Command, retired Admiral William McRaven, stated in 2012 that the keys to successful **"indirect action"** are "empowering host nation forces, providing appropriate assistance to humanitarian agencies, and engaging key populations." As terrorist organizations exploit security vacuums across Africa, President Obama has looked to the U.S. military, and more specifically SOF, to bolster the capacity and capabilities of local partner forces. SOF, with their unique skills as well as cultural and language expertise, are optimized for training and assisting foreign militaries in counter-terrorism efforts. However, with a force that is deployed in over ninety nations and is allocated only 1.6 percent of the Department of Defense budget, it is evident that special operations' African training and counterterrorism funding levels are not consistent with their growing number of assignments—eighty-one separate missions in the last year. However, members of Congress have refused to fully fund the CTPF, believing it would act as a "slush fund". In December of 2014, only $1.3 billion was allocated from the requested amount. Moreover, due to legislative language in the CTPF, the majority of that allotted funding was required to go toward operations in Syria, not Africa. This deep cut constrains the president's plans to train militaries and combat terrorism in Africa. It is unfortunate that Congress fails to see the need for increased funding to allow for SOF operations in Africa. Recent airstrikes

conducted by Nigeria and Kenya highlight the need to further train African nations in intelligence, surveillance, and reconnaissance (ISR). Airstrikes by Nigerian forces against Boko Haram have misfired into the civilian populations, while eyewitnesses claim Kenya's recent airstrikes against Al-Shabab attacked an area without the militant group's presence, resulting in three civilian casualties. Meanwhile, Kenyan Special Forces were deployed seven hours after Al-Shabab's gruesome April 2 Garissa University attack began—an alarmingly slow response time that led in part to the massacre of 147 students. U.S. SOF training could help such security forces overcome these shortfalls to better protect their citizens and counter the threat from these militant groups If congressional members are concerned with the effectiveness of SOF training, they should not be. Although nothing is guaranteed, U.S. SOF have been largely successful in training militaries to combat terrorism in other parts of the world. Admiral McRaven has noted that SOF initiatives to train and partner with Afghan Security Forces were "our greatest success in Afghanistan." In the Philippines, Special Operations Forces recently ended a thirteen-year train and assist effort, which saw the terrorist organization Abu Sayyaf reduced in size from 1,300 to 400 militants. In Colombia, U.S. Special Operations trained Colombian forces to combat terrorist attacks on a crucial oil pipeline, helping reduce the attacks from 179 in 2001 to forty-one in 2002. Prior to that operation, U.S. SOF, specifically Army's Delta Force, began extensively training Colombian police teams in 1992; by 1993, those police teams were able to locate and kill notorious drug kingpin Pablo Escobar. However, the **reliance on SOF "indirect action" will not be able to maintain a high success rate without the proper resources, both in terms of time and funding**. Success will not happen overnight. The poor performances by U.S. SOF-partnered militaries in Libya and Mali, illustrate this point. As a former U.S. Special Operations Officer noted on Libyan training and partnerships, "The take-away here is they're going to take a lot more adult supervision to make sure the checks and balances are in place," and **more supervision will likely call for more financial backing**. Furthermore, the deep cuts in the Counterterrorism Partnership Fund have affected the special operations units' key command partner in the region, U.S. Africa Command (AFRICOM) in battling a recent spike in African terrorist activity. AFRICOM provides crucial support for special operations in Africa and also partners with U.S. SOF to run African training exercises such as the large, ground-based, three-week long Flintlock. Launching in 2006, Flintlock is designed to strengthen African partnerships and train soldiers to handle multiple scenarios including medical aid and tactical kinetic operations. A **failure to fund these sorts of multilateral exercises impairs SOF counter-terrorism efforts across the region**. The nature of war is changing, particularly in Africa. Traditional warfare is being replaced by nonconventional hostile engagements. With this shift, the United States increasingly relies on SOF to train allies and combat adversaries. **The stability of the U.S. special operations in Africa, a crucial means of preventing the spread of terrorism, will depend on Congress' awareness of SOF's vital role in the region** and authorization of a more robust CTPF. U.S. special forces stationed in Africa can only do so much when they are given so little.

Mark Hanrahan, 3/11/2017. "A kid's choice as famine stalks Africa: To feed his siblings or to eat." NBC. http://www.nbcnews.com/news/world/famine-east-africa-multiple-crises-strain-efforts-respond-n731766 — SP

The thread that connects, and exacerbates each of the crises, is conflict and, in South Sudan, as in the other affected countries, violence presents a major obstacle to relief efforts. "O*ne of the biggest challenges is access — being able to reach those who need our assistance the most, and populations being able to reach us*," Elizabeth White, a policy adviser working with aid agency Oxfam in South Sudan, told NBC News. "In the areas where Oxfam and other agencies work that are experiencing emergency levels of hunger — one step away from famine — the humanitarian presence and that unfettered access has been cited as the reason that those areas are not in a state of famine. Holding back the hunger in those areas," White said. "The flip side of that is that the areas that are experiencing the worst levels of conflict, you've got the needs rising … and then we can't get in to assist them because of the insecurity on the ground," she added.

US anti-terror law acts as a chilling effect, deters NGO operation with the threat of shutdown

Jason Burke, the Guardian. April 26, 2017, "Anti-terrorism laws have 'chilling effect' on vital aid deliveries to Somalia." https://www.theguardian.com/global-development/2017/apr/26/anti-terrorism-laws-have-chilling-effect-on-vital-aid-deliveries-to-somalia

Strict British and US counter-terrorism laws are discouraging humanitarian organisations from delivering vital emergency assistance to millions of people facing starvation and fatal diseases in drought-hit Somalia. Senior humanitarian officials say the laws, which target any individual or organisation found to have materially assisted a terrorist group, exert a "chilling effect" on vital assistance in areas of Somalia controlled by Islamic militants from al-Shabaab, an al-Qaida affiliate. The worst drought for 40 years in the unstable east African country threatens 6 million people with famine. Most of the worst hit – around 2 million people – live in areas run by al-Shabaab. **Humanitarian officials say it is almost impossible to guarantee that no aid will reach the extremists if they work there, and fear this means they will fall foul of the laws, exposing them to potential prosecution. "US and UK terrorism financing laws are a significant discouragement to operating in al-Shabaab areas. At the very least, you could end up wasting a huge amount of time explaining yourself; at worst, if substantial amounts of aid were appropriated by al-Shabaab – as has happened to people in the past – you could end up in court with your organisation shut down,"** said the country director of one major international NGO working in Somalia. Moving any aid by land in Somalia involves paying "taxes" at road blocks run by different armed groups, including al-Shabaab. UN experts estimated that at the height of its power in 2010 al-Shabaab imposed fees and taxes that totalled on average $90,000 (£70,200) per aid agency every six months. Also, any access to al-Shabaab controlled areas for NGOs would have to involve negotiations with local community and clan elders, of whom some are likely to be connected to the insurgents. Justin Brady, a senior UN humanitarian official responsible for overseeing the distribution of hundreds of millions of dollars of international assistance in Somalia, said **the primary reason for NGOs avoiding areas run by al-Shabaab remained the security threat posed by the Islamic militants.** But, he said, the US and UK laws were poorly understood and a disincentive. "Once you get past [the security issues], that becomes a consideration and you have to figure out how you can work there … **It has a chilling effect.** I'm sure in Washington or London it's clear what [the laws] meant but here it is much more difficult," Brady said. Senior UN officials in Somalia recently sought clarification from the US and the UK about potential prosecution.

Scenario two is global terror - Instability in the Africa from Terror makes nuclear terrorism possible and at the very least causes smuggling of nuclear material to make a crude bomb

Saenz 13 (WMD TERRORISM AND THE AL QAEDA NETWORK: AN ANALYSIS OF AQIM AND AL SHABAAB By Lisa Saenz Intelligence and National Security Studies Capstone, http://academics.utep.edu/Portals/4302/Lisa%20Saenz%20(Capstone).pdf, accessed 8/12/15) //CJC

Instability in North Africa The level of instability in North Africa is heightened by the number of operational research reactors, the possibility of nuclear terrorism, and the trafficking of illicit materials. According to Senator Jeanne Shaheen, the countries in the Middle East and North Africa present a large proliferation challenge to the U.S. due to the ongoing political instability and "deeply-rooted violent extremism." Nearly one-third of the states in this region possess some type of CBRN capability, and many are suspected of having related research programs. This region is particularly challenging due to the violent nature of its climate, along with its complex ethnic differences, and inexperienced and unstable governments recently brought into power. 16 The recent confirmation of Syria's chemical weapons stockpile and the discovery of Iran's nuclear program, its development and ongoing negotiations, are examples demonstrating the proliferation issues

that are known to be occurring. These materials and expertise may trickle down to the Al Qaeda network, whose direct ties to the Iranian and Syrian regimes amplify the threat of potential trafficking of illicit materials. There may be additional clandestine activities and programs that have yet to be discovered, such as the A.Q. Khan nuclear trade network that was not discovered until 2004. 17 There is also the possibility of terrorists obtaining uranium or plutonium for use in an improvised nuclear device (IND). 18 The geographical location of North Africa and the nuclear research reactors and facilities located in this region presents this opportunity to the inhabiting terrorist groups. According to the International Atomic Energy Agency (IAEA), Algeria, Egypt, Libya, Morocco, Nigeria, Ghana, Democratic Republic of Congo, and South Africa all currently 13 Global Terrorism Database at the University of Maryland's National Consortium for the Study of Terrorism and Responses to Terrorism (START), Accessed on September 8, 2013, http://www.start.umd.edu/gtd/ 14 Zimmerman, "The Al Qaeda Network," 1. 15 Jones, "Re-Examining the Al Qa'ida Threat to the United States," 2-4. 16 Jeanne Shaheen, "Next Generation Cooperation Threat Reduction Act of 2013," Statement for the Record, May 21, 2013. from Institute for Science and International Security. Homeland Security Digital Library. https://0- www.hsdl.org.lib.utep.edu/?view&did=738009 17 "Middle East and North Africa 1540 Reporting," 2013, Nuclear Threat Initiative. Accessed September 12, 2013, http://www.nti.org/analysis/reports/middle-east-and-north-africa-1540-reporting/ 18 Ferguson and Potter, The Four Faces of Nuclear Terrorism, 1. 5 possess operational nuclear research reactors. The nuclear material would be implemented as an alternative energy source to be developed into nuclear power plants to generate electricity. The countries of Algeria, Egypt, Libya, Morocco, Kenya, Nigeria, and Tunisia, are all considering the possibility of nuclear energy and are currently receiving research assistance from the IAEA. 19 Many of these research reactors are located in highly populated cities. Most of them contain a much smaller amount of radioactive materials than nuclear power stations, hence lower security measures. Research reactors in the U.S. have lower security measures for this reason. It can be inferred that security at a majority of these sites in North Africa is rather limited, and may present an attractive target to terrorist groups. 20 The fissile materials contained at these sites are low enough that it is too small to be used to produce an explosive device. However, two or three thefts of such a material could yield enough to potentially create an IND. 21 The material contained in the nuclear power plants that may be built in this area in the future : enriched uranium, low-level radioactive waste, and spent nuclear fuel all present the potential to be used in an IND.22 The concern over the development of future nuclear power plants in this region presents a large step that could very well lead the world closer to the potential for nuclear terrorism. Africa also contains another source where illicit materials can be obtained. Most of Africa is rich in uranium ore deposits; Algeria, Mali, Mauritania, Morocco, Niger, Nigeria, and Somalia all possess these deposits. Uranium mining is a frequent event that is taking place in 33 African states. With the development of nuclear energy programs and mining uranium, it is important that African states begin to prioritize nuclear security. This task may be fairly difficult given the various security challenges that are faced. Most of Africa faces more pressing challenges that include; the proliferation of small arms and light weapons, the alleviation of poverty, the provision of basic goods and services, educational facilities and healthcare. Africa also faces the dilemma of a scarcity of food, unequal land distribution, and perceived corrupt practices of those in power. Implementing the proper security measures required to divert nonstate actors from obtaining nuclear materials will be challenging for these states whose main issues focus on the survivability of its inhabitants. Following the proper security measures seems unlikely. 23 Nuclear Terrorism According to information in the Center for Nonproliferation Studies' WMD Terrorism Database, the number of terrorist incidents involving some type of CBRN has been growing in the past decade, even if the scale of each event remains low. While the probability of a large terrorist attack involving the use of this scale of materials is low, the chances of it occurring is 19 Amelia Broodryk and Noel Stott. "Securing Africa's Nuclear Resources." Institute for Security Studies. 2011. Accessed October 10, 2013, http://www.issafrica.org/iss-today/securing-africas-nuclear-resources 6-7. 20 Ferguson and Potter, The Four Faces of Nuclear Terrorism, 10. 21 William J. Broad, "Research Reactors a Safety Challenge," The New York Times, April 12, 2010, accessed October 13, 2013, http://www.nytimes.com/2010/04/13/science/13nuke.html?pagewanted=all&_r=0 22 "Nuclear Power Plants," The U.S. Environmental Protection Agency, accessed October 22, 2013, http://www.epa.gov/radtown/nuclear-plant.html 23 Amelia Broodryk and Noel Stott. "Securing Africa's Nuclear Resources," 6, 10, 15, 24. 6 becoming more likely due to the gaining popularity of peaceful nuclear programs facilitating their access to these materials. Terrorist acts with smaller consequences have a greater likelihood of occurring because they are easier to carry out. They are more likely to create an IND or RDD than attempt to create a nuclear weapon due to the lack of technological expertise and financial resources. However, if they were able to obtain highly enriched uranium, they would be able to create a devastating explosion using an IND. 24 According to Ferguson and Potter, there are four "faces" of nuclear terrorism. The environment in North Africa brings about the growing possibility that all but one may occur. These "faces" explain how a terrorist group may exploit military and civilian nuclear assets. The first expresses the theft and detonation of an intact nuclear weapon. Next, the theft and or purchase of fissile material may lead to the fabrication and detonation of an improvised nuclear device IND. Third, attacks against and sabotage of nuclear facilities, in particular nuclear power plants causing the release of large amounts of radioactivity. This point would be unlikely to occur in this region because these facilities are located in their homeland. If the targeted facility was located in the area of an adversary, this third point would carry a greater likelihood of occurring. The last point is the unauthorized acquisition of radioactive materials contributing to the fabrication and detonation of a radiological dispersion device (RDD) or dirty bomb. 25 Expanding

nuclear technology in this area of unrest will pose an increased challenge to current non-proliferation efforts. Security in this area is then faced with threats that involve attacks on nuclear facilities and the diversion of nuclear material through trafficking or smuggling to state and non-state actors, and the increase in illicit trafficking cases. 26 Nuclear Smuggling To assist in the identification of potential nuclear smuggling routes, those used for the transport of goods, narcotics, arms, and people could be reasonably assessed. Such smuggling routes could provide transportation and opportunities for them to sustain themselves. It is difficult to detect and bring an end to nuclear trafficking because it is often difficult to tell that it is occurring. It often remains unknown until an incident is caught. The assessment of routes used for trafficking of other materials by AQIM and Al Shabaab could potentially shed light on possible nuclear trafficking routes. Nuclear trafficking routes may already exist due to the A.Q. Khan network, or they may have formed new routes after the network was discovered. North Africa presents a fertile environment for trafficking due to its porous borders, underdeveloped law enforcement institutions, and lack of export control and border security.27 According to the IAEA's Illicit Trafficking Database ITDB, from January 1993 to December 2009, a total of 1773 global incidents have been reported by participating states and non-participating states. There were 500 incidents reported involving the theft of loss of nuclear or radioactive material.28 These events are continually occurring, and these are only the events that are known. It is a matter of 24 Ferguson and Potter, The Four Faces of Nuclear Terrorism, 5, 8, 18. 25 Ibid, 3. 26 Broodryk and Stott. "Securing Africa's Nuclear Resources," 11-12. 27 "Middle East and North Africa 1540 Reporting," 2013, Nuclear Threat Initiative. 28 International Atomic Energy Agency (IAEA), 'The IAEA Illicit Traffi cking Database', 31 Dec. 2004, accessed September 26, 2013, http://www-ns.iaea.org/security/itdb.asp. 7 time before nuclear smuggling begins throughout North Africa if it has not already done so. Both AQIM and Al Shabaab have engaged in the transport of contraband in order to sustain and better facilitate their goals. AQIM Trafficking The recent interventions and regime changes that have occurred in North Africa have facilitated AQIM's trafficking network. AQIM benefited from the collapse of Muammar Qaddafi's regime in Libya, and they now possess the arms and munitions that were moved out of this country. Libya has become a key area for trafficking, conflicts over the control of these routes is becoming more frequent. The uprising that took place in Mali in 2012 also provided AQIM the opportunity to establish relationships with groups in that region. The French intervention in January 2013 in northern Mali further facilitated this growth by degrading military capabilities and pushing AQIM into new territories, creating new safe havens for them to network in. Despite the French intervention, this mission has given way to AQIM growing into areas in Libya and providing them with potentially new trafficking networks in this region. 29 AQIM's network has begun to reach into southern Tunisia, where arms trafficking and criminal networks connecting to Central Africa are known to exist. This region in Tunisia is becoming notoriously known for smuggling and drug trafficking, it is a key trafficking point connecting to the rest of the region. AQIM has been using this area as a safe haven in plotting attacks on eastern Algeria. The main goal of AQIM has been shown to be the overthrow of regimes in North Africa, particularly Algeria, and replacing them with an Islamic regime. Their main foreign enemy is France, and not the U.S., despite their anti-Western sentiment. 30 Their wellintegrated trafficking routes provide an outlet for the trafficking of nuclear materials. Al Shabaab Trafficking Al Shabaab was responsible for the recent terrorist attack at a shopping mall in Nairobi, Kenya. There were at least 67 fatalities, the victims were targeted based on their ideological beliefs, and those who were of Christian faith were murdered. 31 Al Shabaab is becoming one of the most feared militant groups in the Al Qaeda network. Their main focus is to overthrow the Somali government and they support Al Qaeda's ideology of re-establishing a caliphate. The area that they currently maintain a stronghold in is East Africa. They currently do not appear to be plotting against the U.S. but they do present a potential threat in the future. However, their senior leadership has shown interest in targeting U.S. and other foreign targets in East Africa. An even more troubling concept is that many Americans have been recruited to join Al Shabaab's efforts. Furthermore, Al Shabaab is heavily involved in piracy off the coast of Somalia. Much of the cargo in ships that are attacked are then trafficked through the rest of Africa. In 2008, global 29 Zimmerman, "The Al Qaeda Network," 16-18. Anouar Boukhars, "Al-Qaeda's Resurgence in North Africa?" FRIDE: A European think tank for global action. Norwegian Ministry of Foreign Affairs. August 2013. No. 120, 1, 10, 12. 30 Jones, "Re-Examining the Al Qa'ida Threat to the United States," 2. 31 Katherine Zimmerman, "Al Qaeda's African Surge Threatens the U.S." September 25, 2013. AEI Critical Threats. Accessed November 9, 2013. http://www.criticalthreats.org/somalia/zimmerman-al-qaedas-african-surge-threatensus-september-25-2013 8 piracy increased 11% with piracy up by 200 percent in East Africa. 32 This group takes full advantage of its position off the coast of Somalia. It is from this location that the group trafficks arms, ammunition, goods, and other items. This group is a major participant of an international ivory smuggling network and makes a majority of its money from these trading activities; up to 40% of their financial backing comes from these sales. Given their location, present smuggling activities, and anti-Western sentiment, they could potentially participate in nuclear trafficking or nuclear terrorism in the future. 33 Theoretical Framework The hypothesis of my study is that terrorist incidents involving AQIM and Al Shabaab have increased within the past five years in areas containing nuclear and chemical materials. My study seeks to identify trends in areas that may facilitate and potentially be used to conduct nuclear trafficking. If there is an increase in such incidents, this could be a potential indicator that these Al Qaeda affiliates may be closer to obtaining illicit materials to create INDs or RDDs. Therefore, they may present a heightened security threat to U.S. interests and allies abroad, and may possess the potential to conduct acts of nuclear terrorism.

Research Design To implement my analysis, I will be conducting my assessment using a geospatial information model. I will use ArcGIS software to illustrate the location of

armed conflict terrorist incidents conducted by AQIM and Al Shabaab on a projected map of North Africa. This layer will illustrate the number of incidents as points scattered across the map in accordance to the longitude and latitude coordinates indicated in the dataset. The second layer of data includes the locations of research reactors and chemical facilities located in the region. The amount of terrorist incidents will be assessed according to their proximity to each plotted facility. A multiple ring buffer zone has been created around each facility. Each ring represents an indicated distance ranging from 1 km to 50 km. The first analysis compares the amount of AQIM incidents in 2007 to AQIM incidents in 2012. I will assess whether there are more incidents occurring in 2012 than in the past, as well as the amount of incidents located within the buffer zones of each nuclear facility. The second analysis will be conducted in the same method, but will assess the comparison between Al Shabaab incidents that occurred in 2008 with those incidents that occurred in 2012. This analysis begins in 2008 due to the lack of data for 2007. The data I will be using to test my hypothesis is from the Armed Conflict Location and Events Dataset (ACLED). This data contains information on the dates, locations, type of event, groups involved, fatalities, and changes in territorial control.34 This data was divided based on countries, I collected information for the following: Algeria, Egypt, Morocco, Libya, Mali, Mauritania, Somalia, Kenya, and Uganda. I researched each dataset for incidents containing AQIM and/or Al Shabaab. The above countries were the only datasets containing this 32 Stephanie Hanson, "Combating Maritime Piracy," Council on Foreign Relations, April 13, 2009, accessed, November 15, 2013, http://shipmun.pbworks.com/f/Combating%20Maritime%20Piracy.pdf 33 Seth G. Jones, "The Terrorist Threat from Al Shabaab," RAND Office of External Affairs. October 2013. http://www.rand.org/pubs/testimonies/CT400.html 1-2. 34 Armed Conflict Location and Event Dataset, International Peace Research Institute, accessed November 2, 2013, http://www.acleddata.com/ 9 information. Countries such as Tunisia, and Niger did not contain any data for these two groups. I then extracted AQIM and Al Shabaab incident data from each dataset to be uploaded into the ArcGIS software. This data was then layered over a geographic world map. To create additional layers of information for the terrorist incidents, I implemented the "Selection by Attributes" tool to separate the data into different layers based on year in order to measure growth. The data obtained for the locations of the nuclear research reactors and chemical facilities was gathered from the IAEA Research Reactor Database. This database provides technical specifications and information on research reactors and facilities located around the world.35 I also gathered data from the Nuclear Threat Initiative's Interactive Facilities Map displayed with Google Maps. This interactive mapping system displays known biological, chemical, and nuclear facilities.36 After obtaining this data, I gathered longitude and latitude coordinates through Google Earth. The facilities included in this project were those whose information was available through open source materials. Also included were reactors and chemical facilities that have been shut down and are being dismantled. Exhibit 1 illustrates the facilities included in this study. Each facility contains a multiple ring buffer zone. This buffer zone was created using the ArcMap Toolbox application of the software, the facility data was used as my input. Five rings were created representing 1 km, 2 km, 5 km, 10 km, and 50 km. The rings are displayed surrounding each facility to illustrate the distance between the facility and the plotted terrorist incidents. Analysis When conducting the analysis, there were several countries that did not contain any reported terrorist incidents for the years that were assessed. The first analysis compares the amount of AQIM incidents in 2007 to AQIM incidents in 2012. Only three countries contained terrorist incident data for AQIM in 2007; Algeria, Mali, Mauritania. The countries containing incident data in 2012 were Algeria, Mali, Mauritania, Egypt, and Libya. The maps located in the Exhibit section of this paper illustrate the plotted data for the total AQIM incidents occurring from 2007 through 2012 (Exhibit 2), followed by AQIM incidents in 2007 (Exhibit 3), and AQIM incidents in 2012 (Exhibit 4). There are a greater amount of incidents that have occurred in 2007 than in 2012. This may be due to a number of factors. AQIM may now be directing other terrorist groups to conduct attacks for them. There may be an increasing number of groups that they have allied themselves with to assist in carrying out their goals. The maps also show that incidents surrounding nuclear facilities and research reactors were only occurring in Algeria. This area is of particular importance due to its proximity to sea ports, where trafficking of materials have the potential of being facilitated. There is a greater amount of incidents surrounding these reactors in 2007 than there are in 2012. In the assessment of incidents occurring within the buffer zones surrounding the facilities, Exhibit 4, indicates that the Nuclear Research Center, located near the borders of Niger and Mali, has one terrorist incident within 50 km at the city of Tamanransett. The specific incident involved the arrest of an AQIM operative by security services, there were no fatalities. 35 IAEA Research Reactor Database, International Atomic Energy Agency, accessed September 20, 2013, http://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx?rf=1 36 NTI interactive facility map, Nuclear Threat Initiative, accessed September 20, 2013, http://www.nti.org/gmap/?country=egypt&layers=biological,chemical,missile,nuclear 10 The next portion of analysis will consider the AQIM terrorist incidents occurring within the buffer zone of the NUR research reactor in Draria, Algeria. The AQIM 2007 terrorist incidents occurring within a buffer zone is illustrated in Exhibit 5, and Exhibit 6 demonstrates the same area of Algeria without the buffer zone layer. This map demonstrates five AQIM terrorist incidents occurring in 2007 within the buffer zone at the NUR research reactor in Draria. There are four incidents that have occurred within 50 km of the site and one incident occurring within 10 km of the site. The incidents occurring within 50 km of the site involved the following incidents. One involved the bombing of the prime minister's office and a police station, 30 fatalities were recorded. The next incident involved a terrorist attack with four fatalities, the third incident involves another terrorist incident with three fatalities, and the fourth incident involved one fatality. The incident occurring within 10 km of the site involved violence against civilians and had zero fatalities. The following analysis of the AQIM terrorist incidents in 2012 involves the same research reactor in Draria, Algeria. There were not any additional AQIM terrorist incidents occurring at other facilities in North Africa. Exhibit 7 illustrates three AQIM terrorist incidents occurring within 50 km of the NUR research reactor site and one within 10 km of the site. The incidents occurring within 50 km of the site involve a terrorist incident with three fatalities, another incident with two fatalities, and another operation involving two fatalities. The incident occurring within 10 km of the site involved another conflict, with no fatalities reported. The second analysis compares the amount of Al Shabaab incidents from 2008 to 2012. Exhibit 8 illustrates the amount of terrorist incidents occurring in Somalia and along the border with Kenya. When assessing the amount of Al Shabaab incidents contained in the ACLED database, the only countries containing incidents on this group was Somalia, Kenya, and Uganda. Since the group is a fairly recent affiliate of the Al Qaeda network, the amount of data was low. There were no terrorist incidents conducted by Al Shabaab within any of the plotted facilities. According to Exhibit 9, there was a large rise in the amount of incidents in 2012. Incidents have begun to spread outside of Somalia. There are a few limitations to this study. The data in the ACLED terrorist incident dataset may have been gathered on a limited set of criteria. There may be more incidents that have occurred in these regions than what is currently displayed in the model. The data selected to be included may not be representative of all terrorist events occurring in this region. The events included may also not have been properly validated with other sources to confirm which terrorist group conducted the act. There is not the same amount of information available for each incident; some contain more information detailing attacks than others. There also exists a lack of incidents recorded involving Al-Shabaab and AQIM in the Democratic Republic of Congo, Ghana, Nigeria, and Ethiopia. According to the ACLED database, there were no terrorist incidents conducted by these groups. There exists the inherent limitation that not all incidents can be measured or recorded. It is difficult to assess clandestine activity, and many incidents may go unreported. Another limitation may be the location of the facilities plotted on the map. Their longitude and latitude coordinates may be slightly off from the exact location of the site. The map represents an estimate of such locations. There were also several locations recorded for one city, this may prevent different incidents from being accurately portrayed on the map. 11 Conclusion In assessing the AQIM terrorist incidents in the region, it can be concluded that incidents surrounding facilities and research reactors were only found to be in Algeria. There were a greater amount of incidents surrounding reactors in 2007 than in 2012. Most of the incidents occurring within 50 km of a research reactor occurred at the Nur research reactor site. For the incidents occurring in 2007 and 2012, there have been a total of 12 incidents occurring within 50 km of this site, and two incidents occurring within 10 km of the site. The terrorist incidents occurring for Al Shabaab in 2008 and 2012 demonstrate significant growth of this group. They seem to be spreading in numbers, and are more capable of carrying out activity. There were no Al Shabaab terrorist incidents within 50 km of a research reactor or facility. However, while the data presented an increase in terrorist activity for Al Shabaab along the East African coast, but not around nuclear reactors or facilities, there was a decrease in terrorist activity by AQIM (Exhibit 10). This group may not have a large interest in trafficking illicit material. I can assess with moderate confidence that this group has a smaller potential of trafficking nuclear material than Al Shabaab. This study reveals that AQIM and Al Shabaab do not present a significant threat of nuclear terrorism to the U.S. homeland, or a significant threat for carrying out the potential of trafficking nuclear material. Neither group presents a threat of obtaining nuclear material from facilities in this region. I can assess with medium confidence that AQIM and Al Shabaab present a threat to U.S. interests in North Africa due to the past incidents and current motivations. Al Shabaab presents a greater threat to U.S. interests abroad than AQIM. They are unlikely to attack a nuclear reactor or facility because the cities in this region are made up of a combination of allied groups and adversary groups. They would not risk conducting an act of nuclear terrorism that may hurt their allied groups because these sympathizers are a type of support system that provides financial support. Nuclear trafficking is more probable than nuclear terrorism because trafficking in general is a way of life in this area. A majority of the countries in Africa live in extreme poverty. Participation in trafficking provides a source of income. The areas that have been revealed to be likely nuclear trafficking routes are those areas along the coast. This region contains the majority of plotted terrorist incidents in North Africa amongst both groups. Maritime security must be amplified to diminish the likelihood of nuclear material smuggling through cargo ships. The potential for nuclear trafficking in this region will continue to grow within the next 10 to 15 years due to the advent of dual-use technology and the rising popularity in nuclear peace programs. The closer this region becomes to implementing nuclear power plants to produce electricity, the greater the threat of nuclear trafficking.

East Africa is at a unique risk of nuclear theft because of poor security, porous borders, and ungoverned areas – strong terrorist organizations will conduct nuclear terrorism

Mutua 15 – John-Mark Mutua, former Lecturer at Egerton University, International Relations and Politics Tutor at University of the Witwatersrand, 2015 ("Uranium yellowcake trafficking incidents in Africa: Proliferation threat or non-proliferation opportunity?" *African Security Review*, Volume 24, Issue 2, Taylor & Francis Online, June 5th) //CJC

But that was almost a decade ago. **A combination of factor**s may **have eased the illicit acquisition of Africa's vulnerable uranium yellowcak**e for further concealed processing, **enrichment and fabrication of crude nuclear weapons by sophisticated *rogue non-state actors***: the emergence of **well-off terrorist/jihadist groups keen on stealing, buying or building a *nuclear bomb***; robust safeguards of nuclear warheads, fissile material and their facilities yet ***poor securing* of uranium yellowcake, particularly in Africa; the relative ease of trafficking uranium yellowcake**, which is less radioactive per unit mass, **across ill-secured African ports and borders; the proliferation of nuclear-weapons-related information and technological expertis**e (i.e., sophisticated nuclear scientists/engineers, precision computer-aided centrifuge-part manufacturing machines, basic Chinese enrichment technology,17 etc.); **and an increase in largely *ungoverned terrorist-ridden zones* in** North, West, Central and **East Africa, which provide the perfect location for weapons development, testing and launch**.18 Africa's yellowcake proliferation threat may have been further **compounded by the continent's lack of political will and capacity to enforce *nuclear material safeguards***, the sidelining of the continent from an array of international nuclear security initiatives keen on securing fissile material and enrichment or reprocessing technology, and a projected increase in uranium developments in Africa that may be accompanied by a parallel surge in yellowcake trafficking incidents on the continent, assuming the current yellowcake proliferation concerns remain unchecked. While organised rogue non-state actors would encounter significant, but not insurmountable, challenges in developing fissile material and fabricating crude nuclear devices, t**he *catastrophic*** public health, environmental, and politico-economic i**mplications of the above-mentioned actors' successful detonation of crude or fully fledged nuclear weapons, acquired via the tedious yellowcake pathway, should provide little room for complacency**.

We've used intel to catch backpack nukes, (means the intel IL on drones is key)

Meir 15 – Shalev Meir, Strategic Intelligence Service, 2015 ("Al Shabaab Threatening Kenya Using Nuclear Weapons, Police Device New Methods To Deter Attacks," *Strategic Intelligence Service*, May 12th, http://www.intelligencebriefs.com/al-shabaab-threatening-kenya-using-nuclear-weapons-police-device-new-methods-to-deter-attacks/) //CJC

Kenya's special undercover officers working with intelligence teams deterred Al Shabaab's several *backpack nuclear device*s on transit to Nairobi **destined for a *massive nuclear attack***, greater than the 1998 US bombing. **The *nuclear weapons*** which **were being transported by** one Musdaf Ismail Hashi, **one of the most wanted *Al Shabaab*** Mujahideen **suicide bomber**s, was in various parts including detonating cords and blasting caps which is meant to provide "cover" for the delivery man. Intelligence teams who have been tracking the suspect say there were several suspicious telephone conversations between Hashi and one of the Al Shabaab leaders who was issuing him with instructions. Suitcase nukes, commonly known as suitcase bombs are often smuggled into countries, just like drugs and used by terrorists to *conduct massive attacks*. These nuclear weapons are designed to self-destruct if improperly opened. Security agents add that Hashi also had a mixture of explosives; RDX (44%), TNT (22%) and Potassium Nitrate (22%) which could have caused a massive damage killing close to 100,000 people. Kenya's security system is on

the lookout and more police are being trained to fast catch up with methods of detonating nuclear weapons which is now the suspected trend used by Al Shabaab militia group. **Al Shabaab is set to revenge on Kenya *through a massive attack*** following the death of their leader Adan Garar.

Terrorism causes extinction- retaliation

Ayson 10 - Professor of Strategic Studies and Director of the Centre for Strategic Studies: New Zealand at the Victoria University of Wellington (Robert, July. "After a Terrorist Nuclear Attack: Envisaging Catalytic Effects." Studies in Conflict & Terrorism, Vol. 33, Issue 7. InformaWorld.) //CJC

But these two nuclear worlds—a non-state actor nuclear attack and a catastrophic interstate nuclear exchange—are not necessarily separable. It is just possible that some sort of terrorist attack, and especially an act of nuclear terrorism, could precipitate a chain of events leading to a massive exchange of nuclear weapons between two or more of the states that possess them. In this context, today's and tomorrow's terrorist groups might assume the place allotted during the early Cold War years to new state possessors of small nuclear arsenals who were seen as raising the risks of a *catalytic nuclear war* between the superpowers started by third parties. These risks were considered in the late 1950s and early 1960s as concerns grew about nuclear proliferation, the so-called n+1 problem. It may require a considerable amount of imagination to depict an especially plausible situation where an act of nuclear terrorism could lead to such a massive inter-state nuclear war. For example, in the event of a terrorist nuclear attack on the United States, it might well be wondered just how Russia and/or China could plausibly be brought into the picture, not least because they seem unlikely to be fingered as the most obvious state sponsors or encouragers of terrorist groups. They would seem far too responsible to be involved in supporting that sort of terrorist behavior that could just as easily threaten them as well. Some possibilities, however remote, do suggest themselves. For example, how might the United States react if it was thought or discovered that the fissile material used in the act of nuclear terrorism had come from Russian stocks,40 and if for some reason Moscow denied any responsibility for nuclear laxity? The correct attribution of that nuclear material to a particular country might not be a case of science fiction given the observation by Michael May et al. that while the debris resulting from a nuclear explosion would be "spread over a wide area in tiny fragments, its radioactivity makes it detectable, identifiable and collectable, and a wealth of information can be obtained from its analysis: the efficiency of the explosion, the materials used and, most important … some indication of where the nuclear material came from."41 Alternatively, if the act of nuclear terrorism came as a complete surprise, and American officials refused to believe that a terrorist group was fully responsible (or responsible at all) suspicion would shift immediately to state possessors. Ruling out Western ally countries like the United Kingdom and France, and probably Israel and India as well, authorities in Washington would be left with a very short list consisting of North Korea, perhaps Iran if its program continues, and possibly Pakistan. But at what stage would Russia and China be definitely ruled out in this high stakes game of nuclear Cluedo? In particular, if the act of nuclear terrorism occurred against a backdrop of existing tension in Washington's relations with Russia and/or China, and at a time when threats had already been traded between these major powers, would officials and political leaders not be tempted to *assume the worst*? Of course, the chances of this occurring would only seem to increase if the United States was already involved in some sort of limited armed conflict with Russia and/or China, or if they were confronting each other from a distance in a proxy war, as unlikely as these developments may seem at the present time. The reverse might well apply too: should a nuclear terrorist attack occur in Russia or China during a period of heightened tension or even limited conflict with the United States, could Moscow and Beijing resist the pressures that might rise domestically to consider the United States as a possible perpetrator or encourager of the attack? Washington's early response to a terrorist nuclear attack on its own soil might also raise the possibility of an unwanted (and nuclear aided) confrontation with Russia and/or China. For example, in the noise and confusion during the immediate aftermath of the terrorist nuclear attack, the U.S. president might be expected to place the country's armed forces, including its nuclear arsenal, on a higher stage of alert. In such a tense environment, when careful planning runs up against the friction of reality, it is just possible that Moscow and/or China might mistakenly read this as a sign of U.S. intentions to use force (and possibly nuclear force) against them. In that situation, the temptations to preempt such actions might grow, although it must be admitted that any preemption would probably still meet with a devastating response. As part of its initial response to the act of nuclear terrorism (as discussed earlier) Washington might decide to order a significant conventional (or nuclear) retaliatory or disarming attack against the leadership of the terrorist group and/or states seen to support that group. Depending on the identity and especially the location of these targets, Russia and/or China might interpret such action as being far too close for their comfort, and potentially as an infringement on their spheres of influence and even on their sovereignty. One far-fetched but perhaps not impossible scenario might stem from a judgment in Washington that some of the main aiders and abetters of the terrorist action resided somewhere such as Chechnya, perhaps in connection with what Allison claims is the "Chechen insurgents' … long-standing interest in all things nuclear."42 American pressure on that part of the world would almost certainly raise alarms in Moscow that might require a degree of advanced consultation from Washington that the latter found itself unable or unwilling to provide. There is also the question of how other nuclear-armed states respond to the act of nuclear terrorism on another member of that special club. It could reasonably be expected that following a nuclear terrorist attack on the United States, bothRussia and China would extend immediate sympathy and support to Washington and would work alongside the United States in the Security Council. But there is just a chance, albeit a slim one, where the support of Russia and/or China is less automatic in some cases than in others. For

example, what would happen if the United States wished to discuss its right to retaliate against groups based in their territory? If, for some reason, Washington found the responses of Russia and China deeply underwhelming, (neither “for us or against us”) might it also suspect that they secretly were in cahoots with the group, increasing (again perhaps ever so slightly) the chances of a major exchange. If the terrorist group had some connections to groups in Russia and China, or existed in areas of the world over which Russia and China held sway, and if Washington felt that Moscow or Beijing were placing a curiously modest level of pressure on them, what conclusions might it then draw about their culpability.

Feldman, 14 -- Foreign Military Studies Office analyst
[Bob, U.S. Army lieutenant colonel, "Death Unguarded: Unsecured Virulent Pathogens in African Medical Facilities," October 2014, fmso.leavenworth.army.mil/documents/Death-Unguarded.pdf, accessed 8-8-15]

Death Unguarded: Unsecured Virulent Pathogens in African Medical Facilities
They are some of the deadliest and most frightening infectious diseases known: Ebola, Marburg, plague, anthrax and several others. Yet vials of the microbes that cause these diseases, being utilized for medical purposes, especially research, have been known to sit in lightly guarded facilities in Africa, making them relatively easy targets for terrorists who want to obtain the necessary ingredients for spreading disease and fear among their enemies. Once stolen, terrorists would look for ways to bring the pathogens to America, among other places. The days of catapulting infected animals over castle walls to sicken the defenders may be long past, but the legacy of that practice – breaching border security to sneak sick animals or, even less detectable, disease-causing pathogens into a country – is still a viable one. Even if only a relatively few people were actually infected by a bioterrorist-introduced microbe, significant panic might ensue from the fear the disease could extensively spread. This possibility for large-scale deaths or the fear they might occur could earn a stolen pathogen stolen the designation of a biological weapon of mass destruction (WMD). Perhaps the first time much of the American public heard Africa mentioned with regards to WMDs was in 2003 when then President George W. Bush declared in his State of the Union Speech, "The British government has learned that Saddam Hussein recently sought significant quantities of uranium from Africa."1 This sentence would gain notoriety, even earning itself the moniker of "the sixteen words," for while it convinced many that then Iraqi President Hussein was trying to restart his nuclear weapons program, it was later found to be untrue, but not before it helped galvanize much of the American public into believing Hussein needed to be stopped. Very little was heard about WMDs in relation to Africa after that, but though Bush was sorely mistaken regarding the Iraqi-African nuclear material connection. However, the potential for WMDs falling into the hands of terrorists does exist in Africa, only not so much in the form of uranium from Niger as Bush had thought, but rather from numerous types of microbes found across the continent. To be sure, these poorly secured African microbes do not have to be transported across the Atlantic Ocean to present a threat to American lives. Besides American businesspersons, tourists, and students in Africa, there is a growing contingent of US troops on the continent. This latter group would likely make a particularly inviting target for someone or some organization that hates the U.S. For American military forces it is an important part of the operational environment to keep in mind, as sometimes it is what a soldier does not see - in this case a microbe - that can pose the most dangerous threat to life and mission. Absent or Weak Lab Security For many, hearing the word "Entebbe" conjures memories of the daring raid by Israeli commandos in 1976 to free hostages held by Palestinian terrorists after Air France Flight 139, which originated in Tel Aviv,

was hijacked and brought to Uganda's main airport, located in Entebbe.2 Today there is something just as scary in Entebbe, but while the world's attention was riveted on that airport during the hostage crisis, presently few are aware that located nearby is the rather innocuous sounding "Uganda's Ministry of Agriculture, Animals, Industry and Fisheries." When a Congressman and **a Pentagon delegation visited the** facility in 2010 they passed an eroded fence, walked down a long hallway, and turned into a room where they found an unlocked refrigerator storing the extremely deadly anthrax microbe.3 The group also visited the Uganda Virus Research Laboratory, where the Ebola and Marburg viruses are studied. At that time they were kept in a regular refrigerator in a spare room marked with "Restricted Access" signs. Doctors, however, said that "hardly means the area is secure."4 Though some facilities have since been upgraded, there are other labs throughout much of Africa where rooms containing dangerous pathogens are poorly guarded, laboratory equipment does not meet high enough standards to properly contain the pathogens, and/or laboratory personnel lack enough training to properly handle the pathogens or infected tissue samples. Besides the rather chronic lack of adequate security at certain African facilities, previously secure labs may suddenly find themselves in jeopardy. Witness what happened in Egypt in early 2011. Much of the world's attention was focused on the large protests to overthrow Mubarak. Less attention was paid during this time to riot that resulted in the looting of Egypt's primary public health lab in Cairo. Maybe the people were only looking to steal the lab's equipment, including its refrigerators, but several vials of pathogens, including H5N1, went missing.5 H5N1causes bird flu, which, despite its name, can strike and kill humans as well. It is not known whether the vials were stolen or destroyed during the riot, but their loss demonstrates the need to ensure adequate lab security during times of political turmoil, which is relatively common, in general, on the continent, potentially jeopardizing the security of many labs.

Al-Shabaab is the only threat of bio-terror- has the support, financing, and safe haven

Kelley, 12 – American Military University intelligence professional
[Maria, “Terrorism and the Growing Threat of Weapons of Mass Destruction: Al-Shabaab,” Dec 2012, p56-79, accessed 8-29-15]

Over the course of time, al-Shabaab has **shifted its focus** from removing Ethiopia from Somalia to transnational terrorism (Weiss 2010). A clear indication of this shift is evident in comments made by al-Shabaab, "the world's crusader forces were mobilised [sic], and America, unleashed its ‘hunting dogs’ in Ethiopia and Kenya...The United States is Islam's known enemy and we will never expect mercy from them, nor should they expect mercy from us" (Pantuchi 2009, 2, 6). The organization has increasingly adopted "the tactics and rhetoric more commonly associated with al-Qaeda-style [sic] groups" such as the deployment of "suicide bombers and attracting jihadists from around the world" (Pantuchi 2009, 2; New York Times 2012), This, in addition to statements calling for global jihad while at the same time liberating Somalia from outside invaders, implies this organization is allied with al-Qaida. Al-Shabaab has professed since 2007, to be affiliated with al-Qaida, however intelligence analysts have assessed the link to al-Qaida as weak even though al- Shabaab's top leaders are affirmatively associated with senior al-Qaida members (Hanson 2011; NCTC website 2012; New York Times 2012). Al-Qaida members such as Usama bin Laden, Ayman al-Zawahiri, and Abu Yahyah al-Libi have made references to "the lions of Somalia", i.e. al-Shabaab (Pantuchi 2009, 6). Until recently, it was unclear if the two organizations were working together or if al-Shabaab was merely adopting al-Qaida's techniques. On February 9, 2012, Abu Zubayr pledged bayat (oath of allegiance) to Dr. Ayman al-Zawahiri (al-Qaida's leader), who accepted the pledge (Ahmed 2012; Joscelyn and Roggio 2012; Berger 2012; BBC News 2012). Al-Shabaab is officially a part of the al-Qaida network and it is reported that "senior fighters and officials [have]

begun to operate in Somalia's northern regions of Puntland"• (Ahmed 2012). This is an important strategic alliance for both organizations, which is later discussed in this study. Al-Qaida in the Arabian Peninsula (AQAP) was a result of the 2009 merger of al- Qaida in Saudi Arabia and al-Qaida in Yemen (AQY), whose goal is to overthrow both governments and establish an Islamic state. According to NCTC (2012), "AQAP is based primarily in the tribal areas outside of Sanaa, which for the most part remain largely outside the control of the Yemeni Govemment."• Now that the merger is complete, only a small body of water separates these groups' host countries. Al-Qaida in the Lands of the Islamic Magreb (AQIM) is the best-funded and wealthiest division of al-Qaida (Munoz 2012; Masters 2012). Based in Algeria, this branch formed in 2006 and currently operates in Algeria and the northern part of Mali. The formation was a result of groups splitting then merging with al-Qaida. In 1998, a group split from the Armed Islamic Group (AIG) calling themselves Group Salatist pour Ia Predication et Ie Combat (GSPC), which then formally allied in 2006 with al-Qaida East Africa and collectively formed AQIM. In 2011, prior to the official merger of al- Shabaab and al-Qaida, it was assessed that al-Shabaab, al-Qaida in the Islamic Maghreb, and Boko Harem were "trying to forge an alliance **to coordinate attacks on the United States and Western interests...and believed to be working toward "an** alliance of convenience" (New York Times 2012). Boko Haram was founded in 2001 because of religious differences and govemment resource disparity, splitting Nigeria into Muslim North and Christian South (Degadjor 2012). Other names for the group are Jama"˜atu Ahl as-Sunnah li-Da "˜awati wal-Jihad (JASDJ) and Nigerian Taliban (NCTC 2012). It did not become a jihadist group until 2009 when they began conducting violent attacks and its goal is the same as al-Shabaab: to establish an Islamic state (Degadjor 2012; NCTC 2012). While there is a pledge of mutual support between the group and AQIM, it is likely that a formal alliance will soon form. Complete alliance with AQIM and al-Shabaab would be significant because Nigeria is the continent's most populated country and an important oil exporter in the region (Pham 2012). While the group only has a few hundred members today, formal alliance would increase the power, reach, and resources of all three organizations. This group is said to have trained with al-Shabaab in Somalia (Stanford University 2012). Hizbul Islam, an organization formed in 2009 and led by Awes, publically announced its merger with al-Shabaab on December 19, 2010 and "and tumed over Hizbul Is|am's bases in Mogadishu and areas south of the capital"• (Roggio 2010). Hizbul Islam was al-Shabaab's Islamist rival in Somalia and was defeated by al-Shabaab on December 13, 2010 when al-Shabaab seized "the vital city of Burhakaba and threatened to behead 20 Hizbul Islam commanders" (Roggio 2010). Subsequently, commanders of Hizbul Islam broke ranks and joined the victor. On September 24, 2012, Hizbul Islam publically announced its separation from al-Shabaab for two reasons: its official affiliation with al-Qaida, and for the aimless killing of innocent Somali citizens (Hiiraan Online 2012). The Muslim Youth Centre (MYC) in Kenya was originally founded in 2008 as the Pumwani Muslim Youth. The group's goal is to emphasize the "social and economic grievances of lower class Kenyan Muslim youth, who became disillusioned with what they perceived as anti-Muslim discrimination in the country" (Anzalone 2012). In April 2012, the group's emir, Shaykh Ahmad Iman Ali, pledged bayat to Abu Zubayr (Anzalone 2012). This organization is one of al-Shabaab's most important allies in the area because it is used "as a pathway for radicalisation [sic] and recruitment of principally Swahili-speaking Africans for carrying out violent militant activity in Somalia" (Al-Jazeera 2012). On August 27, 2012, Kenyan authorities killed the group's prominent Shaykh, Aboud Rogo. The group has vowed to "begin a new journey of embracing change - a change that has been forced upon us by the Kuffar (non-believers) and one that our beloved brothers in Al-Shabaab have graciously reminded us of in their solidarity with the Mujahideen in Kenya"• (Zelin 2012). There is also a division in Tanzania called Ansaar Muslim Youth Centre (AMYC), which is also an ally of al- Shabaab (Fleming 2012). MYC changed its name to Al-Hijra earlier this year. Lastly, **Eritrea** is suspected of being a close ally and supporter of al-Shabaab (Joselow 2011; UN Security Council Report 2010; U.S. Department of State 2010). Since 1962, Eritrea has been engaged in a long struggle with Ethiopia over territorial boundaries. Ethiopia still occupies territory that the Eritrea-Ethiopia Boundary Commission deemed to be a part of Eritrea. The importance in this history is that it has the potential to explain the motives of Eritrea in its apparent decision to support terrorism. Despite the numerous sanctions imposed on Eritrea by the United Nations (UN), the Eritrean President denies supporting the terrorist organization. Logistical, Financial, and infrastructural Support Each group or country labeled as an afhliate, or otherwise linked with al- Shabaab, provides different levels of support based upon its own capabilities. Overall, four general sources have been identified as primary means of financial, logistical, and infrastructural support for al-Shabaab: taxation and extortion; intemational jihadists, 7 businesses, and diaspora; allied groups and afliliates; and the state sponsorship (Vilkk 2011; UN Security Council Report 2010; Kambere n.d.). The extent of infrastructural support, if any, is undetennined by researching unclassified sources. Taxation and extortion provide al-Shabaab with **continuous income** as it is generated through routine daily life in Somalia. Al-Shabaab collects zakat (obligatory alms) from members of the communities under its control with the pretense of using these collections to provide for communities in need (Harnisch 2010). This mandatory deed allows al-Shabaab to collect two-and-a-half percent of the head-of-household's annual salary. In southern Somalia, there are roadblocks in place for collection purposes (similar to the paying of a toll on a roadway). Non-government organizations are also taxed on aid distributed within al-Shabaab's controlled areas. The UN Monitoring Group "conservatively estimates that Al-Shabaab generates between $70 million and $100 million per year' (UN Security Council Report 2010). Kidnapping has also become a tool by which al-Shabaab obtains large sums of money to continue its operations (Kambere n.d.). Fees (taxation) are/were imposed on the import and export of goods passing through ports under its control, more specifically charcoal and sugar which are the country's main exports (Kambere n.d.; Vilkko 2011; Pelton 2012). Al-Shabaab controled the country's six key ports: Baraawe, Buur Gaabo, Eel Ma"˜an, Kismayu, Marka, and Qudha (Vilkko 2011). The port of Kismayu in particular had an extremely high value to the organization, as it was the primary means by which it brought in weapons and raised money for its operations. In late September 2012, the Kenyan forces eliminated this source of income by an attack that forced al-Shabaab to flee (New York Umes 2012). In late 2011 to early 2012, the organization lost the ports of Bur Gabo and Qudha to Kenyan forces (Fleming 2012). Charcoal exports still account for approximately 15 million USD in revenue per year and sugar accounts for approximately 400,000 to 800,000 USD in revenue per year (Wkko 2012). The Hawiye clan accounts for twenty-Eve percent of the Somali population (ICPVTR 2010). It is a vital supporter of al-Shabaab, more specilically because the struggle for "power and control is in large part

determined by local sub-clan rivalries and allegiances rather than by religious or political ideology" (Cuevas 2010, 6). However, despite on how vital this alliance may be, as explained earlier, loyalty shifts. In terms of support, this means the Hawiye clan, when it is convenient for the clan, provides manpower support to al-Shabaab; this support has been continual and still occurs today (Cuevas 2010). Clans also play an important role in the funneling of funds to militant organizations from diaspora by way of hawala. Businesses such as Nour Mowafaq General Trading L.L.C. (NMFQ)-operated by Al-Ittihad al-Islami-out of the United Arab Emirates also use hawala to funnel funds to al-Shabaab (Vilkko 2012). Hawala is an informal banking system that leaves **no paper trail** as it is transferred "exclusively along clan lines, from one member of a clan to another," and although "all transactions are between private persons, inter-clan support makes it hard to differentiate support to the insurgents from ordinary diaspora remittances" (Vilkko 2011, 9). Diaspora is estimated to provide al-Shabaab with approximately **1 billion** USD **per year** (Wise 2011) Al-Qaida, AQAP, and AQIM provide financial support, training, and educational services to al-Shabaab and vise versa (Cuevas 2010; Harnisch 2010; Wise 2011). The training al-Qaida provides is significant because it provides al-Shabaab with "battle- hardened fighters skilled in the art of guerilla insurgency against a conventional military. . **.[and]** with the knowledge of how to operate successful training camps" (Hamisch 2010, 20). It has also provided small arms, AK-47s, and hand grenades. AQIM in particular, has provided training in skills in "bomb-making and document forging; assistance in setting up training camps; battle-hardened militants who can lead militias; and valuable international recruiting support" (Hamisch 2010, 24). With al-Qaida's help, al-Shabaab has established training camps for suicide bombers (Wise 2011). This merger however now signifies that all that is available to al-Qaida and all of its cells is now available to al-Shabaab. Boko Haram also shares in training, explosive materials, and funds among these organizations (Smith 2012). Hizbul Islam controlled the port of Harardheere, which is one of the ports where local pirate gangs operate, along with several others. After the merger of 2010, al- Shabaab took control of pirate bases and "reached a compromise with the local pirate gangs that would give the militants a 20 percent share of all ransoms received from the hijacking of ships"• (Kambere n.d.). It is now estimated that al-Shabaab receives approximately twenty to tifty percent of ransom collected by pirates operation out of al- Shabaab controlled ports (Vi|kko 2011). MYC was determined to be al-Shabaab's "most important ally and source of foreign tighters in Kenya and perhaps in East Africa as a whole"• (Anzalone 2012). Sheikh Aboud Rogo, who was killed earlier this year, was one of the top recruiters for al-Shabaab's pool of tighters and a strong financial supporter (Mwakilishi 2012). AMYC has close ties with criminal networks and drug smuggling rings in the area. AMYC collaborates with these other groups "for the movement of al-Shabaab recruits and trainers to and from Somalia" (defenceweb 2012). The amount provided by these groups is undetermined. Otherjihadists spread throughout the world have been identified as supporters, or promoters of support, of al-Shabaab, For example, Sheikh Fuad Mohammed Oalaf, an ex-member of the ICU currently in Sweden, has given praise to Somalis residing in Sweden "˜for being the most generous financial contributors to the Shabaab"• (Pantuchi 2009, 4). As an additional example, another ex-member of the ICU, Ali Ahmed Nur Jim'a|e, provides logistical support to al-Shabaab through his many businesses. Jim'ale is considered "one of the largest sources of income for al-Shabaab"• (UN Security Council 2012). Another source of support for al-Shabaab is state sponsorship. Eritrea, Djibouti, Egypt, Libya, Iran, Saudi Arabia, Syria, Qatar, and Yemen are "regularly accused by the Somali Transitional Govemment [and by the U.N. Council] of providing funds and weapons to al-Shabaab" (Kambere n.d.; France 24 International News 2009). The largest suspected supporter however is Eritrea, which is suspected of providing weapons, trainers, and approximately 80,000 USD per month (Joselow 2011; UN Security Council Report 2010; U.S. Department of State 2010; Al-Jazeera 2011). In 2006, Eritrea stated it did not "possess any nuclear, chemical or biological weapons or their means of delivery"• (Permanent Mission of Eritrea 2006). The state is a party to the Nuclear Non-proliferation Treaty (NPT), Chemical Weapons Convention (CWC), Comprehensive Nuclear Test Ban Treaty (CTBT) and various others but no agreement or treaty regarding biological weapons (UN 2006). In the approved matrix of the UN, it was noted that Eritrea's ability to manufacture/produce, develop, and use biological weapons is still undetermined (UN 2006). Therefore, according to available open sources, it does not appear that Eritrea has any facilities to which it could grant access to al-Shabaab or any other terrorist organization. In August 2009, the U.S. wamed Eritrea, once again, to cease all support to al- Shabaab. Somali President, Sharif Sheikh Ahmed stated, "We know for sure that the majority of the weapons in the hands of insurgents are coming from Eritrea" (France 24 International News 2009). Eritrea continued to maintain its innocence, In 2011, Eritrea was still suspected of continuing to supply al-Shabaab with material support. Eritrea maintained its position that, not only were they not providing material support to al- Shabaab but also that they could not conduct the support purported. Eritrean ambassador Beyene Russom declared, "We do not have the capacity to bring three planes in two days, crossing the airspace of Djibouti, crossing the Red Sea and entering the Indian Ocean and entering Somalia airspace, unloading and tlying back in this highly militarized area"• (0dula 2011). Over the past year, the UN has not been able to Gnd evidence of Eritrea"˜s continued material support of al-Shabaab; however, this is not to say that Eritrea is not providing Gnancial support or "other forms of assistance" (Al- Jazeera 2012). Trend of Threats and Attacks The Global Terrorism Database (GTD) is updated about one-time per year hence the figures that follow are from 2006 through 2011. While this study is not of quantitative nature and the methodology is not mixed-methods, in order to explore al-Shabaab's possible future trends, these numbers are necessary. Since its separation from the ICU in 2006, al-Shabaab was either positively identified of or suspected of 324 incidents through December 2011; the number of attacks have significantly increased each year (GTD 2012). The types of attacks have been: 130 armed-assaults, 104 bombings or explosions, 95 kidnappings, 16 attacks against infrastructures or facilities, 14 assassinations, 2 hijackings, and 1 unknown (GTD 2012). These attacks have occurred in Ethiopia, Kenya, Mali, Somalia, and Uganda. The majority of these attacks have occurred against private citizens. The statistics on the industries/categories are: 143 private citizens, 52 general govemment, 32 police, 31 military, 18 non-govemment organization (NGO), 18 diplomatic government, 16 media, 14 businesses, 14 terrorist, 10 religious figures, 7 airports, 5 other, 4 transportation, 3 educational institutions, 2 against food or water supplies, 2 telecommunications, 1 maritime, 1 tourist, 1 utility, and 1 unknown. For the most part, the number of injuries, fatalities, and casualties as a result of these attacks has remained stable. In other words, the numbers are neither increasing nor decreasing. The ranges for injuries, fatalities, and casualties used in GTD are 0, 1- 10, 11-50, 51 -

100, and 101. The ranges of injuries for these incidents are: 1 incident with 101 injuries, 1 incident with 51-100 injuries, 29 incidents with 11-50 injuries, 82 incidents with 1-10 injuries, and 193 incidents without injuries; these numbers leave 18 incidents without a known quantity of injuries. The ranges of fatalities for these incidents are; 4 incidents with 51-100 fatalities; 13 incidents with 11-50 fatalities; 139 incidents with 1-10 fatalities; 157 incidents without fatalities; these numbers leave 11 incidents without a known quantity of fatalities. There were no incidents that caused 101 or more fatalities, The ranges of casualties for these incidents are: 1 incident with 101 casualties; 7 incidents with 51-100 casualties; 31 incidents with 11-50 casualties; 36 incidents with 1-10 casualties; and 119 incidents without casualties; these numbers leave 22 incidents without a known quantity of casualties. These incidents deployed several types of weapons. Explosives or Bombs were used 118 incidents; firearms were used in 103 incidents; melee weapons were used in 22 incidents; incendiaries were used in 5 incidents; sabotage equipment was used in 1 incident; and other type of weapon was used in 1 incident-100 incidents were conducted with unknown weapons. This causes a great area of concern. Al-Shabaab`s terror is not only by conducting physical attacks. In 2011, because of the organization's general control in Somalia, they successfully blocked famine aid from the West which resulted in the death of "tens of thousands and still threatens millions of Somalis"• (NCTC 2012). The database entries are not completed for the 2012-year; notwithstanding the lack of concrete numbers, for general purposes it is suspected al-Shabaab has conducted no less than 17 attacks thus far (Roggio 2012; AI- Jazeera Search Results 2012). Al-Shabaab is a real-world threat because "**no other militant Islamist group in the world**, with the possible exception of Hezbollah, **has unchallenged control of such large parts of a country**...These conditions have allowed al Shabaab to set up training camps to prepare for its insurgency and terrorist operations" (Hamisch 2010, 35). Al-Qaida's leadership has called on al-Shabaab to "disregard international peace efforts and use guerrilla tactics against Somalia government forces and other regional armies in the country" by stating, "fight them in the manner of guerrilla warfare to annihilate, destroy and blow them up" (Ahmed 2012). These two factors alone make it easy to understand why there is a consistent increase in attacks by al-Shabaab. Summary Chapter 4 provides the results of research conducted on weapons of mass destruction and al-Shabaab. The research on weapons of mass destruction included an exploration of chemical, biological, radiological, and nuclear weapons. The research of al-Shabaab included exploration of its origin, allies or affiliates, support system, and trend of threats and attacks. The FTOs list is comprised of groups that meet specific conditions. Al-Shabaab was designated as an FTO in 2008, thereby prohibiting a country or individual from providing material support, resources, or engaging in transactions with al-Shabaab. Designation also freezes of all property or interest therein, in/within/or in the control of the United States. Chemical weapons are those that an adversary could manipulate to harm, incapacitate, or otherwise affect an enemy. This form of attack uses the properties of chemical substances to create the desired affect instead of conventional means of attack, such as explosives. Chemical weapons are inexpensive to manufacture, develop, and deploy when compared to other forms of WMD attacks. Chemical agents are divided into several categories: nerve agents, blister agents, chocking agents, toxins, blood agents, developmental agents, and control agents. Biological weapons are derived from living organisms, or microorganisms, to inflict a particular disease on another living organism. There are not only human variants of pathogens, virus, bacteria, and fungi, but there are also animal and plant variants as well. There are two central groups of biological agents: biological toxins and biological pathogens. Biological toxins are not communicable. A plant or animal is capable of producing biological toxins, which invade the host, replicate, and debilitate Toxins must be introduced to their target by consumption, inhalation, touch transference, or direct injection. Radiological weapons are made of elements that are an unstable form of a chemical element. When this element decays it results in the emission of nuclear radiation. These radioactive elements are usually very small; out of all of the radiological elements, only nine have the potential to appeal towards the making of a WMD. Only two of the nine elements are available in a natural environment and the remaining seven are man-made. Due to their radioactive nature, the man-made elements are encased in metals such as lead, stainless steel, platinum, etc., or in ceramic containers. The main isotopes needed for a nuclear weapon are uranium-235 (U-235) and plutonium-239 (Pu-239) although there are several less common isotopes that can be used. While these materials can be found in nature, they must be enriched to a very particular percentage to be suitable for a nuclear bomb. Therefore, after the material is mined, there are three ways to enrich the material to weapon-grade levels: gaseous diffusion, by gas centrifuge, or laser separation. Energy for a nuclear weapon can be produced by either ission or fusion. Fission bombs are what are commonly referred to as atomic bombs (A-bombs) and fusion are commonly referred to as hydrogen bombs (H-bombs). Fusion bombs are more complex but they are more powerful than a hssion bomb because the nuclear activity from the primary stage heats and compresses the nuclear material encasing the secondary fusion section of the weapon. In 1991, Shari'a courts began to emerge in Somalia in attempts to establish law and order after the overthrow of Mohammed Siad Barre. Once established and as the courts' power grew, it recruited its own militia for executing the imposed judgments. This militia wing adopted the name al-Shabaab or "the youth." Ethiopia continued becoming concemed with the increasing power of ICU and in December 2006, Ethiopia invaded Somalia defeating the ICU and assuming control over Mogadishu, Somalia. The ICU's leadership fled but al-Shabaab continued to tight the Ethiopian military, This led to the clear separation of al-Shabaab from the ICU and established itself in southern Somalia. Al-Shabaab's leader divided southern Somalia and central Somalia into three operational areas, each with its own local leader who receives guidance from the central leader. This lack of rigidity and centralization leads to intema conflicts occurring often, lack of coordination, and a frequent shift in alliances (NCTC website 2012). ' Al-Shabaab has had, and still has, many organizational links'and affiliations throughout the region. The primary links and afhliations (past or present) are: the Hawiye clan; Al-lttihad al-lslami (AlAI); al-Qaida; al-Qaida in the Arabian Peninsula (AQAP); al-Qaida in the Lands of the Islamic Magreb (AQIM); Boko Haram; Hizbul Islam; The Muslim Youth Centre (MYC); Ansaar Muslim Youth Centre (AMYC); and Eritrea. These identities provide al-Shabaab with mainly financial and logistical support. It remains undetermined if any of the aforementioned entities could provide infrastructural support. Since its separation from the ICU in 2006, al-Shabaab was either positively identified of or suspected of 324 incidents through December 2011. While there are no reports of al-Shabaab deploying any chemical, biological, radiological, or nuclear weapons, there were 100 incidents conducted in which the weapon used remains unknown. Al-Shabaab is essentially "a hybrid of al-Qaida and the Taliban, in which the militant elements are able to train and prepare for attacks as a result of the space provided to them by the group's administrative organization" (Hamisch 2010, 35). CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS The Problem As the War on Terror continues, there is a continuing concem in the U.S. intelligence community (IC) regarding which other terrorist organizations could eventually and potentially cause serious or grave ham1 to the U.S,, whether on U.S. soil or its interests around the world. AI-Shabaab was chosen for this research because they are, as named by The New York `l7mes, "one of Africa's most fearsome militant Islamist groups"• (2012) and they operate in and near an area drowning in sorrow and turmoil Now more than ever, there is a necessity in researching the probability of a WMD attack. This concern has lead to the need to have the following question answered: Based on support, probability of

attainability, and current capabilities of the Foreign Terrorist Organization al-Shabaab, is this organization likely to seek asymmetric methods of attack? Literature Review After reviewing the unclassilied peer-reviewed data available, it was determined that what the literature was still missing was the connection among all of these parts: chemical agents, biological toxins, radiological materials, nuclear materials, all of their power, the officially designated Foreign Terrorist Organizations (PTO), and most importantly, the probability of deployment by a specitic terrorist organization. The literature reviewed illustrated the power of chemical, biological, radiological, and nuclear materials and how realistic the probability of attainability is by terrorist organizations, particularly those already slated as FTOs. The Methodology This research used a combination of descriptive and exploratory case studies to develop further questions and reach conclusions. The methodology employed was deductive, relying heavily on qualitative research. This subjective approach was used to provide meaning to the literature available on this topic, determine gaps, and draw conclusions to fill those gaps. Content analysis of documents of materials was the primary method for gathering information. The data gathered was then organized by categories and subcategories using hierarchy style charting for each class of WMD and its components. As questions arose or as inconsistencies were discovered, floating blocks were marked by different color shadings. The Results Chemical weapons are those that an adversary could manipulate to harm, incapacitate, or otherwise affect an enemy. Chemical weapons are fairly inexpensive to manufacture, develop, and deploy when compared to other forms of WMD attacks. Biological weapons are derived from living organisms, or microorganisms, to inflict a particular disease on another living organism. For most ofthe biological pathogens and toxins there is a fairly intense process required to duplicate the biotoxins or pathogens, to keep them active, and to weaponize them. Radiological weapons are made of elements that are an unstable form of a chemical element. When this element decays it results in the emission of nuclear radiation. Understanding of the basic scientific background of what makes up a radiological element is necessary to recognize its potential as a radiological weapon. It is not necessary to have a degree in physics or have a substantial understanding thereof to engineer a radiological weapon. While materials for a nuclear weapon can be found in nature, they must be enriched to a very particular percentage to be suitable for a nuclear bomb. The level of expertise required for manipulating or creating nuclear materials is beyond common knowledge or simple Google searching. Extensive and elaborate costly facilities are a requirement to producing nuclear weapons. After the overthrow of Mohammed Siad Barre, courts attempted to establish order in Somalia and failed. These local courts merged and became known as the Islamic Courts Union (ICU) and recruited its own militia for the purpose of executing the imposed judgments. This militia wing adopted the name al-Shabaab. After the defeat of the ICU, al-Shabaab splintered off and became its own separate entity. Since its separation from the ICU in 2006, al-Shabaab was either positively identified of, or suspected of, 324 incidents through December 2011. Of those, there were 100 incidents conducted in which the weapon used remains unknown. Al-Shabaab was designated as an FTO in 2008, thereby prohibiting a oountry or individual from providing material support, resources, or engaging in transactions with the organization. Even so, al-Shabaab has had, and still has, many organizational links and affiliations throughout the region. These identities provide al-Shabaab with mainly financial and logistical support. It remains undetennined if any of the aforementioned entities could provide infrastructural support. Recommendations It is recommended by the researcher that this study be taken more in-depth to include all organizations, which could be, may be, or are slightly affiliated or allied with al-Shabaab. Exploration of those organizations is also recommended to ensure all possible capabilities are thoroughly analyzed. It is further recommended that the follow- up study include quantitative methodology to ensure all angles of this subject are explored and explained. This study should also be taken to the classified level to ensure its usefulness to the intelligence community. Al-Shabaab continues to grow and so does its threat. It is expanding its area of operation and now includes the northem region of Somalia. Future Research Hizballah (The Party of God) formed on or about 1982, has been advocating for the official establishment of Islamic rule in Lebanon, calling itself the defender of Lebanon after the Israeli invasion of 1982 (NCTC 2012). Its has close ties with Iran and like al-Qaida, it has several cells spread throughout Europe, Asia, Middle East, North America, South America, Central America, and Africa. While basic separation by religion keeps Hizballah and al-Shabaab apart, al-Shabaab declared an "open battle" against Israel, giving another commonality to Hizballah and al-Shabaab (Bartell and Gray 2012), At this time, there is no clear indication of a connection between these two groups but it is a possibility. Exploration of all possibilities for alliance and/or support between these groups is strongly recommended. It is assessed that these organizations will begin working together despite the difference in ideologies because their theologies are relatively close. Hizballah (and Iran) has the potential to provide al-Shabaab with the infrastructural support it would need to produce weapons of mass destruction. There are many more organizations which are otherwise linked with or associated with al-Shabaab including, but not limited to, Alliance to Re-liberate Somalia (ARS), Mujahidiin of the Golis Mountains, Jabhat al-Islamiya, Mu'askar Ras Kamboni, and Mu'askar Anole (ICPVTR 2010; Fleming 2012). Continued research is required to fully fill this gap and continue exploring the potential or current capabilities of al- Shabaab obtaining and deploying a WMD. Summary Chapter 5 provided summaries of the problem, the review of the literature, the methodological approach used for this study, and the results presented in Chapter 4. Chemical, biological, radiological, and nuclear weaponized devices are all attainable, to a certain degree. Each type of weapon of mass destruction (WMD) has been clearly found to have both its advantages and disadvantages of use. In general, all four types discussed in this research can be unreliable in terms of effects, pose a danger to the handler, and have the potential to give away the individual's position. Some types of WMD, such as radiological and nuclear elements, require a specific skillset therefore making the protection of the knowledgeable individual relatively important. Other types of WMD, such as chemical and biological agents and toxins, provide the ease of being easily created by someone with minimal understanding of biological sciences thereby making an individual replaceable; hence, ensuring the safety of the handler is not a priority. To assess the type of weapon that an organization or individual is likely to employ, one would need to first determine what goal is to be achieved by the attack. Motivations and disincentives of the use of WMD depend upon the organization's operational, political, theological, and psychological goals. Another large factor is the amount of financial and logistical support given to the organization. This research analyzed one Foreign Terrorist Organizations (FTOs): al-Shabaab This organization has been detemined to currently possess the ability to create or launch a WMD attack if it chose to explore this option. The lack of rigidity and centralization leads to internal conflicts occurring often, lack of coordination, and a frequent shift in alliances makes this organization very unstable. Eritrea is suspected of providing al-Shabaab with support, not to mention the organization operates in an area of strategic importance, meaning that alliances have the potential to grow from senior- to-senior relations to organization-to-organization relations between al-Shabaab and al- Qaida. The form of logistical support that Eritrea could potentially offer is unmonitored access to its two ports, located in the strategic Red Sea, with easy access to and from Yemen or Saudi Arabia. It also could allow for the easy movement of goods between Eritrea and Somalia. The history of conflict between Ethiopia and Eritrea along with the history of conflict between Ethiopia and Somalia makes this type of support plausible. However, continuous U.S. sanctions have taken their toll on Eritrea and it is now assessed that Eritrea is no longer providing material support to al-Shabaab. It still remains undetermined if Eritrea is providing support by other means or methods. Of the WMD analyzed in this research, it has been assessed that chemical and biological weapons are the most likely to receive consideration by al-Shabaab. While at this time the group itself does not possess the resources, its location, ties,

and merger with al-Qaida place this organization in a **perfect position** to acquire and employ the use of such weapons. Because al-Shabaab is slowly losing regional control, it is possible that in an act of desperation to show superiority it could resort to WMD as the means to regain control over the local people. It is hoped that in time, the diminishment of funds will reduce the number of al-Shabaab militants. As discovered by this research, acquiring and producing chemical or biological weapons is not complicated; and it would not take much of the agent or toxin to create mass panic in the troubled country of Somalia or to have the legitimate government consider retreating. Al-Shabaab, especially after its official merger with al-Qaida, has the potential for either using facilities already established by its allies or affiliates, or building facilities for this purpose particularly because the substantial annual financial intake. For these reasons, and based on the requirements for creating such weapons, it is assessed that there is a realistic chance that al-Shabaab will tum to WMD as a fighting technique. Even a small-scale attack with a chemical or biological WMD conducted by al-Shabaab would be successful and would achieve the organization's goals, at least in the short term.

East Africa is key- access to Ebola- ensures global pandemic

Teckman, 13 -- Council on Foreign Relations program coordinator
[Amanda, "The Bioterrorist Threat of Ebola in East Africa and Implications for Global Health and Security," Global Policy, May 2013, www.globalpolicyjournal.com/sites/default/files/pdf/Teckman%20-%20The%20Bioterrorist%20Threat%20of%20Ebola%2005.13.pdf, accessed 8-11-15]

For example, Al Qaeda, a terrorist organization with a history of executing attacks in East Africa, has 'demonstrated the desire to cause mass casualties and an interest in using disease as a weapon' (Koblentz, 2010, p.114). While the group has not been able to develop a biological weapon with the capability to cause a large number of deaths, it may do so in the future, if it is able to recruit experts and obtain an agent such as Ebola. Due to the presence of naturally occurring pathogens in East Africa and the increasing appearance of Ebola, there is concern that someone with malicious intentions could access these pathogens. 'Disease-causing microorganisms occur naturally in the region [of East Africa] and are therefore accessible to those with sufficient knowledge to use to deliberately cause disease. This is an adequate reason to presume that eastern Africa, like other regions with similar conditions, faces a potential threat from [bioweapons]' (Njuguna, 2005, p.14). Leroy et al. (2011, p.964) find that despite the fact that filoviruses are a 'major public health issue for Africa and a category A biothreat' due to the explosive disease course; high case fatality rate; and lack of specific treatments or vaccines, these viruses are a 'minor public health threat' due to the low disease burden compared to other diseases in Africa. As a 'major public health issue for Africa,' the naturally occurring Ebola virus needs more attention, especially since it is appearing more frequently in East Africa. While bioterrorism in East Africa is a concern, resources devoted to one health threat should not be diverted to another health issue. The potential for a deliberate biological attack in Africa is a security concern and methods to reduce the risk should be put in place. Borrie and Loye (2005, p.102) note that 'it is in the political interest of African countries to take cognizance of the increasing potential of the life sciences being misused for hostile purposes. Preventive action will reduce the vulnerability of the countries to endemic diseases as well as to biological attacks.' With this statement, the author is careful to point out that this does not mean fewer resources be devoted to issues also facing Africa. While a bioterrorist attack in East Africa is unlikely, it is still possible due to terrorist activity in the region and the presence of the more frequently appearing Ebola, and steps should be taken to prevent and mitigate this major public health issue. Natural occurrence of Ebola in Africa and the state of health systems Ebola virus occurs naturally in Central and East Africa and the disease caused by the virus is appearing with more frequency. This has implications for global health and security because it makes the virus potentially accessible to groups who may want to recruit an expert to find the virus and prepare the virus for use as a bioweapon. Human interaction with the environment can cause the emergence and reemergence of infectious diseases. 'Increasing human numbers have been a principal factor leading to uncontrolled urbanization, changes in agriculture, land use and animal husbandry practices, and accelerated globalization, all of which have been major and inter-related drivers of the re-emergence of epidemic infectious disease' (Wilcox et al., 2008, pp.113-114). An article in the Lancet notes that an increase in human consumption of wildlife products has led pathogens to find new hosts: the transmission of Ebola to humans is an 'example of organisms or pathogens exploiting new host opportunities resulting from human behaviour' (Karesh et al., 2012). Because of the consumption of wildlife products in Africa and the link to the incidence of infectious diseases, the region is ripe for anyone with specific expertise to harvest a naturally occurring virus. Attempts at obtaining pathogens from nature that can be weaponized have been successful. For example, the Japanese cult Aum Shinrikyo obtained a natural strain of anthrax; however, it turned out to be a non-virulent strain (Barletta, Sands and Tucker, 2002, pp.57-58). And, as stated before, Carus (2001, p.14) notes six instances in which a biological agent was acquired from a natural source. In addition to the natural occurrence of Ebola in **East Africa**, the region and Africa in general **is more susceptible** to a lethal infectious disease

outbreak because of the lack of health infrastructure. 'Due to lack of proper equipment and hygienic practices, large-scale epidemics occur mostly in poor, isolated areas without modern hospitals or welleducated medical staff' (Tyagi, Kumar and Singla, 2010, p.3). Mackey and Liang (2012, p.67) report a shortage of 1.5 million health workers in Africa due in part to brain drain, or a migration of health care workers from developing countries to developed countries. One result of this shortage of health care professionals is a weak formal health system. Another result is that patients instead use traditional healers, some of whom treat the sick in their own homes, which may not be sterile environments (Allaranga et al., p.34). These practices promote transmission of infectious diseases. From a global health and security perspective Koblentz (2010, p.100) notes that the international health and security risk posed by a biological agent is increasing because of 'advances in science and technology, the emergence of new diseases, globalization, and the changing nature of conflict. It is the convergence of these trends that has propelled biological threats onto the international agenda.' An Ebola bio-attack in East Africa is a potential threat for global public health for several reasons. First, because we are now living in a globalized world where people and objects can travel quickly from one part of the globe to another, a disease as potentially contagious as Ebola could also travel as rapidly. The east African region is a destination for foreign investors, tourists, health workers, diplomats, students and non-governmental organization representatives. For example, 'the growing popularity of China as a destination for both short- and long-term training for Kenyans…cannot be separated from the wider involvement of China in Kenya's infrastructure development…and Chinese migration to East Africa' (King, 2010, p.488). The steady flow of people and goods to and from East Africa demonstrates the ease with which a pathogen can travel. Additionally, the 'globalization of the pharmaceutical and biotechnology industries and the diffusion of information about the life sciences are making the ingredients necessary to develop biological weapons—knowledge, expertise, equipment, and materials—more widely available' (Koblentz, 2010, p.102). While globalization has made it easier for an infectious disease to travel and for non-experts to access biotechnological advancements, it has also provided improvements in more effectively responding to Ebola outbreaks. However, the fact remains that there is no cure, and once someone is infected with Ebola, there is a chance it will spread and infect others. Additionally, an Ebola bioterrorist attack in East Africa is a danger to global health because it presents a global political security risk. The virus can infect anyone that it comes in contact with; it does not discriminate. The virus is contagious and, coupled with the fact that humans come in closer contact with a wide range of people now more than ever, it is possible for anyone to become infected, even world leaders. Second, natural Ebola outbreaks are occurring more frequently in Sub-Saharan Africa, and this indicates a greater potential for transmission to a greater number of people and a greater potential for a terrorist to obtain the virus. Authors of an article in Trends in Microbiology point out that Ebola has become a global health concern because of the recent increase in cases as well as the possibility for it to be used as a bioweapon: There has been an increasing frequency of filovirus [i.e. Marburg virus and Ebola virus] outbreaks reported from endemic regions of Africa in recent years which, together with its potential for introduction into non-endemic countries through international travel and its potential for use as a bioweapon, has made [the Ebola virus] a worldwide public health concern (Groseth, Feldmann and Strong, 2007, p.408). Between 1976 and 1997, there were two outbreaks in East Africa; between 2000 to present, there were five outbreaks (CDC, Known cases). Table 1 shows the frequency of occurrence and number of deaths associated with Ebola outbreaks in East Africa. Third, the 'outbreak narrative' of a bioterrorist attack in East Africa can create fear and can further the spread of the disease. The 'outbreak narrative,' or the journey of an infection from identification through containment chronicled by science, media and dramatizations, affects the way people perceive the disease and how they handle it: As [outbreak narratives] disseminate information, they affect survival rates and contagion routes. They promote or mitigate the stigmatizing of individuals, groups, populations, locales, behaviors and lifestyles and they change economies. They also influence how both scientists and the lay public understand the nature and consequences of infection, how they imagine the threat and why they react so fearfully to some disease outbreaks and not others at least as dangerous… (Wald, 2008, p.2-3). Therefore, the outbreak narrative may include misinformation that may cause fear and alter the path of the disease. Finally, the lack of an Ebola vaccine or effective treatment protocol potentially threatens global health and security because in the event of an outbreak, only strict quarantine measures would prevent the spread of a disease which is already difficult to diagnose, as previously mentioned. Policy recommendations The potential dangers that an Ebola bio-attack in East Africa presents to global health and security cannot be overlooked. In fact, one of the reasons there is no vaccine is too little attention has been paid to the virus. Due to its potential to cause morbidity and mortality across the globe, the threat of an Ebola bio-attack should not be ignored. Therefore, the WHO, individual states and other organizations must formulate a response to this global health concern. A strong response will be comprised of the following. First, states should strengthen political will and capacity to develop a vaccine for use in an outbreak and to deter bioterrorists. While a cure may be decades away, if scientists are actively supported in looking for a cure, it is more likely that one will be discovered sooner, discouraging a deliberate Ebola outbreak, rather than highlight any weakness in global defense against Ebola. Second, public health organizations should increase surveillance and their ability to detect and identify an infectious disease. For example, USAID's Predict project mapping tool can be used as a model1 . According to an article in the East African Journal of Public Health, collaboration with those in charge of the conservation of wildlife is essential for the early detection of viral hemorrhagic fever epidemics. Hemorrhagic fever epidemics caused by Ebola and Marburg viruses are occurring more and more frequently in Sub-Saharan Africa and only an adapted epidemiological surveillance system will allow for early detection and effective response (Allaranga et al., 2010, p.32). Early detection of Ebola can help mitigate its spread, in either a natural outbreak or a deliberate attack. Third, states and public health organizations should support African disease control centers and sharing of resources (human resources, financial and material/testing, prevention and treatment equipment). An article on the 1995 Ebola outbreak in Kikwit, Democratic Republic of Congo, reveals that shortly after the disease was suspected, nine international medical teams, including the WHO, Doctors Without Borders and the CDC, arrived, bringing supplies and knowledge. The arriving teams helped to augment the understaffed hospital, provided barrier supplies and disinfectant, improved the quality of the isolation unit's effectiveness, assisted in developing safer burial procedures and improved the triage system for sick patients (Hall, Hall and Chapman, 2008, p.447). According to Njuguna (2005, p.17), 'if a terrorist attack with a biological agent were to occur, medical microbiology laboratories would be instrumental in helping to detect and identify the agent and in alerting the authorities. Referral centres should have all necessary resources to support the field laboratories.' Additionally, the benefits of

biosecurity measures should be shared with practitioners and policymakers in East Africa. During seminars held in developing countries, Rappert and Gould (2009, p.90) found a pattern: 'a low prior recognition of dual-use issues by practicing scientists, students and policymakers.' Specifically, in Africa, the authors found that there was a positive response to investment in science but at the same time a suspicion of new technologies (Rappert and Gould, 2009, p.81). The international community and developed states should share ways in which biosecurity can protect people. Advanced knowledge of lab security measures and investment in biosecurity infrastructure is a positive step toward limiting biological outbreaks, whether natural or deliberate. Fourth, states, non-governmental organizations and public health organizations should closely collaborate and effectively communicate. The more aware expert organizations are of infectious disease outbreaks, the more high level institutions such as the WHO and the CDC will be able to become involved, prevent the spread of misinformation, and devote resources to handling not only the outbreak but also the investigation. Finally, public health organizations should encourage and facilitate training in infectious disease outbreaks and prevention practices for members of organizations who are serving in East Africa (i.e., diplomats, members of the armed forces). These members should be trained in infectious disease outbreaks to help prevent their own infection and mitigate an outbreak by taking necessary precautions. For example, in 2009, the U.S. 'Armed Forces Health Surveillance Center, Division of Global Emerging Infections Surveillance and Response System (AFHSC-GEIS) supported…training initiatives in 40 countries for …U.S. military, civilian and host-country personnel' (Otto et al, 2005, p.1). Increased public knowledge and awareness is an important step in preventing and containing an infectious disease. Conclusion The threat of an Ebola bioterrorist attack in East Africa is a global health and security concern, and should not be ignored. While the threat is unlikely due to difficulties in obtaining the virus and recruiting experts to handle and weaponize the virus, the threat still exists and is increasing due to the more frequent outbreaks and subsequent accessibility to the virus in East Africa. **A threat nexus occurs in East Africa:** there is **a history of terrorism** in the region**; Ebola naturally occurs** there; **the virus has the ability to be** used as **a lethal bioterror**ist **agent,** killing 25 to 90 per cent of those infected; and there is no vaccine for Ebola. **Ebola's epidemiological makeup creates circumstances in which it could spread quickly to all parts of the globe.** Global health and security are currently compromised because a vaccine has not been discovered to prevent and treat the virus and to deter bioviolence. The political will in both the developed and developing world does not exist to cultivate such a vaccine. Several steps need to be taken to change the threat a deliberate Ebola attack in East Africa poses to global health and security, including stronger political will to develop a vaccine; increased surveillance and prediction capabilities; sharing of information and resources with partners in East Africa; and training individuals working in East Africa in prevention. These measures will help deter an offensive Ebola outbreak in East Africa and will mitigate the effects of another natural outbreak in the region.

Ebola bioterror is the biggest threat of global epidemic- most recent data proves

Gunaratne, 15 – Li Ka-shing Scholar at the Lee Kuan Yew School of Public Policy at National University of Singapore

[Naveen, "The Ebola Virus and the Threat of Bioterrorism," The Fletcher Forum of World Affairs, 39 Fletcher F. World Aff. 63, Winter 2015, l/n, accessed 8-12-15]

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This paper argues that Ebola can be used as a successful bioterrorism agent. While technologically advanced medical-disease surveillance measures can detect a possible natural outbreak, if the Ebola virus were deliberately introduced into a densely populated city, the outcome would be disastrous. Making matters worse are the less tangible but serious psychological effects of the outbreak, which are felt worldwide. Hysteria and stigma attached to the disease disrupts day-to-day life and hinders socioeconomic activity. The research on the Ebola virus presented here is focused on a comparative analysis with the potential bioterrorist agent smallpox (variola major) and the already employed bio-agent anthrax. This structured analysis attempts to determine the potential of Ebola as an effective agent in a bioterrorist attack, and the consequences of such an event, taking into account the transnational nature of pandemics and the dynamics of world politics. A comparative approach was selected as the most suitable methodology for this analysis because primary data on the relationship between the Ebola virus and bioterrorism is limited. The method of structured, focused comparison is a prevalent approach in military research that uses qualitative data or literature available to trace a hypothesized process. n1 For the purposes of this paper, the structure will focus on five characteristics necessary for a biological agent to become a successful bioterrorism agent: pathogenesis and etiology, infectiousness and symptoms, dissemination methods, capacity for weaponization, and the available prophylaxis. Based [*64] on these characteristics this study concludes that the Ebola virus is capable of being a successful bio-agent, analogous to smallpox and anthrax. In certain factors such as infectiousness and prophylaxis, Ebola is, in fact, a more suitable bioterror agent than smallpox or anthrax. BIO-AGENTS AND BIOTERRORISM Bioterrorism is defined as "the use or threatened use of biological agents against a person, group, or larger population to create fear or illnesses for purposes of intimidation, gaining an advantage, interruption of normal activities, or ideological objectives." n2 The effects from a biological agent exposure range from mild illnesses to acute adverse manifestations or even death. n3 Bioterrorism agents are complex and varying, and perpetrators take into consideration the biological agents, means of dissemination, and levels of fear that best suit their objectives. The Centers for Disease Control and Prevention (CDC) in the United States classifies viruses, bacteria, and other pathogens into three categories, Categories A, B, and C, that are tabulated according to the likelihood that the agent will be used and the severity

of the outbreaks that would result if the agent were used in an act of bioterrorism. n4 Category A represents the highest threat, with biological agents that cause high levels of morbidity and mortality, while agents in Categories B and C represent subsequently lesser threats to the population. This categorization scheme provides a holistic guideline that may be considered as a reference guide to existing biological agents. The bioterrorist attacks in the United States in 2001, for instance, involved the Category A agent Bacillus anthracis, commonly known as "anthrax." The recent Ebola hemorrhagic fever (EHF) outbreak in Africa has reinvigorated the discussion on Ebola as a potential agent of bioterrorism. Since the first recorded Ebola outbreak in Sudan and the Democratic Republic of Congo in 1976, there have been sporadic outbreaks of an endemic nature that have been primarily restricted to Central and West Africa. n5 But the 2014 Ebola outbreak that began in West Africa poses an unprecedented threat--and signals the potential for a global pandemic. The World Health Organization's (WHO) Global Alert Response [*65] on the Ebola virus reported 5,335 probable, confirmed, and suspected cases of the virus in Guinea, Liberia, and Sierra Leone as of September 14, 2014, with 2,622 confirmed deaths. n6 Despite the efforts to contain the disease, recent data mapping indicates an increase in the rate of infection and a widening of the disease's geographical distribution. According to the CDC's Morbidity and Mortality Weekly Report (MMWR) published on September 24, the approximate number of cases in Liberia and Sierra Leone will increase to between 500,000 and 1.4 million by January 2015, based on the prevailing trend of infection. n7 POTENTIAL FOR EBOLA IN BIOTERRORISM To understand the present context of the threat of bioterrorism, it is vital to illuminate the historical developments of biological warfare. Early accounts of biological warfare involve the strategic use of feces, cadavers, and other fomites to spread disease and coerce the enemy to surrender. n8 Tatar forces used plague victims in Kaffa to spread disease in the fourteenth century, and British forces used smallpox to destroy the Native American population in the eighteenth century. n9 Biological weapons were also integrated into the strategic "cult of the offensive" during the First World War and resulted in state-funded biological weapons programs. n10 The legitimacy of biological weapons as sanctioned by the state motivated the wide use of glanders, an infectious disease that primarily affects horses, donkeys, and mules, and anthracis (anthrax) by German forces during the war. n11, n12 Even though these acts of cruelty were conducted under the mantle of strategic military objectives, many countries pushed for the prohibition of biological warfare. Along with asphyxiating, poisonous, and other gases and chemicals, bacteriological methods of warfare were banned under the 1925 Geneva Protocol. n13 But world powers continued to produce and utilize biological weapons during World War II. For example, Japan continued its bio-agents weapons research program in occupied Manchuria from 1932 to the end of the war. n14 The horrors committed during these conflicts bolstered the international community's efforts toward a comprehensive ban of state funded biological weapons programs. In 1975, the Biological and Toxin Weapons Convention (BWC), a multilateral effort to prohibit the development, production, and stockpiling of these weapons, went into force. n15 Political discord concerning verification and implementation mechanisms, along with a lack of punitive action for violations under the BWC and the Geneva Convention remain. Still, states have largely refrained from weaponizing biological agents for the purpose [*66] of avoiding unnecessary suffering in war, as embodied under the Law of Armed Conflict (LOAC). Such concerns for international law are hardly present in terrorist ideology. It is highly unlikely today that a state would resort to producing biological agents for conventional warfare. This makes it more important to investigate the role of non-state actors and their ability or interest in using biological agents in acts of terrorism. Non-state actors are bounded by rationality, and pursuing a weapon of ultimate power would be beneficial to attain their higher social, ideological, and political goals leading to perverse tactics not accepted by the international community. Even small bioterrorist attacks disproportionately spread fear and terror, and the threat of such an event is not unfounded in past experiences. To illustrate, Oregon's Rajneeshee cult intentionally contaminated salad bars with Salmonella Typhimurium in 1984, causing 751 reported infections and 45 accounts of hospitalizations. n16 The Japanese cult Aum Shinrikyo used Sarin gas in an attack at the Tokyo subway. n17 The cult was also accused of sending members to Zaire in 1992 to obtain weaponizable strands of the Ebola virus. n18 The United States experienced the most recent event of bioterrorism following 9/11, when perpetrators delivered Bacillus anthracis spores contained in envelopes to media centers and government officials. n19 This attack resulted in twentytwo cases of anthrax infections, eleven of which were inhalation anthrax and the remaining eleven were cutaneous anthrax (although four were only suspected cases). n20 While Al Qaeda has been actively seeking nuclear weapons to cause mass casualties within the western world, n21 scholars have explained that the difficulties in attaining nuclear weapons and the cost of operating them are much greater than for biological agents. n22 It follows that it may be easier and more advantageous for a terrorist group to use less costly bioweapons. In fact, recent data from a recently recovered Islamic State of Iraq and the Levant (ISIL) laptop from Syria indicate the Jihadist's intention to weaponize bubonic plague in order to inflict mass casualties. n23 Critics have noted that the danger of handling biological agents, whether it be through research, development, weaponization, or delivery, may make such bioterrorism unlikely. But terrorists endure similarly dangerous threats in their more typical operations, and have proven willing to die for the cause. Considering the trends in suicide bombings, it is possible to conclude that the risks terrorists are willing to accept are limitless. It is not [*67] fanciful to expect a hierarchically organized and **sufficiently funded** terrorist organization to resort to bioterrorism when the followers are willing to do whatever that is necessary to support their ideological beliefs. MAPPING EBOLA WITH THE FIVE-FACTOR STRUCTURED, FOCUSED COMPARISON: PATHOGENESIS AND ETIOLOGY The first dimension of the structured, focused comparison is the biological agent's pathogenesis and etiology. Pathogenesis of the agent is an indispensable variable in an act of bioterrorism. The pathological analysis of Ebola is contrasted here to anthrax and smallpox (variola major) and shows that if successfully weaponized, Ebola is a more suitable bioterrorism agent due to its potency and acute effects. Compared with anthrax and smallpox, the pathogenesis and etiology of the Ebola virus have distinct characteristics. Anthrax and smallpox infections are primarily spread by inhalation of aerosol droplets, while the Ebola virus infects by "direct contact with blood, secretions, or tissue of humans." n24 Although it may seem like Ebola is less potent as a bioterrorist agent, in reality it has the capacity to infect with minor contact, through multiple entry routes. In addition, research indicates that contact with infected skin of Ebola patients can transmit the disease. n25 Cutaneous contraction is highly possible when disposing of the dead bodies, whether it may be during funeral traditions or burial processes. The **mutating factor of**

the Ebola virus increases the risk of spread because it is difficult to predict the incubation time and the time for infection symptoms to appear in victims. And though anthrax, smallpox, and Ebola can all cause fatalities, Ebola causes far more severe necrosis than the other two bio-agents. Ebola therefore has a **higher "terror factor"** than anthrax or smallpox. Moreover, the rapid development of the Ebola virus within the infected individual and person-to-person transmission, which helps to create mass public panic, serves the purpose as a bioterrorism agent. INFECTIOUSNESS Infectiousness and the resulting symptoms are key properties in a bioterrorist agent. Infectiousness defines the capacity of the agent to spread among the targeted population. The infective dose of smallpox in aerosol condition ranges from 10 to 100 organisms and the anthrax aerosol infective dose is between 8,000 to 50,000 spores. n26, n27 However, the infective dose for a viral hemorrhagic fever such as Ebola is considered extremely [*68] low at 1 to 10 organisms in an aerosol calculation. n28 Thus, compared to anthrax and smallpox, the infective dose of Ebola is extremely low. With such capacity, Ebola would become an ideal weapon for bioterrorism. The Ebola infection's symptomatic effects are also unique compared to anthrax and smallpox. The Ebola virus causes a viral hemorrhagic fever that severely degrades the human body. The transition to the often fatal EHF will result in "progressive hemorrhagic diathesis, such as petechaie, mucous membrane, and conjunctival hemorrhage." n29 These acute diatheses become a cause of death in the infected patients. While there is no doubt that anthrax and smallpox have the capacity to cause acute effects and result in severe suffering, the gruesomeness of the Ebola virus communicates greater fear to the target population. DISSEMINATION Dissemination comprises two parts: the method of spreading the disease and the area of the infective zone. The primary and secondary Ebola virus infection is dependent on direct contact. An epidemic can begin with the primary infection occurring from a zoonotic infection (transmission between different species of animals) or an exposure to a viral reservoir (pathogen-carrying host). The secondary infections are primarily dependent on person-to-person contact. Because the Ebola virus has multiple infection routes and only requires a very low infective dose, the initial dissemination does not necessitate a large target area. For instance, primary transmission can be initiated by exposing the population deliberately to an infected individual or animal, and the targeted population will spread the virus through person-to-person contact. **The mutating property** of the Ebola virus **will hinder** symptomatic **detection** and exacerbate the condition to EHF, potentially causing mass mortalities. Furthermore, in a bioterrorist attack, the Ebola virus could be introduced to the target population simultaneously at multiple locations. This tactic would increase the virus' dispersion and cause rapid infections in the target population. Although the Ebola virus lacks the capacity for aerosol dispersion, as the present outbreak in West Africa indicates, the virus can propagate through the population and be transmitted across borders. Further, substandard public health measures will exacerbate the situation and increase the spread of the Ebola virus. Therefore, as a bioterrorism agent, if Ebola is to be introduced into a target population, the extremely high contagiousness and the multiple infectious routes could create an epidemic. Additionally, the extremely high infectiveness of the Ebola virus could [*69] develop a substantive infected area with the targeted territory. The infective area in an Ebola outbreak will continue to expand until the infected population is isolated and public health systems can contain the transmissions with no further person-to-person contact. For instance, since the first reported case of Ebola infection from Guinea on March 22, 2014, n30 the epidemic has affected large swaths of Guinea, Liberia, and Sierra Leone with widespread transmission within eight months. n31 Far more than anthrax and smallpox, the Ebola virus has shown that it can be disseminated in a small area of the target population and transmitted through primary and secondary infections. WEAPONIZATION The weaponizing capability of an agent is essential to utilizing a bioagent successfully in bioterrorism. Weaponizing can be categorized into two types: explosive and non-explosive weapons. The explosive weapon category does not necessarily correlate to a thermal explosion device but to a weapon that can spread the bio-agent instantaneously. The non-explosive weapon disperses the bio-agents without any explosive force. An exploding device or a bomb with a delivery mechanism can be used to spread the biological agent over a target area. On the other hand, a terrorist organization could weaponize bio-agents to be disseminated using bio-aerosols as non-explosive paint-sprayers, handheld atomizers, insecticide sprayers, and handheld drug delivery systems. n32 A terrorist organization would select the method based on the availability of the bio weapon, access to such a weapon, the funds required to acquiring the weapon, and the target characteristics and the objectives of the bioterrorism attack. In the case of anthrax, the United States weaponized Bacillus anthracis spores into bombs in May 1944 at Camp Detrick. n33 Likewise, the former Soviet Union's biological weapons research laboratories weaponized anthrax into bombs and spray tanks that could be delivered from aircraft and ballistic missiles. n34 As opposed to the explosive biological weapons method, bioterrorist attacks in 2001 used non-explosive letter envelopes to specifically target individuals, which successfully created panic among the public, even beyond the targeted countries. The smallpox virus was weaponized as an explosive aerosol weapon by the former Soviet Union and the same approach could incentivize a bioterrorist attack. n35 Additionally, smallpox can also be weaponized using non-explosive fomites or contagious individuals to spread the disease among a target population. [*70] Nonetheless, a large-scale explosive release of a bio-agent faces intrinsic difficulties. For example, a smallpox bomb's success lessens depending on weather conditions and vulnerability to sunlight and ultraviolet rays. n36 Notwithstanding, a terrorist organization can weaponize smallpox using explosive or non-explosive means, even though the disease was proclaimed eradicated in 1977 and the only available stocks are maintained by the United Kingdom, United States, South Africa, and Russia. n37 If a terrorist organization wanted to conduct a deliberate bioterrorist attack using smallpox, they must covertly acquire a weaponizable strain from one of the high security viral research laboratories. Though the process might be extremely difficult, the threat still exists of a bioterrorism attack using smallpox variola major. Weaponizing the Ebola virus requires a unique and creative approach. There is no recorded explosive weaponization of the Ebola virus even from the bioweapons research programs that existed during the Cold War era. However, a filoviridae virus, such as Marburg, was weaponized by the former Soviet Union and a terrorist organization might similarly hope to develop an explosive weapon using the Ebola virus. n38 Notwithstanding, the **Ebola** virus **can be effectively weaponized** by non-explosive methods. As the Ebola virus is effectively transmitted by direct contact, weaponizing the virus will focus on increasing person-toperson or zoonotic interaction. First, an infected human can be used as a non-explosive Ebola virus weapon, n39 used to spread the disease within the targeted population. Analogous to suicide bombers, in bioterrorism infected humans will become the biological weapon. This delivery method is called "implantation," where the infected individual or the group of people becomes the Ebola vector that will maintain person-to-person contact and attempt to spread the illness by body fluids, saliva, and skin exposure. n40 Hypothetically, a successful bioterrorist attack can be conducted on a target population by transporting the infected individual or group by mass rapid transport systems such as trains and busses at peak hours. The highly

congested public transportation will create an ideal environment for direct contact with the target population and simply transmit the Ebola virus. Further, deploying infected human weapons during the festive seasons, political rallies and events that result in mass congregations could be an effective option. In the contemporary context, the ongoing epidemic in West Africa [*71] is an ideal opportunity for an interested terrorist organization to acquire infected individuals or cadavers to produce human weapons. Second, the Ebola virus can be weaponized as an inoculating injection. The infected body fluids and blood can be directly introduced into the targeted individuals to transmit the Ebola virus. A similar method was used in the 1978 umbrella killings that inoculated ricin toxin using tiny pellets. n41 Analogously, the inoculating injection can be delivered using a dart or a syringe. This non-explosive weapon can spread the virus to individual or multiple targets simultaneously. Further, the viral reservoir to weaponize the injection could be acquired from an infected individual. Inoculating injection is an ideal weapon for a covert bioterrorist strike. Moreover, if Ebola is introduced with coordinated multiple bioterrorist attacks, it is highly likely that it will continue to become an epidemic and spread fear among the population. Third, an infected animal reservoir can also be used as an Ebola virus weapon. n42 Non-human primates, bats, and rodents are Ebola virus infectors and they could be used as a viral reservoir to spread the disease among the population. The animal reservoir could be attained by direct exposure to contaminated cadavers or by inoculation, and the infected animal group can be released among the target population. This might result in multiple zoonotic infections and subsequently permeate the population through person-to-person contact. Hence, the Ebola virus has a higher likelihood of being weaponized through non-explosive methods than explosive methods. Compared to anthrax and smallpox, mass dispersion by explosive means is limited in the Ebola virus, but the non-explosive weapon options can be effectively used to infect the target population. Moreover, creating a nonexplosive Ebola weapon is effective and plausible; a terrorist organization might seek to develop a non-explosive Ebola weapon and use it to cause fatalities, terror, and panic among the target population. PROPHYLAXIS The prophylaxis methods available to counter a bioterrorist agent are crucial to the agent's success in an act of bioterrorism. Substantial prophylaxis methods used against the diseases can subside the intended public [*72] terror and suffering. Prophylaxis against a bio-agent consists of vaccinations, prevention, and treatment. There is no approved vaccination against the Ebola virus, n43 unlike both anthrax and smallpox. The post exposure treatment focuses on supportive therapy because there is no approved antiviral or antimicrobial medication for the disease, again unlike anthrax (which is treatable) and smallpox (which has an approved vaccine). n44, n45 This would exacerbate the situation after a deliberate bioterrorist attack, as the chance for survival or recovery after an Ebola infection is reduced. The major focus after an Ebola outbreak is directed toward infection control. The control measures include patient isolation to prevent person-toperson contact, quarantine and containment locations in the hospital, and special personal protective equipment such as double gloves, N-95 masks, face shields, goggles, and impermeable gowns. n46 Similar to smallpox, any research on the Ebola virus is only conducted at BSL-4 high containment laboratories. n47 Furthermore, mortuary practices must avoid any skin contact with the diseased patient to avoid cutaneous transmission of the virus. Hence, postmortem practices must also adhere to secure containment that prevents person-to-person transmission. n48 The lack of any vaccine and antiviral medication to prevent or treat in pre- or post-exposure scenarios makes the Ebola virus a highly suitable candidate as an agent for a bioterrorist attack. CONCLUSION A structured, focused comparison with anthrax and smallpox reveals that the Ebola virus is a highly effective biological agent. The pathogenesis and the etiology of the virus indicate that it is a **stable, highly fatal, and mutative** virus that could cause acute Ebola hemorrhagic fever. Furthermore, the infectiousness of the virus indicates that it can spread rapidly among a target population through person-to-person contact via multiple entry routes into the human body. In addition, a terrorist organization can cause primary infections in a small population and then allow the infection to spread by secondary transmission. Even though the Ebola virus cannot be spread through aerosol dispersion, the relatively small infective dose makes the virus highly susceptible for direct transmission. The present Ebola outbreak provides any terrorist organization interested in bioterrorism an Ebola virus reservoir of infected individuals or infected dead bodies, lessening the difficulty of covertly acquiring the virus strain. Without proper public infection control mechanisms, this outbreak could **rapidly rise to an epidemic** level.

Extinction outweighs - psychological bias, peer reviewed, 5% p-value threshold

Dennis Pamlin & Stuart Armstrong 15, Dennis Pamlin, Executive Project Manager Global Risks, Global Challenges Foundation, and Stuart Armstrong, James Martin Research Fellow, Future of Humanity Institute, Oxford Martin School, University of Oxford, February 2015, “Global Challenges: 12 Risks that threaten human civilization: The case for a new risk category,” Global Challenges Foundation, p.30-93, https://api.globalchallenges.org/static/wp-content/uploads/12-Risks-with-infinite-impact.pdf

2. Risks with infinite impact: A new category of risks “Most risk management is really just advanced contingency planning and disciplining yourself to realise that, given enough time, very *low probability events not only can happen, but they absolutely will happen*.” Lloyd Blankfein, Goldman Sachs CEO, July 2013 1 *Risk = Probability × Impact* Impacts where civilisation collapses to a state of *great suffering* and *do not recover*, or a situation where all human life end, are defined as *infinite* as the result is *irreversible* and *lasts forever*. A new group of global risks This is a report about a limited number of global risks – that can be identified through a scientific and transparent process – with impacts of a magnitude that pose a threat to human civilisation,

or even possibly to all human life. With such a focus it may surprise some readers to find that the report's essential aim is to inspire action and dialogue as well as an increased use of the methodologies used for risk assessment. The real focus is not on the almost unimaginable impacts of the risks the report outlines. Its fundamental purpose is to encourage global collaboration and to use this new category of risk as a driver for innovation. The idea that we face a number of global challenges threatening the very basis of our civilisation at the beginning of the 21st century is well accepted in the scientific community, and is studied at a number of leading universities.2 But there is still no coordinated approach to address this group of challenges and turn them into opportunities for a new generation of global cooperation and the creation of a global governance system capable of addressing the greatest challenges of our time. This report has, to the best of our knowledge, created the first science-based list of global risks with a potentially infinite impact and has made the first attempt to provide an initial overview of the uncertainties related to these risks as well as rough quantifications for the probabilities of these impacts. What is risk? Risk is the potential of losing something of value, weighed against the potential to gain something of value. Every day we make different kinds of risk assessments, in more or less rational ways, when we weigh different options against each other. The basic idea of risk is that an uncertainty exists regarding the outcome and that we must find a way to take the best possible decision based on our understanding of this uncertainty.3 To calculate risk the probability of an outcome is often multiplied by the impact. The impact is in most cases measured in economic terms, but it can also be measured in anything we want to avoid, such as suffering. At the heart of a risk assessment is a probability distribution, often described by a probability density function4; see figure X for a graphic illustration. The slightly tilted bell curve is a common probability distribution, but the shape differs and in reality is seldom as smooth as the example. The total area under the curve always represents 100 percent, i.e. all the possible outcomes fit under the curve. In this case (A) represents the most probable impact. With a much lower probability it will be a close to zero impact, illustrated by (B). In the same way as in case B there is also a low probability that the situation will be very significant, illustrated by (C). Figure 1: Probability density function [FIGURE 1 OMITTED] The impacts (A), (B) and (C) all belong to the same category, normal [common] impacts: the impacts may be more or less serious, but they can be dealt with within the current system. The impacts in this report are however of a special kind. These are impacts where everything will be lost and the situation will not be reversible, i.e challenges with potentially infinite impact. In insurance and finance this kind of risk is called "risk of ruin", an impact where all capital is lost.5 This impact is however only infinite for the company that is losing the money. From society's perspective, that is not a special category of risk. In this report the focus is on the "risk of ruin" on a global scale and on a human level, in the worst case this is when we risk the extinction of our own species. On a probability curve the impacts in this report are usually at the very far right with a relatively low probability compared with other impacts, illustrated by (D) in Figure 2. Often they are so far out on the tail of the curve that they are not even included in studies. For each risk in this report the probability of an infinite impact is very low compared to the most likely outcome. Some studies even indicate that not all risks in this report can result in an infinite impact. But a significant number of *peer-reviewed* reports indicate that those impacts *not only can happen*, but that their *probability is increasing* due to *unsustainable trends*. The assumption for this report is that by creating a better understanding of our scientific knowledge regarding risks with a potentially infinite impact, we can inspire initiatives that can turn these risks into drivers for innovation. Not only could a better understanding of the unique magnitude of these risks help address the risks we face, it could also help to create a path towards more sustainable development. The group of global risks discussed in this report are so different from most of the challenges we face that they are hard to comprehend. But that is also why they can help us to build the collaboration we need and drive the development of further solutions that benefit both people and the planet. As noted above, none of the risks in this report is likely to result directly in an infinite impact, and some are probably even physically incapable of doing so. But all are so significant that they could reach a threshold impact able to create social and ecological instability that could trigger a process which could lead to an infinite impact. For several reasons the potentially infinite impacts of the risks in this report are not as well known as they should be. One reason is the way that extreme impacts are often masked by most of the theories and models used by governments and business today. For example, the probability of extreme impacts is often below what is included in studies and strategies. The tendency to exclude impacts below a probability of five percent is one reason for the *relative "invisibility"* of *infinite impacts*. The almost standard use of a 95% confidence interval is one reason why low-probability high-impact events are often ignored.6 Figure 2: Probability density function with tail highlighted [FIGURE 2 OMITTED] Climate change is a good example, where almost all of the focus is on the most likely scenarios and there are few studies that include the low-probability high-impact scenarios. In most reports about climate impacts, the impacts caused by warming beyond five or six degrees Celsius are even omitted from tables and graphs even though the IPCC's own research indicates that the probability of these impacts are often between one and five percent, and sometimes even higher.7 Other aspects that contribute to this relative invisibility include the fact that extreme impacts are difficult to translate into monetary terms, they have a global scope, and they often require a time-horizon of a century or more. They cannot be understood simply by linear extrapolation of current trends, and they lack historical precedents. There is also the fact that the

measures required to significantly reduce the probability of infinite impacts will be radical compared to a business-as-usual scenario with a focus on incremental changes. The exact probability of a specific impact is difficult or impossible to estimate.8 However, the important thing is to establish the current magnitude of the probabilities and compare them with the probabilities for such impacts we cannot accept. A failure to provide any estimate for these risks often results in strategies and priorities defined as though the probability of a totally unacceptable outcome is zero. An approximate number for a best estimate also makes it easier to understand that a great uncertainty means the actual probability can be both much higher and much lower than the best estimate. It should also be stressed that uncertainty is not a weakness in science; it always exists in scientific work. It is a systematic way of understanding the limitations of the methodology, data, etc.9 Uncertainty is not a reason to wait to take action if the impacts are serious. Increased uncertainty is something that risk experts, e.g. insurance experts and security policy experts, interpret as a signal for action. A contrasting challenge is that our cultural references to the threat of infinite impacts have been dominated throughout history by religious groups seeking to scare society without any scientific backing, often as a way to *discipline people* and implement unpopular measures. It should not have to be said, but this report is obviously *fundamentally different* as it focuses on *scientific evidence* from *peer-reviewed sources*. Infinite impact The concept infinite impact refers to two aspects in particular; the terminology is not meant to imply a literally infinite impact (with all the mathematical subtleties that would imply) but to serve as a reminder that these risks are of a different nature. Ethical These are impacts that threaten the very *survival of humanity and life on Earth* – and therefore can be seen as being infinitely negative from an *ethical perspective*. *No positive gain can outweigh even a small probability* for an infinite negative impact. Such risks require society to ensure that we eliminate these risks by reducing the impact below an infinite impact as a *top priority*, or at least do everything we can to reduce the probability of these risks. As some of these risks are impossible to eliminate today it is also important to discuss what probability can right now be accepted for risks with a possible infinite impact. Economic Infinite impacts are beyond what most traditional economic models today are able to cope with. The impacts are irreversible in the most fundamental way, so tools like cost-benefit assessment seldom make sense. To use discounting that makes infinite impacts (which could take place 100 years or more from now and affect all future generations) close to invisible in economic assessments, is another example of a challenge with current tools. So while tools like cost-benefit models and discounting can help us in some areas, they are seldom applicable in the context of infinite impacts. New tools are needed to guide the global economy in an age of potential infinite impacts. See chapter 2.2.2 for a more detailed iscussion. Roulette and Russian roulette When probability and normal risks are discussed the example of a casino and roulette is often used. You bet something, then spin the wheel and with a certain probability you win or lose. You can use different odds to discuss different kinds of risk taking. These kinds of thought experiment can be very useful, but when it comes to infinite risks these gaming analogies become problematic. For infinite impact a more appropriate analogy is probably Russian roulette. But instead of “normal” Russian roulette where you only bet your own life you are now also betting everyone you know and everyone you don’t know. Everyone alive will die if you lose. There will be no second chance for anyone as there will be no future generations; humanity will end with your loss. What probability would you accept for different sums of money if you played this version of Russian roulette? Most people would say that it is stupid and – no matter how low the probability is and no matter how big the potential win is – this kind of game should not be played, as it is unethical. Many would also say that no person should be allowed to make such a judgment, as those who are affected do not have a say. You could add that most of those who will lose from it cannot say anything as they are not born and will never exist if you lose. The difference between ordinary roulette and “allhumanity Russian roulette” is one way of illustrating the difference in nature between a “normal” risk that is reversible, and a risk with an infinite impact. An additional challenge in acknowledging the risks outlined in this report is that many of the traditional risks including wars and violence have decreased, even though it might not always looks that way in media.10 So a significant number of experts today spend a substantial amount of time trying to explain that much of what is discussed as dangerous trends might not be as dangerous as we think. For policy makers listening only to experts in traditional risk areas it is therefore easy to get the impression that global risks are becoming less of a problem. The *chain of events* that could result in *infinite impacts* in this report also *differ* from most of the traditional risks, as most of them are *not* triggered by *wilful acts*, but *accidents*/mistakes. Even the probabilities related to nuclear war in this report are to a large degree related to inadvertent escalation. As many of the tools to analyse and address risks have been developed to protect nations and states from attacks, risks involving accidents tend to get less attention. This report emphasises the need for an open and democratic process in addressing global challenges with potentially infinite impact. Hence, this is a scientifically based invitation to discuss how we as a global community can address what could be considered the greatest challenges of our time. The difficulty for individual scientists to communicate a scientific risk approach should however not be underestimated. Scientists who today talk about low-probability impacts, that are serious but still far

from infinite, are often accused of pessimism and scaremongering, even if they do nothing but highlight scientific findings.11 To highlight infinite impacts with even lower probability can therefore be something that a scientist who cares about his/her reputation would want to avoid. In the media it is still common to contrast the most probable climate impact with the probability that nothing, or almost nothing, will happen. The fact that almost nothing could happen is not wrong in most cases, but it is unscientific and dangerous if different levels of probability are presented as equal. The tendency to compare the most probable climate impact with the possibility of a low or no impact also results in a situation where low-probability high-impact outcomes are often totally ignored. An honest and scientific approach is to, whenever possible, present the whole probability distribution and pay special attention to unacceptable outcomes. The fact that we have challenges that with some probability might be infinite and therefore fundamentally irreversible is difficult to comprehend, and *physiologically* they are something our brains are poorly equipped to respond to, according to evolutionary psychologists.12 It is hard for us as individuals to grasp that humanity for the first time in its history now has the capacity to create such catastrophic outcomes. Professor Marianne Frankenhaeuser, former head of the psychology division, Karolinska Institute, Stockholm, put it this way: "Part of the answer is to be found in psychological defence mechanisms. The nuclear threat is collectively denied, because to face it would force us to face some aspects of the world's situation which we do not want to recognise." 13 This *psychological* denial may be one reason why there is a tendency among some stakeholders to confuse "being optimistic" with denying what science is telling us, and ignoring parts of the probability curve.14 Ignoring the fact that there is strong scientific evidence for serious impacts in different areas, and focusing only on selected sources which suggest that the problem may not be so serious, is not optimistic. It is both unscientific and dangerous.15 A scientific approach requires us to base our decisions on the whole probability distribution. Whether it is possible to address the challenge or not is the area where optimism and pessimism can make people look at the same set of data and come to different conclusions. Two things are important to keep in mind: first, that there is always a probability distribution when it comes to risk; second, that there are two different kinds of impacts that are of interest for this report. The probability distribution can have different shapes but in simplified cases the shape tends to look like a slightly modified clock (remember figure 1). In the media it can sound as though experts argue whether an impact, for example a climate impact or a pandemic, will be dangerous or not. But what serious experts discuss is the probability of different oucomes. They can disagree on the shape of the curve or what curves should be studied, but not that a probability curve exists. With climate change this includes discussions about how sensitive the climate is, how much greenhouse gas will be emitted, and what impacts that different warmings will result in. Just as it is important not to ignore challenges with potentially infinite impacts, it is also important not to use them to scare people. Dramatic images and strong language are best avoided whenever possible, as this group of risks require sophisticated strategies that benefit from rational arguments. Throughout history we have seen too many examples when threats of danger have been damagingly used to undermine important values. The history of infinite impacts: The LA-602 document The understanding of infinite impacts is very recent compared with most of our institutions and laws. It is only 70 years ago that Edward Teller, one of the greatest physicists of his time, with his back-of-the-envelope calculations, produced results that differed drastically from all that had gone before. His calculations indicated that the explosion of a nuclear bomb – a creation of some of the brightest minds on the planet, including Teller himself – could result in a chain reaction so powerful that it would ignite the world's atmosphere, thereby ending human life on Earth.16 Robert Oppenheimer, who led the Manhattan Project to develop the nuclear bomb, halted the project to see whether Teller's calculations were correct.17 The resulting document, LA- 602: Ignition of the Atmosphere with Nuclear Bombs, concluded that Teller was wrong, But the sheer complexity drove them to end their assessment by writing that "further work on the subject [is] highly desirable".18 The LA-602 document can be seen as the first scientific global risk report addressing a category of risks where the worst possible impact in all practical senses is infinite.19 Since the atomic bomb more challenges have emerged with potentially infinite impact. Allmost all of these new challenges are linked to the increased knowledge, economic and technical development that has brought so many benefits. For example, climate change is the result of the industrial revolution and development that was, and still is, based heavily on fossil fuel. The increased potential for global pandemics is the result of an integrated global economy where goods and services move quickly around the world, combined with rapid urbanisation and high population density. In parallel with the increased number of risks with possible infinite impact, our capacity to analyse and solve them has greatly increased too. Science and technology today provides us with knowledge and tools that can radically reduce the risks that historically have been behind major extinctions, such as pandemics and asteroids. Recent challenges like climate change, and emerging challenges like synthetic biology and nanotechnology, can to a large degree be addressed by smart use of new technologies, new lifestyles and institutional structures. It will be hard as it will require collaboration of a kind that we have not seen before. It will also require us to create systems that can deal with the problems before they occur. The fact that the same knowledge and tools can be both a problem and a solution is important to understand in order to avoid polarisation. Within a few decades, or even sooner, many of the tools that can help us solve the global challenges of today will come from fields likely to provide us with the most powerful instruments we have ever had – resulting in their own sets of challenges. Synthetic biology, nanotechnology and artificial intelligence (AI) are all rapidly evolving fields with great potential. They may help solve many of today's main challenges or, if not guided in a benign direction, may result in catastrophic outcomes. The point of departure of this report is the fact that we now have the knowledge, economic resources and technological ability to reduce most of the greatest risks of our time. Conversely, the infinite impacts we face are almost all unintended results of human ingenuity. The reason we are in this situation is that we have made progress in many areas without addressing unintended low-probability high-impact consequences. Creating innovative and resilient systems rather than simply managing risk would let us focus more on opportunities. But the resilience needed require moving away from legacy systems is likely to be disruptive, so an open and transparent discussion is needed regarding the transformative solutions required. Figure 3: Probability density function with tail and threshold highlighted [FIGURE 3 OMITTED] 2.1 Report structure The first part of the report is an introduction where the global risks with potential infinite impact are introduced and defined. This part also includes the methodology for selecting these risks, and presents the twelve risks that meet this definition. Four goals of the report are also presented, under the headings "acknowledge", "inspire", "connect" and "deliver". The second part is an overview of the twelve global risks and key events that illustrate some of the work around the world to address them. For each challenge five important factors that influence the probability or impact are also listed. The risks are divided into four different categories depending on their characteristics. "Current challenges" is the first category and includes the risks that currently threaten humanity due to our economic and technological development - extreme climate change, for example, which depends on how much greenhouse gas we emit. "Exogenic challenges" includes risks where the basic probability of an event is beyond human control, but where the probability and magnitude of the impact can be influenced - asteroid impacts, for example, where the asteroids' paths are beyond human control but an impact can be moderated by either changing the direction of the asteroid or preparing for an impact. "Emerging challenges" includes areas where technological development and scientific assessment indicate that they could both be a very important contribution to human welfare and help reduce the risks associated with current challenges, but could also result in new infinite impacts.20 AI, nanotechnology and synthetic biology are examples. "Global policy challenge" is a different kind of risk. It is a probable threat arising from future global governance as it resorts to destructive policies, possibly in response to the other challenges listed above. The third part of the report discusses the relationship between the different risks. Action to reduce one risk can increase another, unless their possible links are understood. Many solutions are also able to address multiple risks, so there are significant benefits from understanding how one relates to others. Investigating these correlations could be a start, but correlation is a linear measure and non-linear techniques may be more helpful for assessing the aggregate risk. The fourth part is an overview, the first ever to our knowledge, of the uncertainties and probabilities of global risks with potentially infinite impacts. The numbers are only rough estimates and are meant to be a first step in a dialogue where methodologies are developed and estimates refined. The fifth part presents some of the most important underlying trends that influence the global challenges, which often build up slowly until they reach a threshold and very rapid changes ensue. The sixth and final part presents an overview of possible ways forward. 2.2 Goals Goal 1: Acknowledge That key stakeholders, influencing global challenges, acknowledge the existence of the category of risks that could result in infinite impact. They should also recognice that the list of risks that belong to this category should be revised as new technologies are developed and our knowledge increases. Regardless of the risks included, the category should be given special attention in all processes and decisions of relevance. The report also seeks to demonstrate to all key stakeholders that we have the capacity to reduce, or even eliminate, most of the risks in this category. Establish a category of risks with potentially infinite impact. Before anything significant can happen regarding global risks with potentially infinite impacts, their existence must be acknowledged. Rapid technological development and economic growth have delivered unprecedented material welfare to billions of people in a veritable tide of utopias.21 But we now face the possibility that even tools created with the best of intentions can have a darker side too, a side that may threaten human civilisation, and conceivably the continuation of human life. This is what all decision-makers need to recognise. Rather than succumbing to terror, we need to acknowledge that we can let the prospect inspire and drive us forward. Goal 2: Inspire That policy makers inspire action by explaining how the probabilities and impacts can be reduced and turned into opportunities. Concrete examples of initiatives should be communicated in different networks in order to create ripple effects, with the long-term goal that all key stakeholders should be inspired to turn these risks into opportunities for positive action. Show concrete action that is taking place today. This report seeks to show that it is not only possible to contribute to reducing these risks, but that it is perhaps the most important thing anyone can spend their time on. It does so by combining information about the risks with information about individuals and groups who has made a significant contribution by turning challenges into opportunities. By highlighting concrete examples the report hopes to inspire a new generation of leaders. Goal 3: Connect That leaders in different sectors connect with each other to encourage collaboration. A specific focus on financial and security policy where significant risks combine to demand action beyond the incremental is required. Support new meetings between interested stakeholders. The nature of these risks spans countries and continents; they require action by governments and politicians, but also by companies, academics, NGOs, and many other groups. The magnitude of the possible impacts requires not only leaders to act but above all new models for global cooperation and decision-making to ensure delivery. The need for political leadership is therefore crucial. Even with those risks where many groups are involved, such as climate change and pandemics, very few today address the possibility of infinite impact aspects. Even fewer groups address the links between the different risks. There is also a need to connect different levels of work, so that local, regional, national and international efforts can support each other when it comes to risks with potentially infinite impacts. Goal 4: Deliver That concrete strategies are developed that allow key stakeholders to identify, quantify and address global challenges as well as gather support for concrete steps towards a wellfunctioning global governance system. This would include tools and initiatives that can help identify, quantify and reduce risks with potentially infinite impacts. Identify and implement strategies and initiatives. Reports can acknowledge, inspire and connect, but only people can deliver actual results. The main focus of the report is to show that actual initiatives need to be taken that deliver actual results. Only when the probability of an infinite impact becomes acceptably low, very close to zero, and/or when the maximum impact is significantly reduced, should we talk about real progress. In order to deliver results it is important to remember that global governance to tackle these risks is the way we organise society in order to address our greatest challenges. It is not a question of establishing a "world government", it is about the way we organise ourselves on all levels, from the local to the global. The report is a first step and should be seen as an invitation to all responsible parties that can affect the probability and impact of risks with potentially infinite impacts. But its success will ultimately be measured only on how it contributes to concrete results. 2.3 Global challenges and infinite impact This chapter first introduces the concept of infinite impact. It then describes the methodology used to identify challenges with an infinite impact. It then presents risks with potentially infinite impact that the methodology results in. 2.3.1 Definition of infinite impact The specific criterion for including a risk in this report is that well-sourced science shows the challenge can have the following consequences: 22 1. Infinite impact: When civilisation collapses to a state of great suffering and does not recover, or a situation where all human life ends. The existence of such threats is well attested by science.23 2. Infinite impact threshold – an impact that can trigger a chain of events that could result first in a civilisation collapse, and then later result in an infinite impact. Such thresholds are especially important to recognise in a complex and interconnected society where resilience is decreasing.24 A collapse of civilisation is defined as a drastic decrease in human population size and political/economic/social complexity, globally for an extended time.25 The above definition means the list of challenges is not static. When new challenges emerge, or current ones fade away, the list will change. An additional criterion for including risks in this report is "human influence". Only risks where humans can influence either the probability, the impact, or both, are included. For most risks both impact and probability can be affected, for example with nuclear war, where the number/size of weapons influences the impact and tensions between countries affects the probability. Other risks, such as a supervolcano, are included as it is possible to affect the impact through various mitigation methods, even if we currently cannot affect the probability. Risks that are susceptible to human influence are indirectly linked, because efforts to address one of them may increase or decrease the likelihood of another. 2.3.2 Why use "infinite impact" as a concept? The concept of infinity was chosen as it reflects many of the challenges, especially in economic theory, to addressing these risks as well as the need to question much of our current way of thinking. The concept of a category of risks based on their extreme impact is meant to provide a tool to distinguish one particular kind of risk from others. The benefit of this new concept should be assessed based on two things. First, does the category exist, and second, is the concept helpful in addressing these risks? The report has found ample evidence that there are risks with an impact that can end human civilisation and even all human life. The report further concludes that a new category of risk is not only meaningful but also timely. We live in a society where global risks with potentially infinite impacts increase in both number and probability according to multiple studies. Looking ahead, many emerging technologies which will certainly provide beneficial

results, might also result in an increased probability of infinite impacts.26 Over the last few years a greater understanding of low probability or unknown probability events has helped more people to understand the importance of looking beyond the most probable scenarios. Concepts like “black swans” and “perfect storms” are now part of mainstream policy and business language.27 Greater understanding of the technology and science of complex systems has also resulted in a new understanding of potentially disruptive events. Humans now have such an impact on the planet that the term “the anthropocene” is being used, even by mainstream media like The Economist.28 The term was introduced in the 90s by the Nobel Prize winner Paul Crutzen to describe how humans are now the dominant force changing the Earth’s ecosystems.29 The idea to establish a well defined category of risks that focus on risks with a potentially infinite impact that can be used as a practical tool by policy makers is partly inspired by Nick Bostrom’s philosophical work and his introduction of a risk taxonomy that includes an academic category called “existential risks”.30 Introducing a category with risks that have a potentially infinite impact is not meant to be a mathematical definition; infinity is a thorny mathematical concept and nothing in reality can be infinite.31 It is meant to illustrate a singularity, when humanity is threatened, when many of the tools used to approach most challenges today become problematic, meaningless, or even counterproductive. The concept of an infinite impact highlights a unique situation where humanity itself is threatened and the very idea of value and price collapses from a human perspective, as the price of the last humans also can be seen to be infinite. This is not to say that those traditional tools cannot still be useful, but with infinite impacts we need to add an additional set of analytical tools. Life Value The following estimates have been applied to the value of life in the US. The estimates are either for one year of additional life or for the statistical value of a single life. – $50,000 per year of quality life (international standard most private and government-run health insurance plans worldwide use to determine whether to cover a new medical procedure) – $129,000 per year of quality life (based on analysis of kidney dialysis procedures by Stefanos Zenios and colleagues at Stanford Graduate School of Business) – $7.4 million (Environmental Protection Agency) – $7.9 million (Food and Drug Administration) – $6 million (Transportation Department) – $28 million (Richard Posner based on the willingness to pay for avoiding a plane crash) Source: Wikipedia: Value of life http://en.wikipedia.org/wiki/Value_of_life US EPA: Frequently Asked Questions on Mortality Risk Valuation http://yosemite.epa.gov/EE%5Cepa%5Ceed.nsf/webpages/MortalityRiskValuation.html Posner, Richard A. Catastrophe: risk and response. Oxford University Press, 2004 Some of the risks, including nuclear war, climate change and pandemics, are often included in current risk overviews, but in many cases their possible infinite impacts are excluded. The impacts which are included are in most cases still very serious, but only the more probable parts of the probability distributions are included, and the last part of the long tail – where the infinite impact is found – is excluded.32 Most risk reports do not differentiate between challenges with a limited impact and those with a potential for infinite impact. This is dangerous, as it can mean resources are spent in ways that increase the probability of an infinite impact. Ethical aspects of infinite impact The basic ethical aspect of infinite impact is this: a very small group alive today can take decisions that will fundamentally affect all future generations. “All future generations” is not a concept that is often discussed, and for good reason. All through human history we have had no tools with a measurable global impact for more than a few generations. Only in the last few decades has our potential impact reached a level where all future generations can be affected, for the simple reason that we now have the technological capacity to end human civilisation. If we count human history from the time when we began to practice settled agriculture, that gives us about 12,000 years.33 If we make a moderate assumption that humanity will live for at least 50 million more years34 our 12,000-year history so far represents 1/4200, or 0.024%, of our potential history. So our generation has the option of risking everything and annulling 99.976% of our potential history. Comparing 0.024% with the days of a person living to 100 years from the day of conception, this would equal less than nine days and is the first stage of human embryogenesis, the germinal stage.35 Two additional arguments to treat potentially infinite impacts as a separate category are: 36 1. *An approach to infinite impacts cannot be one of trial-and-error*, because there is no opportunity to learn from errors. The reactive approach – see what happens, limit damage, and learn from experience – is unworkable. Instead society must be proactive. This requires foresight to foresee new types of threat and willingness to take decisive preventative action and to bear the costs (*moral* and economic) of such actions. 2. We cannot necessarily rely on the institutions, morality, social attitudes or national security policies that developed from our experience of other sorts of risk. Infinite impacts are in a different category. Institutions and individuals may find it hard to take these risks seriously simply because they lie outside our experience. Our collective fear-response will probably be ill-calibrated to the magnitude of threat. Economic aspects of infinite impact and discounting In today’s society a monetary value is sometimes ascribed to human life. Some experts use this method to estimate risk by assigning a monetary value to human extinction.37 We have to remember that the monetary values placed on a human life in most cases are not meant to suggest that we have actually assigned a specific value to a life. Assigning a value to a human life is a tool used in a society with a limited supply of resources or infrastructure (ambulances, perhaps) or skills. In such a society it is impossible to save every life, so some trade-off must be made.38 The US Environmental Protection Agency explains its use like this: “The EPA does not place a dollar value on individual lives. Rather, when conducting a benefit-cost analysis of new environmental policies, the Agency uses estimates of how much people are willing to pay for small reductions in their risks of dying from adverse health conditions that may be caused by environmental pollution.” 39 The fact that monetary values for human lives can help to define priorities when it comes to smaller risks does not mean that they are suitable for quite different uses. Applying a monetary value to the whole human race makes little sense to most people, and from an economic perspective it makes no sense. Money helps us to prioritise, but with no humans there would be no economy and no need for priorities. Ignoring, or discounting, future generations is actually the only way to avoid astronomical numbers for impacts that may seriously affect every generation to come. In Catastrophe: Risk and Response, Richard Posner provides a cost estimate, based on the assumption that a human life is worth $50,000, resulting in a $300 tn cost for the whole of humanity, assuming a population of six billion. He then doubles the population number to include the value of all future generations, ending up with $600 tn, while acknowledging that “without discounting, the present value of the benefits of risk-avoidance measures would often approach infinity for the type of catastrophic risk with which this book is concerned.” 40 Discounting for risks that include the possibility of an infinite impact differs from risk discounting for less serious impacts. For example the Stern Review41 prompted a discussion between its chief author, Nicholas Stern, and William Nordhaus,42 each of whom argued for different discount levels using different arguments. But neither discussed a possible infinite climate impact. An overview of the discussion by David Evans of Oxford Brookes University highlighted some of the differing assumptions.43 Two things make infinite impacts special from a discounting perspective. First, there is no way that future generations can compensate for the impact, as they will not exist. Second, the impact

is something that is beyond an individual preference, as society will no longer exist. Discounting is undertaken to allocate resources in the most productive way. In cases that do not include infinite impacts, discounting “reflects the fact that there are many high-yield investments that would improve the quality of life for future generations. The discount rate should be set so that our investable funds are devoted to the most productive uses.” 44 When there is a potentially infinite impact, the focus is no longer on what investments have the best rate of return, it is about avoiding the ultimate end. While many economists shy away from infinite impacts, those exploring the potentially extreme impacts of global challenges often assume infinite numbers to make their point. Nordhaus for example writes that “the sum of undiscounted anxieties would be infinite (i.e. equal to 1 + 1 +1 + … = ∞). In this situation, most of us would dissolve in a sea of anxiety about all the things that could go wrong for distant generations from asteroids, wars, out-of-control robots, fat tails, smart dust and other disasters.” 45 It is interesting that Nordhaus himself provides very good graphs that show why the most important factor when determining actions is a possible threshold (see below Figure 4 and 5). Nordhaus was discussing climate change, but the role of thresholds is similar for most infinite impacts. The first figure is based on traditional economic approaches which assume that Nature has no thresholds; the second graph illustrates what happens with the curve when a threshold exists. As Nordhaus also notes, it is hard to establish thresholds, but if they are significant all other assumptions become secondary. The challenge that Nordhaus does not address, and which is important especially with climate change, is that thresholds become invisible in economic calculations if they occur far into the future, even if it is *current actions* that unbalance the system and eventually push it over the threshold.46 Note that these dramatic illustrations rest on assumptions that the thresholds are still relatively benign, not moving us beyond tipping points which result in an accelerated release of methane that could result in a temperature increase of more than 8 ºC, possibly producing infinite impacts.47 Calculating illustrative numbers By including the welfare of future generations, something that is important when their very existence is threatened, economic discounting becomes difficult. In this chapter, some illustrative numbers are provided to indicate the order of magnitude of the values that calculations provide when traditional calculations also include future generations. These illustrative calculations are only illustrative as the timespans that must be used make all traditional assumptions questionable to say the least. Still, as an indicator for why infinite impact might be a good approximation they might help. As a species that can manipulate our environment it could be argued that the time the human race will be around, if we do not kill ourselves, can be estimated to be between 1-10 million years – the typical time period for the biological evolution of a successful species48 – and one billion years, the inhabitable time of Earth.49 [FIGURE 4 OMITTED] [FIGURE 5 OMITTED] If we assume – 50 million years for the future of humanity as our reference, – an average life expectancy of 100 years50, and – a global population of 6 billion people51 – all conservative estimate – , we have half a million generations ahead of us with a total of 3 quadrillion individuals. Assuming a value of $50,000 per life, the cost of losing them would then be $1.5 ×1020, or $150 quintillion. This is a very low estimate, and Posner suggests that maybe the cost of a life should be “written up $28 million” for catastrophic risks52. Posner’s calculations where only one future generation is included result in a cost of $336 quadrillion. If we include all future generations with the same value, $28 million, the result is a total cost of $86 sextillion, or $86 × 1021. This $86 sextillion is obviously a very rough number (using one billion years instead of 50 million would for example require us to multiply the results by 20), but again it is the magnitude that is interesting. As a reference there are about 1011 to 1012 stars in our galaxy, and perhaps something like the same number of galaxies. With this simple calculation you get 1022 to 1024, or 10 to 1,000 sextillion, stars in the universe to put the cost of infinite impacts when including future generations in perspective.53 These numbers can be multiplied many times if a more philosophical and technology-optimistic scenario is assumed for how many lives we should include in future generations. The following quote is from an article by Nick Bostrom in Global Policy Journal: “However, the relevant figure is not how many people could live on Earth but how many descendants we could have in total. One lower bound of the number of biological human life-years in the future accessible universe (based on current cosmological estimates) is 1034 years. Another estimate, which assumes that future minds will be mainly implemented in computational hardware instead of biological neuronal wetware, produces a lower bound of 1054 human-brain-emulation subjective life-years.” 54 Likewise the value of a life, $28 million, a value that is based on an assessment of how individuals chose when it comes to flying, can be seen as much too small. This value is based on how much we value our own lives on the margin, and it is reasonable to assume that the value would be higher than only a multiplication of our own value if we also considered the risk of losing our family, everyone we know, as well as everyone else on the planet. In the same way as the cost increases when a certain product is in short supply, the cost of the last humans could be assumed to be very high, if not infinite. Obviously, the very idea to put a price on the survival of humanity can be questioned for good reasons, but if we still want to use a number, $28 million per life should at least be considered as a significant underestimation. For those that are reluctant or unable to use infinity in calculations and are in need of a number for their formulas, $86 sextillion could be a good initial start for the cost of infinite impacts. But it is important to note that this number might be orders of magnitude smaller than an estimate which actually took into account a more correct estimation of the number of people that should be included in future generations as well as the price that should be assigned to the loss of the last humans. 2.3.3 Infinite impact threshold (IIT) As we address very complex systems, such as human civilisation and global ecosystems, a concept as important as infinite impact in this report is that of infinity impact threshold. This is the impact level that can trigger a chain of events that results in the end of human civilisation. The infinite impact threshold (IIT) concept represents the idea that long before an actual infinite impact is reached there is a tipping point where it (with some probability) is no longer possible to reverse events. So instead of focusing only on the ultimate impact it is important to estimate what level of impact the infinity threshold entails. The IIT is defined as an impact that can trigger a chain of events that could result first in a civilisation collapse, and then later result in an infinite impact. Such thresholds are especially important to recognise in a complex and interconnected society where resilience is decreasing. Social and ecological systems are complex, and in most complex systems there are thresholds where positive feedback loops become self-reinforcing. In a system where resilience is too low, feedback loops can result in a total system collapse. These thresholds are very difficult to estimate and in most cases it is possible only to estimate their order of magnitude. As David Orrell and Patrick McSharry wrote in A Systems Approach to Forecasting: “Complex systems have emergent properties, qualities that cannot be predicted in advance from knowledge of systems components alone”. According to complexity scientist Stephen Wolfram’s principle of computational irreducibility, the only way to predict the evolution of such a system is to run the system itself: “There is no simple set of equations that can look into its future.” 55 Orrell and McSharry also noted that “in orthodox economics, the reductionist approach means that the economy is seen as consisting of individual, independent agents who act to maximise their own utility. It assumes that prices are driven to a state of near-equilibrium by the ‘invisible hand’ of the economy. Deviations from this state are assumed to be random and independent, so the price fluctuations are often modelled using the normal distribution or other distributions with thin tails and finite variance.” The drawbacks of an approach using the normal distribution, or other distributions with thin tails and finite variance, become obvious when the unexpected happens as in the recent credit crunch, when existing models totally failed to capture the true risks of the economy. As an employee of Lehman Brothers put it on August 11, 2007: “Events that models predicted would happen only once in 10,000 years happened every day for three days.” 56 [FIGURE 6 OMITTED] The exact level for an infinite impact threshold should not be the focus, but rather the fact that such thresholds exists and that an order of magnitude should be estimated.57 During the process of writing the report, experts suggested that a relatively quick death of two billion people could be used as a tentative number until more research is available.58 With current trends undermining ecological and social resilience it should be noted that the threshold level is likely to become lower as time progress. 2.3.4 Global F-N curves and ALARP In the context of global risks with potentially infinite impact, the possibility of establishing global F-N curves is worth exploring. One of the most common and flexible frameworks used for risk criteria divides risks into three bands: 59 1. Upper: an unacceptable/ intolerable region, where risks are intolerable except in extraordinary circumstances and risk reduction measures are essential. 2. Middle: an ALARP (“as low as reasonably practicable”) region, where risk reduction measures are desirable but may not be implemented if their cost is disproportionate to the benefit achieved. 3. Lower: a broadly acceptable/ negligible region, where no further risk reduction measures are needed. The bands are expressed by F-N curves. When the frequency of events which cause at least N fatalities is plotted against the number N on log–log scales, the result is called an F-N curve.60 If the frequency scale is replaced by annual probability, then the resultant curve is called an f-N curve. The concept for the middle band when using F-N curves is ALARP. It is a term often used in the area of safety-critical and safety-involved systems.62 The ALARP principle is that the residual risk should be as low as reasonably practicable. The upper band, the unacceptable/ intolerable region, is usually the area above the ALARP area (see figure 8) By using F-N curves it is also possible to establish absolute impact levels that are never acceptable, regardless of probability (Figure 7. Based on an actual F-n Curve showing an absolute impact level that is defined as unacceptable). This has been done in some cases for local projects. The infinite threshold could be used to create an impact limit on global F-N curves used for global challenges in the future. Such an approach would help governments, companies and researchers when they develop new technical solutions and when investing in resilience. Instead of reducing risk, such an approach encourages the building of systems which cannot have negative impacts above a certain level. Pros – Clearly shows relationship between frequency and size of accident – Allows judgement on relative importance of different sizes of accident – Slope steeper than -1 provides explicit consideration of multiple fatality aversion and favours concepts with lower potential for large fatality events – Allows company to manage overall risk exposure from portfolio of all existing and future facilities Cons – Cumulative expression makes it difficult to interpret, especially by non-risk specialists – Can be awkard to derive – May be difficult to use if criterion is exceeded in one area but otherwise is well below – Much debate about criterion lines Figure 7: Example of F-n curve showing different levels of risk 61 Figure 9: Pros and cons of F-N curves 63 46 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.3 Global challenges and infinite impact practical guidance that can provide defined group of risks 2.3.5 A name for a clearly 10 100 1000 10000 10 10 10 10 10 10 10 10-2 -3 -4 -5 -6 -7 -8 -9 Number of Fatalities (N) Frequency (F) of Accidents with N or More Fatalities (Per Year) ALARP region Unacceptable Acceptable Today no established methodology exists that provides a constantly updated list of risks that threaten human civilisation, or even all human life. Given that such a category can help society to better understand and act to avoid such risks, and better understand the relation between these risks, it can be argued that a name for this category would be helpful.65 To name something that refers to the end of humanity is in itself a challenge, as the very idea is so far from our usual references and to many the intuitive feeling will be to dismiss any such thing. The concept used in this report is “infinity”. The reson for this is that many of the challenges relate to discussed. In one way the name is not very important so long as people understand the impacts and risks associated with it. Still, a name is symbolic and can either help or make it more difficult to get support to establish the new category. The work to establish a list of risks with infinite impact evolved from “existential risk”, the philosophical concept that inspired much of the work to establish a clearly defined group of risks. The reason for not using the concept “existential risk and impact” for this category, beside the fact that existential impact is also used in academic contexts to refer to a personal impact, is that the infinite category is a smaller subset of “existential risk” and this new category is meant to be used as a tool, not a scientific concept. Not only should the impacts in the category potentially result in the end of all human life, it should be possible to affect the probability and/or impact of that risk. There must also exist an agreed methodology, such as the one suggested in this report, that decides what risks belong and not belong on the list. Another concept that the category relates to is “global catastrophic risk” as it is one of the most used concepts among academics interested in infinite impacts. However it is vague enough to be used to refer to impacts from a few thousand deaths to the end of human civilisation. Already in use but not clearly defined, it includes both the academic concept existential risks and the category of risks with infinite impacts. macroeconomics and its challenges in relation to the kind of impacts that the risks in this report focus on. Further, the name clearly highlights the unique nature without any normative judgements. Still, infinity is an abstract concept and it might not be best communicate the unique group of risks that it covers to all stakeholders. In the same way as it can be hard to use singularity to describe a black hole, it can be difficult to use infinity to describe a certain risk. If people can accept that it is only from a specific perspective that the infinity concept is relevant it could be used beyond the areas of macroeconomics. Two other concepts that also have been considered during the process of writing this report are “xrisks” and “human risk of ruin”. Xrisk has the advantage, and disadvantage, of not really saying anything at all about the risk. The positive aspect is that the name can be associated with the general concept of extinction and the philosophical concept of existential risk as both have the letter x in them. The disadvantage is the x often represents the unknown and can therefore relate to any risk. There is nothing in the name that directly relates to the kind of impacts that the category covers, so it is easy to interpret the term as just unknown risks. Human risk of ruin has the advantage of having a direct link to a concept, risk of ruin, that relates to a very specific state where all is lost. Risk of ruin is a concept in use in gambling, insurance, and finance that can all give very important contributions to the work with this new category of risk. The resemblance to an existing concept that is well established could be both a strength and a liability. Below is an overview of the process when different names were Figure 8: Example of F-n curve showing an absolute impact level that is defined as unacceptable/ infinite. i.e no level of probability is acceptable above a certain level of impact, in this case 1000 dead 64 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 47 2.3 Global challenges and infinite impact 3. 2. 1. 9. Unacceptable risks in different combinations, e.g. unacceptable global risks – This is probably not appropriate for two main reasons. First, it is a normative statement and the category aims to be scientific; whether these risks are unacceptable or not is up to the citizens of the world to decide. Second, the idea of risk is that it is a combination of probability times impact. If a risk is unacceptable is therefore also usually related to how easy it is to avoid. Even if a risk is small, due to relatively low probability and relatively low impact, but is very easy to address, it can be seen as unacceptable, in the same way a large risk can be seen as acceptable if it would require significant resources to reduce. There will not be a perfect concept and the question is what concept can find the best balance between being easy to understand, acceptable where policy decisions needs to be made and also acceptable for all key groups that are relevant for work in these area. During the process to find a name for this category inspiration has been found in the process when new concepts have been introduced; from irrational numbers and genocide to sustainable development and the Human Development Index. So far “infinite risk” can be seen as the least bad concept in some areas and “xrisks” and “human risk of ruin” the least bad in others. The purpose of this report is to establish a methodology to identify a very specific group of risks as well as continue to a process where these risks will be addressed in a systematic and appropriate way. The issue of naming this group of risks will be left to others. The important is that the category gets the attention it deserves. The three concepts are very different. Global catastrophic risk is possibly the most used concept in contexts where infinite impacts are included, but it is without any clear definition. Existential risk is an academic concept used by a much smaller group and with particular focus on future technologies. The category in this report is a tool to help decision makers develop strategies that help reduce the probability that humanity will end when it can be avoided. The relation between the three concepts can be illustrated with three circles. The large circle (1) represents global catastrophic risks, the middle one (2) existential risks and the small circle (3) the list of twelve risks in this report, i.e. risks where there are peer reviewed academic studies that estimate the probability of an infinite impact and where there are known ways to reduce the risk. A list that could be called infinite risks, xrisks, or human risk of ruin. Other concepts that are related to infinite impacts that could potentially be used to describe the same category if the above suggestions are not seen as acceptable concepts are presented below, together with the main reason why these concepts were not chosen for this report. 1. Risk of ruin – is a concept in gambling, insurance and finance relating to the likelihood of losing all one’s capital or affecting one’s bankroll beyond the point of recovery. It is used to describe individual companies rather than systems.66 2. Extinction risk – is used in biology for any species that is threatened. The concept is also used in memory/cognition research. It is a very dramatic term, to be used with care. These factors make it probably unsuitable for use by stakeholders accustomed to traditional risk assessment. 3. Astronomical risk – is seldom used scientifically, but when it is used it is often used for asteroids and is probably best reserved for them.67 4. Apocalyptic risk – could have been suitable, as the original meaning is apocálypsis, from the Greek ́ mó and κκλύπτω meaning ‘un-covering’. It is sometime used, but in a more general sense, to mean significant risks.68 But through history and today it is mainly used for a religious end of time scenario. Its strong links to unscientific doom-mongers make it probably unsuitable for a scientific concept. 5. End-of-the-world risk - belongs to the irrational doomsday narratives and so is probably unsuitable for scientific risk assessments. 6. Extreme risk – is vague enough to describe anything beyond the normal, so it is probably unsuitable for risk assessments of this magnitude. 7. Unique risk – is even vaguer, as every risk is unique in some way. Probably best avoided in risk assessments. 8. Collapse risk – is based on Jared Diamond’s thinking.69 There are many different kinds of collapse and only a few result in infinite impact. 48 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.3 Global challenges and infinite impact Estimations of impact Only literature where there is some estimation of impact that indicates the possibility of an infinite impact is included. Leading organisations’ priorities In order to increase the probability of covering all relevant risks an overview of leading organisations’ work was conducted. This list was then compared with the initial list and subjected to the same filter regarding the possibility to affect the probability or impact. Possibility of addressing the risk Possibility of addressing the risk: From the risks gathered from literature and organisations, only those where the probability or impact can be affected by human actions are included. Expert review Qualitative assessment: Expert review in order to increase the probability of covering all relevant global risks. List of risks Result: List of risks with potentially infinite impacts. Relevant literature Identification of credible sources: search relevant literature in academic literature included in World of Knowledge and Google Scholar. 1 2 3 4 5 6 This chapter presents the methodology used to identify global risks with potentially infinite impact. Methodology overview In order to establish a list of global risks with potentially infinite impact a methodological triangulation was used, consisting of: – A quantitative assessment of relevant literature. – A strategic selection of relevant organisations and their priorities. – A qualitative assessment with the help of expert workshops. 2.4 Methodology 70 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 49 2.4 Methodology The scientific review of literature was led by Seth Baum, Executive Director of the Global Catastrophic Risk Institute72 and research scientist at the Center for Research on Environmental Decisions, Columbia University.73 The methodology for including global risks with a potentially infinite impact is based on a scientific review of key literature, with focus on peer-reviewed academic journals, using keyword search of both World of Knowledge74 and Google Scholar75 combined with existing literature overviews in the area of global challenges. This also included a snowball methodology where references in the leading studies and books were used to identify other scientific studies and books. In order to select words for a literature search to identify infinite impacts, a process was established to identify words in the scientific literature connected to global challenges with potentially infinite impacts. Some words generate a lot of misses, i.e. publications that use the term but are not the focus of this report. For example “existential risk” is used in business; “human extinction” is used in memory/cognition. Some search terms produced relatively few hits. For example “global catastrophic risk” is not used much. Other words are only used by people within a specific research community: few use “existential risk” in our sense unless they are using Nick Bostrom’s work. The term “global catastrophe” was identified as a phrase that referred almost exclusively to extremely negative impacts on humans, by a diversity of researchers, not just people in one research community. A list of 178 relevant books and reports was established based on what other studies have referred to, and/or which are seen as landmark studies by groups interviewed during the process. They were selected for a closer examination regarding the challenges they include.76 The full bibliography, even with its focus on publications of general interest, is still rather long. So it is helpful to have a shorter list focused on the highlights; the most important publications based on how often they are quoted, how wellspread the content (methodology, lists, etc.) is and how often key organisations use them. The

publications included must meet at least one of the following criteria: – Historical significance. This includes being the first publication to introduce certain key concepts, or other early discussions of global challenges. Publications of historical significance are important for showing the intellectual history of global challenges. Understanding how the state of the art research got to where it is today can also help us understand where it might go in the future. – Influential in developing the field. This includes publications that are highly cited77 and those that have motivated significant additional research. They are not necessarily the first publications to introduce the concepts they discuss, but for whatever reason they will have proved important in advancing research. – State of the art. This includes publications developing new concepts at the forefront of global challenges research as well as those providing the best discussions of important established concepts. Reading these publications would bring a researcher up to speed with current research on global challenges. So they are important for the quality of their ideas. – Covers multiple global challenges (at least two). Publications that discuss a variety of global challenges are of particular importance because they aid in identifying and comparing the various challenges. This process is essential for research on global risks to identify boundaries and research priorities. In order to identify which global challenges are most commonly discussed, key surveys were identified and coded. First, a list of publications that survey at least three global challenges was compiled, and they were then scanned to find which challenges they discussed. The publications that survey many global challenges were identified from the full bibliography. Publications from both the academic and popular literature were considered. Emphasis was placed on publications of repute or other significance.78 To qualify as a survey of global challenges, the publication had to provide an explicit list of challenges or to be of sufficient length and breadth for it to discuss a variety of challenges. Many of the publications are books or book-length collections of articles published in book form or as special issues of scholarly journals. Some individual articles were also included because they discussed a significant breadth of challenges. A total of 40 global challenge survey publications were identified. For authors with multiple entries (Bostrom with three and WEF with ten) each challenge was counted only once to avoid bias. review of key literature 71 2.4.1 A scientific 50 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.4 Methodology 0 5 10 15 20 25 Climate Change Nuclear War Pandemic Biodiversity loss Asteroid / Comet / Meteor Volcano Genetic Engineering High Energy Physics Nanotech Resource Depletion Artificial Intelligence Chemical Pollution Ecological Catastrophe Biogeochem Government Failure Poverty System Failure Astronomic Explosion LULCC Biological Weapons Chemical Weapons Extraterrestrial Reject Procreation Computer Failure EM Pulse New Technology Ozone Depletion Dysgenics Ocean Acidification Interstellar Cloud Atmosphere Aerosols Phase Transition Simulation Unknown 21 18 17 15 14 14 13 13 13 13 11 11 11 8 8 8 8 7 7 5 5 5 5 4 4 4 4 3 3 2 1 1 1 1 In terms of authorship and audience, there are 17 academic publications, 9 popular publications, 1 government report, 3 publications written by academics for popular audiences. In terms of format, there are 15 books, 5 edited collections, 7 articles, 3 of miscellaneous format. Of the 40 publications identified, 22 were available at the time of coding. In addition, 10 Global Risks Reports from the World Economic Forum were coded and then gathered under one heading: “WEF Global Risk Report 2005-2014”. A list of 34 global challenges was developed based on the challenges mentioned in the publications. A spreadsheet containing the challenges and the publications was created to record mentions of specific challenges in each publication to be coded. Then each publication was scanned in its entirety for mentions of global challenges. Scanning by this method was necessary because many of the publications did not contain explicit lists of global challenges, and the ones that did often mentioned additional challenges separately from their lists. So it was not required that a global challenge be mentioned in a list for it to be counted – it only had to be mentioned somewhere in the publication as a challenge. Assessing whether a particular portion of text counts as a global challenge and which category it fits in sometimes requires some interpretation. This is inevitable for most types of textual analysis, or, more generally, for the coding of qualitative data. The need for interpretation in this coding was heightened by the fact that the publications often were not written with the purpose of surveying the breadth of global challenges, and even the publications that were intended as surveys did not use consistent definitions of global challenges. The coding presented here erred on the side of greater inclusivity: if a portion of text was in the vicinity of a global challenge, then it was coded as one. For example, some publications discussed risks associated with nuclear weapons in a general sense without specifically mentioning the possibility of large-scale nuclear war. These discussions were coded as mentions of nuclear war, even though they could also refer to single usages of nuclear weapons that would not rate as a global challenge. This more inclusive approach is warranted because many of the publications were not focused exclusively on global challenges. If they were focused on them, it is likely that they would have included these risks in their global challenge form (e.g., nuclear war), given that they were already discussing something related (e.g., nuclear weapons). Below are the results from the overview of the surveys. Figure 9: Number of times global challenges are included in surveys of global challenges Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 51 2.4 Methodology Climate Change Nuclear War Pandemic Biodiversity loss Asteroid / Comet / Meteor Volcano Genetic Engineering High Energy Physics Nanotech Resource Depletion Artificial Intelligence Chemical Pollution Ecological Catastrophe 21 18 17 15 14 14 13 13 13 13 11 11 11 0 25 20 15 10 5 dung beetle star trek zinc oxalate human extinction 0 200 400 600 800 1000 It should be noted that the literature that includes multiple global challenges with potentially infinite impact is very small, given the fact that it is about the survival of the human race. Experts in the field of global challenges, like Nick Bostrom, have urged policymakers and donors to focus more on the global challenges with infinite impacts and have used dramatic rhetoric to illustrate how little research is being done on them compared with other areas. However, it is important to note that many more studies exist that focus on individual global risks, but often without including low-probability high-impact outcomes.80 How much work actually exists on human extinction infinite impact is therefore difficult to assess. The list of risks found in the scientific literature was checked against a review of what challenges key organisations working on global challenges include in their material and on their webpages. This was done to ensure that no important risk was excluded from the list. The coding of key organisations paralleled the coding of key survey publications. Organisations were identified via the global catastrophic risk organisation directory published by the Global Catastrophic Risk Institute.82 They were selected from the directory if they worked on a variety of global challenges – at least three, and ideally more. The reason for focusing on those that work on multiple challenges is to understand which challenges they consider important and why. In contrast, organisations that focus on only one or two challenges may not Figure 10: The global challenges included ten times or more in surveys of global challenges on global challenges 81 organisations working 2.4.2 A review of Figure 11: Number of academic papers on various topics (listed in Scopus, August 2012) From the paper “Existential Risk Prevention as Global Priority” 79 52 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 2.4 Methodology Climate Change Nuclear War Pandemic Resource Depletion Biological Weapons Computer Failure Government Failure Nanotech Chemical Weapons Artificial Intelligence Genetic Engineering System Failure Biodiversity loss Ecological Failure Poverty Volcano Asteroid / Comet / Meteor Astronomic Explosion Biogeochem Chemical Pollution Extraterrestrial High Energy Physics New Technology Ozone Depletion Atmospheric Aerosols Dysgenics EM Pulse Interstellar Cloud LULCC Ocean Acidification Phase Transition Reject Procreation Simulation Unknown 13 13 12 9 8 7 7 7 6 5 4 4 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 4 8 12 2 6 10 14 be able to adjust their focus according to which challenges they consider the most important. The organisation coding used the same coding scheme developed for coding survey publications. References to specific global challenges were obtained from organisations’ websites. Many have web pages which list the topics they work on. Where possible, references to global challenges were pulled from these pages. Additional references to these challenges were identified by browsing other web pages, including recent publications. While it is possible that some of these organisations have worked on global challenges not mentioned on the web pages that were examined, overall the main challenges that they have worked on have probably been identified and coded. So the results should give a reasonably accurate picture of what global challenges these organisations are working on. Organisations working with global challenges were initially selected on the basis of the literature overview. A snowball sampling was conducted based on the list of organisations identified, according to whether they claimed to work on global challenges and/or their web page contained information about “existential risk”, “global catastrophic risk”,“human extinction” or “greatest global challenges”. Cross-references between organisations and input during the workshops were also used to identify organisations. An initial list of 180 organisations which work with global challenges was established. Based on the production of relevant literature, which other organisations referred to the organisation, and/or are seen as influential by groups interviewed during the process, a short-list of organisations were selected for a closer examination regarding the challenges they work with. Then those working with multiple challenges were selected, resulting in a list of 19 organisations.83 Below is the overview of the results from the overview of key organisations working with multiple global challenges. The organisations working on global challenges vary widely in: 1. What they count as a global challenge 2. How systematically they identify global challenges; and 3. Their emphasis on the most important global challenges For most organisations working with global challenges there are no explanations for the methodology used to select the challenges. Only a few thought leaders, like Tower Watson and their Extreme Risk Report 2013, have a framework for the challenges and estimates of possible impacts. Figure 12: Global challenges that key organisations work with Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 53 2.4 Methodology Climate Change Nuclear War Pandemic Resource Depletion Biological Weapons Computer Failure Government Failure Nanotech Chemical Weapons Artificial Intelligence Genetic Engeneering System Failure Atmospheric Aerosols 13 13 12 9 8 7 7 7 6 5 4 4 0 4 8 12 2 6 10 14 In most cases there is neither a definition of the impact, nor a definition of the probability. The report that focuses on global risk which is probably best known is the WEF Global Risk Report. The WEF’s risk work, with many other groups’, is probably best described as belonging to the category of risk perception rather than risk assessment, where experts are asked to estimate risks, but without any clear definition of probability or impact. The more serious organisations, like the WEF, also clearly define what they do as discussing perception of risk, not a scientific assessment of the actual risk. The WEF describes its perception methodology as follows: “This approach can highlight areas that are of most concern to different stakeholders, and potentially galvanise shared efforts to address them.” 85 The question which people are asked to answer is: “What occurrence causes significant negative impact for several countries and industries?” 86 The respondents are then asked to provide a number on two scales from 1-4, one for impact and another for likelihood (within 10 years).87 It is then up to the respondent to define what 1-4 means, so the major value of the report is to track the changes in perception over the years. Such perception approaches are obviously very interesting and, as the WEF states, can influence actual probability as the readers’ decisions will be influenced by how different challenges are perceived. Still, it is important to remember that the report does not provide an assessment of the actual probability (0-100%) or an assessment of the impact (and not the impact on human suffering, as many respondents likely define risk in monetary terms for their own company or country). An overview of WEF reports from the last ten years indicates that the challenges that likely could happen when applying a five year horizon, like the first signs of climate change, governmental failure and traditional pandemic, are identified. On the other hand, challenges which have very big impacts but lower probability, like extreme climate change, nanotechnology, major volcanoes, AI, and asteroids, tend to get less, or no, attention. An important question to explore is whether a focus on the smaller but still serious impacts of global challenges can result in an increased probability of infinite impacts. For example, there are reasons to believe that a focus on incremental adaptation instead of significant mitigation could be a problem for climate change as it could result in high-carbon lock-in.88 Other research indicates that focus on commercially relevant smaller pandemics could result in actions that make a major pandemic more likely. It is argued that this could happen, for example, by encouraging increased trade of goods while investing in equipment that scans for the type of pandemics that are known. Such a system can reduce the probability for known pandemics while at the same time resulting in an increased probability for new and more serious pandemics.89 Figure 13: The top 12 global challenges that key organisations work with 2.4.3 Workshops global risks 2.5 The list of Two workshops were arranged where the selection of challenges was discussed, one with risk experts in Oxford at the Future of Humanity Institute and the other in London with experts from the financial sector. See Appendix 2 for agenda and participants. In both workshops the list of global challenges was discussed to see if any additional challenges should be included, or if there were reasons to exclude some from the list. No challenge was excluded at the workshops, but one was added. Although little research exists yet that is able to verify the potential impacts, the participants agreed to include Global System Collapse as a risk with possible infinite impact. There was agreement that further research is needed to clarify exactly what parts of the economic and political system could collapse and result in a potentially infinite outcome. The conclusion was that enough research exists to include such a collapse on the list. Based on the risks identified in the literature review and in the review of organisations and applying the criteria for potentially infinite impact, these risks were identified: 1. Extreme Climate Change 2. Nuclear War 3. Global Pandemic 4. Ecological Catastrophe 5. Global System Collapse 6. Major Asteroid Impact 7. Supervolcano 8. Synthetic Biology 9. Nanotechnology 10. Artificial Intelligence (AI) 11. Unknown Consequences 12. Future Bad Global Governance This is an initial list. Additional risks will be added as new scientific studies become available, and some will be removed if steps are taken to reduce their probability90 and/or impact so that they no longer meet the criteria. Four categories of global challenges The challenges included in this report belong to four categories. The first, current challenges, includes those where decisions today can result directly in infinite impacts. They are included even if the time between action and impact might be decades, as with climate change. The second category is exogenous challenges, those where decisions do not – currently – influence probability, but can influence impact. The third category is emerging challenges, those where technology and science are not advanced enough to pose a severe threat today, but where the challenges will probably soon be able to have an infinite impact. The technologies included in emerging challenges, including synthetic biology, nanotechnology and artificial intelligence (AI), will be critical to finding solutions to infinite impacts. Including these technologies should not be seen as an attempt to arrest them. If anything, the development of sustainable solutions should be accelerated. But it is equally important to create guidelines and frameworks to avoid their misuse, whether intentional or accidental. The fourth category, future global policy challenges, is of a different kind. It includes challenges related to the consequences of an inferior or destructive global governance system. This is especially important as well-intended actions to reduce global challenges could lead to future global governance systems with destructive impact. The first category, current challenges, includes: 1. Extreme Climate Change 2. Nuclear War 3. Global Pandemic 4. Ecological Catastrophe 5. Global System Collapse The second category, exogenous challenges, covers: 6. Major Asteroid Impact 7. Supervolcano Those in the third category, emerging challenges, are: 8. Synthetic Biology 9. Nanotechnology 10. Artificial Intelligence (AI) 11. Unknown Consequences The fourth category, global policy challenges, is: 12. Future Bad Global Governance not included 2.5.1 Risks Many risks could severely damage humanity but have not been included in this report. They were excluded for one or more of three reasons: 1. Limited impact. Many challenges can have significant local negative effects, without approaching the “2 billion negatively affected” criterion - tsunamis, for example, and chemical pollution. 2. No effective countermeasures. The report focuses on promoting effective interventions and so ignores challenges where nothing useful can be done to prevent or mitigate the impact, as with nearby gamma-ray bursts. 3. Included in other challenges. Many challenges are already covered by others, or have a damage profile so similar that there seemed no need to have a separate category. Population growth, for one, is an underlying driver significant for climate change and eco-system catastrophe, but without direct large-scale impacts. The challenges mentioned in the reviewed literature and organisations which are not included in this report often refer to economic damage such as “fiscal crises” or “unemployment”. While such impacts could have far-reaching consequences they are obviously of another magnitude than those included here. Some of the risks that were suggested and/or which exist in books and reports about global risks were rejected according to the criteria above. They include: 91 1. Astronomical explosion/nearby gamma-ray burst or supernova.92 These seem to be events of extremely low probability and which are unlikely to be survivable. Milder versions of them (where the source is sufficiently far away) may be considered in a subsequent report. _Not included due to: No effective countermeasures 2. False vacuum collapse. If our universe is in a false vacuum and it collapses at any point, the collapse would expand at the speed of light destroying all organised structures in the universe.93 This would not be survivable. _Not included due to: No effective countermeasures 3. Chemical pollution. Increasingly, there is particular concern about three types of chemicals: those that persist in the environment and accumulate in the bodies of wildlife and people, endocrine disruptors that can interfere with hormones, and chemicals that cause cancer or damage DNA. _Not included due to: Limited impact 4. Dangerous physics experiments creating black holes/strangelets including high energy physics. These risks are of low probability94 and have been subsumed under “Uncertain Risks” _Not included due to: Included in other challenges 5. Destructive solar flares. Though solar flares or coronal mass ejections could cause great economic damage to our technological civilisation,95 they would not lead directly to mass casualties unless the system lacks basic resilience. They have been subsumed in the Global System Collapse category. _Not included due to: Limited impact/included in other challenges 6. Moral collapse of humanity. Humanity may develop along a path that we would currently find *morally repellent*. The consequences of this are *not clear-cut*, and *depend on value judgements that would be contentious and unshared*.96 Some of these risks (such as global totalitarianism or *enduring poverty*) were included in the Governance Disasters category. _Not included due to: included in other challenges 7. Resource depletion/LULCC/ Biodiversity loss. It has often been argued that declining resources will cause increased conflict.97 Nevertheless such conflicts would *not* be *sufficient in themselves to threaten humanity on a large scale, without a “ System Collapse”* or “Governance Disasters”. _Not included due to: included in other challenges 8. New technological experimental risks. It is possible and plausible that new unexpected technological risks will emerge due to experiments. However, until we know what such risks may be, they are subsumed in the “Uncertain Risks” category. _Not included due to: included in other challenges 9. Genocides. Though immense tragedies within specific areas, past genocides have remained contained in space and time and haven’t spread across the globe.98 _Not included due to: Limited impact 10. Natural disasters. Most natural disasters, like tsunamis and hurricanes, have no likelihood of causing the extent of casualties100 needed for consideration on this list, as they are geographically limited and follow relatively mild impact probability curves. _Not included due to: Limited impact 11. Computer failure/Cyberwarfare. Though an area of great interest and research, cyberwarfare has never caused mass casualties and would be unlikely to do so directly. It may be the subject of a future report, but in this report it is considered to be a subset of warfare and general destabilising risks. _Not included due to: Limited impact/Submersed in other challenges 12. Underlying trends, e.g. overpopulation. Though increased population will put strains on resources and can contribute to increased probability for other challenges included in this report (such as climate change and ecosystem catastrophe), plausible population levels will not cause any direct harm to humanity.101 Population growth is however an important trend that is significantly affecting several risks. _Not included due to: Limited impact/Submersed in other challenges Note: Important underlying trends are discussed in chapter 5. 2.5 The rseulting list of global risks using this methodology the infinite threshold impact levels beyond 2.6 Relationship between General mitigation and resilience Total short term casualties Civilisation collapse General pre-risk collapse countermeasures Post-risk collapse countermeasures Post-collapse external threats and risks Post-collapse politics Maintaining technology base Long-term reconstruction probability Anthropic effect Extinction Pre-risk rebuilding enablers (tech stores...) Social and ecosystem resilience Long term impact Post-risk politics Complex systems are often stable only within certain boundaries. Outside these boundaries the system can collapse and rapidly change to a new stable state, or it can trigger a process where change continues for a long time until a new stable state is found. Sometimes it can take a very long time for a system to stabilise again. Looking at all the biotic crises over the past 530 million years, a research team from Berkeley found an average of 10 million years between an extinction and a subsequent flourishing of life.102 What makes things difficult is that once a system is unstable, a small disaster can have knock-on effects – the death of one Austrian nobleman can result in an ultimatum which draws in neighbours until Australians end up fighting Turks and the First World War is well under way, to be followed by communism, the Second World War and the Cold War. The challenge of understanding complex systems includes the fact that many of them have multiple attractors, including what are called “strange attractors”.103 Changes are close to linear as long as the system does not change very much, but once it is pushed out of balance it will get closer to other attractors, and when those become strong enough the system will tend to move towards chaos until a new balance is achieved around the new attractor.104 None of the risks in this report is likely to result directly in an infinite impact, and some cannot do so physically. All the risks however are big enough to reach a threshold where the social and ecological systems become so unstable that an infinite impact could ensue, as the graph below shows. This graph and its accompanying text explain, how an event that reaches a threshold level could cascade into even worse situations, via civilisation collapse105 to human extinction. The graph also seeks to illustrate the importance of ensuring ecological and social resilience, the two major insurance policies we have against a negative spiral after a major impact that takes us beyond the infinite threshold. 2.6 Relations between impact levels beyond the infinite threshold 1. Social and ecosystem resilience. Resilient systems are naturally resistant to collapse, though this often comes at the cost of efficiency.106 The more resilient the system, the more likely it is to be able to adapt to even large disasters. Improving resiliience ahead of time can improve outcomes, even if the nature of the disaster isn’t known. 2. General pre-risk collapse countermeasures. This category consists of all those measures put into place ahead of time to prevent civilisation collapse. It could include, for instance, measures to ensure continuity of government or prevent breakup of countries (or to allow these breakups to happen with the minimum of disruption). At the same time it should be noted that these kinds of measures could also trigger the breakdown. 3. General mitigation and resilience. This category consists of all measures that can reduce the impact of

risks and prevent them getting out of hand (excluding social and ecosystem measures, which are important and general enough to deserve their own category). 4. Pre-risk rebuilding enablers. On top of attempting to prevent collapses, measures can also be taken to enable rebuilding after a collapse.107 This could involve building stores of food, of technology, or crucial reconstruction tools.108 Alternatively, it could involve training of key individuals or institutions (such as the crews of nuclear submarines) to give them useful post-collapse skills. 5. Long-term impact. Some risks (such as climate change) have strong long-term impacts after years or even decades. Others (such as pandemics) are more likely to have only a short-term impact. This category includes only direct longterm impacts. 6. Post-risk politics. The political structures of the post-risk world (governmental systems, conflicts between and within political groupings, economic and political links between groups) will be important in determining if a large impact leads ultimately to civilisation collapse or if recovery is possible. 7. Post-risk collapse countermeasures. These are the countermeasures that the postrisk political structures are likely to implement to prevent a complete civilisation collapse. 8. Maintaining a technology base. Current society is complex, with part of the world's excess production diverted into maintaining a population of scientists, engineers and other experts, capable of preserving knowledge of technological innovations and developing new ones. In the simpler post-collapse societies, with possibly much lower populations, it will be a challenge to maintain current technology and prevent crucial skills from being lost.109 9. Post-collapse politics. Just as post-risk politics are important for preventing a collapse, post-collapse politics will be important in allowing a recovery. The ultimate fate of humanity may be tied up with the preservation of such concepts as human rights, the scientific method and technological progress. 10. Post-collapse external threats and risks. Simply because a risk has triggered the collapse of human civilisation, that does not mean that other risks are no longer present. Humanity will have much less resilience to deal with further damage, so the probability of these risks is important to determine the ultimate fate of humanity. 11. Anthropic effects. We cannot observe a world incapable of supporting life, because we could not be alive to observe it. When estimating the likelihood of disasters and recovery it is very important to take this effect into consideration and to adjust probability estimates accordingly.110 12. Long-term reconstruction probability. A post-collapse world will differ significantly from a preindustrial revolution world. Easy access to coal and oil will no longer be possible. In contrast, much usable aluminium will have been extracted and processed and will be left lying on the surface for easy use. Thus it will be important to establish how technically possible it may be to have a second industrial revolution and further reconstruction up to current capabilities without creating the problems that the first industrial revolution resulted in. "You may choose to look the other way but you can never say again that you did not know." William Wilberforce Challenges 3. Twelve Global 60 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3. Twelve Global Challenges Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences For the selection of events information from specialised bodies and scientific journals in the area of global risk was gathered.111 Using keywords related to the various risks, a global selection of events was sought, along with original sourcing in academic or official sources. The list of events was then ranked based on their risk relevance, i.e. their effect on the probability and/or the impact of the challenge. To finalise the list, a group of experts was consulted by email and a draft overview of the challenges was presented at a workshop at the Future of Humanity Institute (FHI) in Oxford, where additional input was provided on selection and content. Issue experts were then consulted before the final list of events was established. 112 Four categories were used to classify the different events: 1. Policy: Global or national policy initiatives that affect probability and/or impact 2. Event: The challenge is made real in some way that is relevant for probability and/or impact 3. Research: New knowledge about probability and/or impact 4. Initiative: A stakeholder/group addressing the challenge in concrete ways to reduce probability and impact Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 61 3. Twelve Global Challengesof risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1Current risks Climate Change 3.1.1 Extreme Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions, or in the distribution of weather around the average conditions (i.e., more or fewer extreme weather events). Extreme climate change is used to distinguish from the impacts beyond the dangerous climate that a 2° C temperature rise is expected to result in.113 62 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.1.1 Expected impact disaggregation 3.1.1.2 Probability Many of the expected impacts of climate change are well known, including a warming climate, more severe storms and droughts, rising sea levels, ocean acidification, and damage to vulnerable ecosystems.114 As for all risks there are uncertainties in the estimates, and warming could be much more extreme than the middle estimates suggest. Models tend to underestimate uncertainty115 (especially where impact on humanity is concerned,116 where the effect also depends on modellers' choices such as the discount rate117), so there is a probability118 that humanity could be looking at a 4°C119 or even 6°C120 warming in the coming decades. This could arise from positive feedback loops, such as the release of methane from permafrost121 or the dieback of the Amazon rainforests,122 that strengthen the warming effect. So far, efforts at curbing emissions have been only moderately successful and are still very far from what is needed.123 The impact of global warming, whether mild or severe, would be felt most strongly in poorer countries. Adaptation that can address significant warming is often very expensive,124 and many of the poorest countries are in the tropics and sub-tropics that would be hardest hit (they could become completely uninhabitable for the highest range of warming125). Mass deaths and famines, social collapse and mass migration are certainly possible in this scenario. Combined with shocks to the agriculture and biosphere-dependent industries of the more developed countries, this could lead to global conflict and possibly civilisation collapse – to the extent that many experts see climate change as a national security risk126. Further evidence of the risk comes from indications that past civilisation collapses have been driven by climate change.127 Extinction risk could develop from this if the remaining human groups were vulnerable to other shocks, such as pandemics, possibly exacerbated by the changed climate.128 There is some evidence of 6°C climate change causing mass extinction in the past,129 but a technological species such as ourselves might be more resilient to such a shock. A unique feature of the climate change challenge is what is called geo-engineering.130 Though this could - if it works - reduce many impacts at a relatively low cost, it would not do so evenly. Geo-engineering would possibly reduce the impacts of climate change in some countries, benefitting them while leaving others to suffer.131 This could lead to greater political instability. One of the most popular geo-engineering ideas – stratospheric sulphate aerosols – suffers from the weakness that it must be continuous. 132 If for any reason it stopped (such as a civilisation collapse), warming would resume at a significantly higher pace, reaching the point where it would have been without geo-engineering. The speed of this rebound would put extra pressure on the ecosystem and the world's political system. So the biggest challenge is that geoengineering may backfire and simply make matters worse.134 Five important factors in estimating the probabilities and impacts of the challenge: 1. The uncertainties in climate sensitivity models, including the tail. 2. The likelihood - or not - of global coordination on controlling emissions. 3. The future uptake of low-carbon economies, including energy, mobility and food systems. 4. Whether technological innovations will improve or worsen the situation, and by how much. 5. The long-term climate impact caused by global warming. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 63 3.1 Current risks CLIMATE CHANGE Climate research Pre-warming mitigation efforts Pre-warming collapse countermeasures Climate warfare Collapse of geoengineering projects New, polluting, uses for carbon products Low-carbon economies Geoengineering Technological innovations Research in emmision-reducing technologies Global coordination Economic transformations Research in mitigation and adaptation Moderate climate change Global poverty Extreme climate change Feedback loops Carbon emissions Climate change mitigation and adaptation Direct casualties Political instability in vulnerable nations Agriculture disruption Disruption to world politics and economy Ecosystem damage (e.g. ocean acidification) Post warming politics Long-term climate effects Forced migration Total short-term casualties Meta-uncertainty on how to predict the international political process Meta-uncertainty on the true uncertainty in climate change models Increased storms, flooding and natural disaters Civilization collapse Easily visible effects of climate change Extinction Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts GOVERNANCE DISASTERS Global povety Global instability New system of governance Smart sensors Global coordination Improvements to global governance Deliberate attempts to construct world dictatorship Technological innovations Enduring poverty Not achieving important ethical goals Climate change Lack of human flourishing Undesirable world system (e.g. global dictatorship) Global pollution Disruption to world politics and economy Total short-term casualties Collapse of world system Post-disaster politics General mitigation effort Long-term negative effects Civilisation collapse Extinction Failing to solve important problems Making things worse Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts Meta-uncertainty on tradeoffs between e.g. poverty, survival, freedom 64 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 1. Research which further refines our understanding of climate change and geo-engineering ideas will be essential in predicting change, preparing for it, and potentially reversing it. On the negative side, climate science research may allow the possibility of climate change tools being used for warfare. 2. Global poverty will affect both the vulnerability of many nations to the effects of climate change, and the likelihood of achieving global coordination earlier rather than later. 3. Pre-extreme warming mitigation efforts will affect the level of impact from climate change. 4. Pre-warming collapse countermeasures will affect the likelihood of civilisation collapse. 5. Research into mitigation and adaptation is necessary for effective implementation of either approach. 6. Research into emission-reducing technologies (such as alternative energies) will be important for transitioning to a low carbon economy. 7. Global coordination and cooperation will be key to funding mitigation/ adaptation research and development, and for the global control of carbon emissions or transitioning to a global low carbon economy. 8. Climate warfare is possible if geoengineering and climate modification methods can be harnessed by nations to harm others. 9. New, more polluting uses of carbon would, if they had a strong economic rationale, put upwards pressure on carbon emissions. 10. The direct casualties of limited global warming are likely to be few, as humans can adapt to many different temperatures and climates. The indirect effect can however be significant, e.g. migration, starvation, extreme weather. 11. Climate change is likely to cause extensive ecosystem damage, such as ocean acidification and pressure on many sensitive species that cannot easily adapt to temperature changes. 12. Agriculture will be disrupted by increased temperature. 13. The direct and indirect effects of climate change will have a great impact on the world's political and economic systems, which will in turn determine the severity of the changes. 14. Many nations will be made politically vulnerable to the direct and indirect impacts of climate change, putting great pressure on their political systems and institutions. 15. Climate change will cause an increase in storms, floods, and other natural disasters. If political stability is maintained, most of the casualties are likely to result from these factors. 16. Forced migration from unstable or disrupted areas will put further pressure on more stable areas. 17. The long-term impact of climate change (including further carbon emissions and warming) will be important for determining the risk of collapse and subsequent rebuilding possibilities. 18. Attempts to mitigate and adapt to climate change will be important for reducing the severity of climate change's impact. 19. The level of carbon emissions is the driver of climate change, and will be crucial in determining its ultimate impact. 20. Feedback loops will be important in determining whether carbon emissions are self-damping or self-forcing (i.e. whether an extra ton of CO2 emissions is likely to result in more or less than a ton in the atmosphere). 21. Transitioning to low carbon economies will be crucial for reducing emissions without disrupting the world's political or economic systems. 22. Geo-engineering offers the possibility of decreasing carbon concentration in the atmosphere alongside, or instead of, emission reductions. But it may make climate warfare a possibility. 23. If geo-engineering projects collapse in the middle of implementation, this could lead to strong warming over a dangerously short period of time. 24. Technological innovations will be crucial for transitioning to low carbon economies or allowing geo-engineering. But they may also result in new, carbon-intensive innovations, which, if sufficiently profitable, could push emissions up. 25. Some level of changes to the standard economic system may be needed to transition to low carbon economies. 26. Easily visible impacts of climate change may be instrumental in pushing better global coordination on the issue. 27. The political systems in place as warming increases will determine how well the world copes with a hotter planet. 28. Climate models are extremely detailed and inevitably uncertain. But the real level of uncertainty includes uncertainties about the models themselves. 29. The course of international politics is extremely hard to predict, even for political scientists.135 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 65 3.1 Current risks during 2013 3.1.1.3 Main events 19-Apr-13: Launch of the report "Unburnable Carbon 2013: Wasted capital and stranded assets" 136 – Research To constrain the rise in global average temperature to less than 2°C above pre-industrial levels, a maximum of around 565 – 886 billion tonnes (Gt) of carbon dioxide could be emitted before 2050.137 The world's proven fossil fuel reserves amount to 2,860 Gt of CO2, however, and are viewed as assets by companies and countries. Since it is likely that these assets cannot be realised, these entities are over-valued at current prices – arguably, a "carbon bubble." The report provides evidence that serious risks are growing for highcarbon assets, and aims to help investors and regulators manage these risks more effectively and prepare for a global agreement on emissions reductions. It indirectly highlights part of the challenge of emissions reductions: they will mean the loss of highly valuable assets to corporations and governments. 02-May-13: CO2 at 400 PPM for the first time in > 800,000 years138 – Event The Mauna Loa carbon dioxide record, also known as the "Keeling Curve," is the world's longest unbroken record of atmospheric CO2 concentrations. It recently reached 400 ppm (parts per million) of CO2. Such concentrations have not been reached for at least 800,000 years,139 placing humanity in a historically unprecedented situation. Prior to the Industrial Revolution, natural climate variations caused atmospheric CO2 to vary between about 200 ppm during ice ages and 300 ppm during the warmer inter-glacial periods. The last time concentrations were as high as they are now seems to have been during the Mid-Pliocene, about 3 million years before the present when temperatures were 2-3°C warmer, and in which geological evidence and isotopes agree that sea level was at least 15 to 25 m above today's levels with correspondingly smaller ice sheets and lower continental aridity.140 21-May-13: China agrees to impose carbon targets by 2016141 – Policy Since China is the world's greatest emitter of CO2,142 any reduction steps it takes can have a substantial impact. It has announced a "National Low Carbon Day",143 a "series of major promotional events to improve awareness and get the whole society to address climate change." More practically, the Chinese government has agreed to impose carbon targets by 2016 - a ceiling on greenhouse gas emissions.144 Figure 14-15, Source: Scripps Institution of Oceanography, via http://blogs.scientificamerican.com/ observations/2013/05/09/400-ppm-carbon-dioxide-in-the-atmosphere-reaches-prehistoric-levels 66 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 22-May-13: Private Sector Initiative - database of actions on adaptation145 – Initiative Global warming is an externality146 – a consequence of business decisions made by entities that do not bear the full cost of what they decide – so the drive to mitigate its effects is more likely to come from governmental or supra-governmental organisations. Nevertheless, the private sector has been involved in mitigation attempts for a variety of reasons, from investment opportunities to public relations. The United Nations Framework Convention on Climate Change (UNFCCC) maintains a database of some of these attempts, ranging from Ericsson's enabling access to climate services in Uganda, through BASF's development of new technologies for food security, Allianz insurers rewarding sustainable business practices, all the way to Chiles de Nicaragua's attempts to enable small agro-exporters to adapt to climate change – and many more. The potential opportunities for private companies are listed as: – New market opportunities and expansion; – Development of climate-friendly goods and services; – Potential cost savings; – Risk reduction measures, including physical operations; – Climate proofing the supply chain; – Enhanced corporate social responsibility. 27-Sep-13: IPCC report: "Climate Change 2013: The Physical Science Basis" 147 – Research The 5th IPCC report "considers new evidence of climate change based on many independent scientific analyses from observations of the climate system, palaeoclimate archives, theoretical studies of climate processes and simulations using climate models." It concludes that: – Warming of the climate system is unequivocal, and since the 1950s many of the observed changes are unprecedented over decades to millennia. The atmosphere and oceans have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. – Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. – Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. – Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent. – The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] m. – The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The report further predicted, amongst other points, that: – Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions. – The oceans will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation. Further uptake of carbon by the oceans will increase ocean acidification. Global mean sea level will continue to rise during the 21st century. – It is very likely that Arctic sea ice cover will continue to shrink and become thinner. Global glacier volume will further decrease. – Most aspects of climate change will persist for many centuries even if emissions of CO2 are stopped. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 67 3.1 Current risks 27-Sep-13: Launch of the Global Risk and Opportunity Indicator (GROI) 148 – Research Launched by the Global Challenge Foundation, this Indicator is a web tool for illustrating quantified risks, with the objective of increasing awareness about global risks and opportunities and helping guide the changes required in the global governance system. The site is still under construction; the Foundation's aims are to achieve, by the end of 2014: 1. An interactive Global Risk & Opportunity Indicator that allows users to calculate the probability for any global warming, between one and ten degrees Celsius, at different greenhouse gas concentrations. The indicator will then be further developed to illustrate interdependencies with other global risks and highlight opportunities for minimising the risks. Subsequent development will allow users to change different underlying assumptions and see the corresponding change in risk. 2. Methodology and data to estimate probabilities for a number of climate impacts at different temperature levels, e.g., sea level rise, droughts, flooding and heat waves, as well as to explore the risk of runaway global warming. 3. Methodology and data to estimate the probability of existential climate threats, i.e., to estimate the risk that climate change impacts pose a significant threat to human civilisation – defined as a serious negative impact on at least two billion people. 23-Nov-13: Limited progress at Warsaw COP 19 climate negotiations 149 – Policy The global environment can be considered a global public good (i.e. non-excludable and non-rivalrous).150 Economic theory claims that such goods will be undersupplied by the market.151 Hence the importance of trans-national negotiations to address climate change. Despite the importance of the subject, the main achievement of the Warsaw negotiations was to keep talks on track for more negotiations in 2015.152 Though there was general agreement on the necessity of cutting carbon emissions, the dispute was over how to share the burden of doing so. In this instance, the debate was between more- and less-developed countries, with the latter demanding compensation from the former to help them cope with the burden of reducing emissions. That particular dispute was papered over,153 but similar ones will be likely in future due to the range of different actors and their divergent agendas.154 03-Dec-13 Abrupt Impacts of Climate Change: Anticipating Surprises155 – Research Climate change has been developing gradually, at least on the human scale156 (though very rapidly on a geological timescale157). This may not continue, however: this paper looks at the potential for abrupt changes in physical, biological, and human systems, in response to steady climate change. It highlights two abrupt changes that are already under way: the rapid decline in sea ice158 and the extinction pressure on species.159 On the other hand, some widely discussed abrupt changes – the rapid shutdown of the Atlantic Meridional Overturning Circulation160 and the rapid release of methane from either thawing permafrost161 or methane hydrates162 – are shown to be unlikely to occur this century. The report argues that large uncertainties about the likelihood of some potential abrupt changes163 highlight the need for expanded research and monitoring, and propose an abrupt change early warning system. The aim would be to foresee abrupt change before it occurs, and reduce the potential consequences. 68 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 69 3.1 Current risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1 Current risks 3.1.2 Nuclear War After their use in Hiroshima and Nagasaki nuclear weapons have never been used in a conflict, but because they are extremely powerful and could cause destruction throughout the world, the possibility of nuclear war has had a great effect on international politics. 164 70 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.2.1 Expected impact disaggregation 3.1.2.2 Probability The likelihood of a full-scale nuclear war between the USA and Russia has probably decreased in recent decades due to some improvements in relations between these two countries and reductions in the size of their arsenals. Still, the potential for deliberate or accidental165 nuclear conflict has not been removed, with some estimates putting the risk of nuclear war in the next century or so at around 10%166 – it may have been mostly down to luck that such a war did not happen in the last half century167. A nuclear war could have a range of different impacts. At the lowest end is the most obvious and immediate impact: destruction and death in major cities across the world, due to the explosions themselves and the radioactive fallout. But even if the entire populations of Europe, Russia and the USA were directly wiped out in a nuclear war – an outcome that some studies have shown to be physically impossible168, given population dispersal and the number of missiles in existence169 – that would not raise the war to the first level of impact, which requires > 2 billion affected.170 A larger impact would depend on whether or not the war triggered what is often called a nuclear winter or something similar.171

The term refers to the creation of a pall of smoke high in the stratosphere that would plunge temperatures below freezing around the globe and possibly also destroy most of the ozone layer.172 The detonations would need to start firestorms in the targeted cities, which could lift the soot up into the stratosphere.173 There are some uncertainties about both the climate models and the likelihood of devastating firestorms,174 but the risks are severe and recent models175 have confirmed the earlier176 analysis. Even a smaller nuclear conflict (between India and Pakistan, for instance) could trigger a smaller nuclear winter which would place billions in danger.177 The disintegration of the global food supply would make mass starvation and state collapse likely. As the world balance of power would be dramatically shifted and previous ideological positions called into question, large-scale war would be likely. This could lead to a civilisation collapse. Extinction risk is only possible if the aftermath of the nuclear war fragments and diminishes human society to the point where recovery becomes impossible178 before humanity succumbs179 to other risks, such as pandemics.180 Five important factors in estimating the probabilities and impacts of the challenge: 1. How relations between current and future nuclear powers develop. 2. The probability of accidental war. 3. Whether disarmament efforts will succeed in reducing the number of nuclear warheads. 4. The likelihood of a nuclear winter. 5. The long-term effects of a nuclear war on climate, infrastructure and technology. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 71 3.1 Current risks NUCLEAR WAR US-Russia relations Relations between future major nuclear powers Number of future major nuclear powers Meta-certainty of changes in the military technology Meta-certainty of political predictions Disarmament efforts Proliferation: desire for nuclear weapons Proliferation: building nuclear weapons Number of future small nuclear powers Relations between future nuclear powers Relations between current nuclear powers Nuclear attack Nuclear attack Full-scale Nuclear War Disruption to world politics and economy War casualties Firestorm risks Firestorm risks Nuclear Winter Small Nuclear Winter Post-war politics Pre-war casualty countermeasures (bunkers, food...) Long-term impact Extinction Civisation collapse Total short term casualties War casualties Nuclear accidents or misunderstandings Small-scale Nuclear War Nuclear terrorism Nuclear security Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts GOVERNANCE DISASTERS Global povety Global instability New system of governance Smart sensors Global coordination Improvements to global governance Deliberate attempts to construct world dictatorship Technological innovations Enduring poverty Not achieving important ethical goals Climate change Lack of human flourishing Undesirable world system (e.g. global dictatorship) Global pollution Disruption to world politics and economy Total short-term casualties Collapse of world system Post-disaster politics General mitigation effort Long-term negative effects Civilisation collapse Extinction Failing to solve important problems Making things worse Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts Meta-uncertainty on tradeoffs between e.g. poverty, survival, freedom 72 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 1. The success or failure of disarmament will determine the number of nuclear warheads available for a future nuclear conflict. 2. The first step of proliferation is countries desiring to possess nuclear weapons. Various political interventions may reduce or increase this desire. 3. The second step of proliferation is countries building nuclear weapons. Various mechanisms, agreements and inspections may be relevant 4. Nuclear terrorism may be the trigger of a larger nuclear conflict, especially if the detonation is misinterpreted as a traditional attack. 5. The security of nuclear weapons and materials affects both the probability of nuclear terrorism and the control likelihood of nuclear accidents. 6. The relations between future nuclear powers will be the major determinant of whether a nuclear war breaks out. 7. The relations between current nuclear powers will be a major determinant of the relations between future nuclear powers. 8. The relations between future major nuclear powers will be the major component of determining whether a major nuclear war breaks out. 9. Relations between the USA and Russia (the only current major nuclear powers) will be a major determinant of the relations between future major nuclear powers. 10. Pre-war countermeasures (such as nuclear bunkers and food stores) can help mitigate the casualties of a smaller nuclear conflict. 11. A small-scale nuclear war could start with an attack by one or more nuclear powers. 12. A full-scale nuclear war could start with an attack by one or more major nuclear powers. 13. Aside from attacks, the other way a nuclear war could start would be through accidental firings or misinterpretations of other incidents. 14. Firestorms caused by burning cities are one of the main ways a nuclear conflict could cause major climate disruption, and hence high casualties. 15. The direct war casualties from a nuclear conflict are likely to be small compared with the potential climate effects. 16. A nuclear winter is the way in which a nuclear conflict could have the most damaging effects on the world. 17. Even a smaller nuclear conflict could trigger a smaller nuclear winter that could have major disruptive effects on agriculture and hence human survival. 18. Any war will have a disruptive impact on the world's politics and economy. A nuclear conflict – possibly accompanied by a nuclear winter – even more so. 19. The long term impact of nuclear winter, infrastructure disruption, and possibly radiation, will determine the likelihood of collapse and rebuilding. 20. Since a nuclear power must be one of the parties to a nuclear war, the number of the former affects the probability of the latter. 21. Since a major nuclear power must be one of the parties to a major nuclear war, the number of the former affects the probability of the latter. 22. Post-war politics will be determined by the war, the disruption it caused, and the number of casualties it inflicted. 23. Unlike other risks, nuclear weapons are targeted by humans, so may take out important parts of the world's infrastructure (and conventional weapons used in a conflict may have the same effect). 24. Unlike other risks, nuclear weapons are targeted by humans, so may take out important parts of the world's technology and research base (and conventional weapons used in a conflict may have the same effect). 25. Maintaining a technology base will be complicated by the possible targeting of infrastructure and the technology base during a conflict. 26. The further development of military technology is hard to predict. The current balance of power under MAD (mutually assured destruction) is based on certain assumptions about the effectiveness of nuclear weapons, such as second strike capability. If this were removed (such as by effective submarine detection, or anti-ballistic missile shields), the effect on the balance of power is hard to predict. 27. The course of international politics is extremely hard to predict, even for political scientists.181 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 73 3.1 Current risks during 2013 3.1.2.3 Main events 12-Feb-13: North Korea carries out third, largest nuclear test 182 – Event On 12 February 2013, North Korea carried out its third nuclear test. The test was condemned across the world, 183 and led to increased sanctions184 against the already isolated nation.185 North Korea is the only nation to have withdrawn from the Nuclear NonProliferation Treaty,186 and is the only country to have conducted nuclear tests in the 21st century, starting in 2006, 187 as well as developing a ballistic missile capability.188 It has also been involved in the export of weapons technology, undermining the Treaty.189 Diplomatic attempts to deal with North Korea (especially on the part of the United States) have generally been inconsistent and unsuccessful.190 Though the situation remains a potential flashpoint for conventional and nuclear conflict, and its collapse could have disastrous consequences191 (including the possibility of "loose nukes" becoming available to various groups), it should be noted that the "North Korean problem" has existed in one form or another since the end of the Korean War in 1953, without erupting into open conflict.192 04-Mar-13: Conference: Humanitarian Impact of Nuclear Weapons 193 – Policy On 4 and 5 March 2013, the Norwegian Minister of Foreign Affairs, Espen Barth Eide, hosted an international conference on the humanitarian impact of nuclear weapons. The conference heard presentations on the effects of nuclear weapons detonations. Three key points emerged: – It is unlikely that any state or international body could address the immediate humanitarian emergency caused by a nuclear weapon detonation in an adequate manner and provide sufficient assistance to those affected. Moreover, it might not be possible to establish such capacities at all. – The historical experience from the use and testing of nuclear weapons has demonstrated their devastating immediate and long-term effects. While political circumstances have changed, the destructive potential of nuclear weapons remains. – The effects of a nuclear weapon detonation, irrespective of cause, will not be limited by national borders, and will affect states and people to significant degrees, regionally as well as globally. A number of states wished to explore these issues further, and Mexico said it would host a follow-up conference.194Figure 16, Source: Wikimedia Commons, http://en.wikipedia.org/wiki/ File:Worldwide_nuclear_testing.svg CC-BY-SA license. Worldwide nuclear testing, 1945-2013 74 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 16-May-13: Revealed: The USSR and US Came Closer to Nuclear War Than Was Thought 195 – Research Documents recently released under a FOIA (US Freedom Of Information Act) request show that the risk of nuclear conflict between the superpowers was higher than realised at the time. The large-scale 1983 NATO nuclear exercises Able Archer 83" spurred "a high level of Soviet military activity, with new deployments of weapons and strike forces." This unprecedented Soviet reaction in turn created a series of introspective US intelligence analyses and counter-analyses, debating whether US intelligence had actually understood Soviet actions, perceptions, and fears – and acknowledging the danger of nuclear "miscalculation" if it had not.196 This is but one of the many nuclear accidents197 and incidents that peppered the Cold War and its aftermath, and which have been revealed only subsequently. We know now that there were at least three occasions – the Cuban missile crisis in 1962,198 the Petrov incident in 1983199 and the Norwegian rocket incident in 1995200 – where a full-scale nuclear war was only narrowly averted.201 Further information on these incidents, and on how they were interpreted and misinterpreted202 by the great powers, will be important to estimate the probability of nuclear conflict in the coming decades. On a more positive note, efforts are being made to reduce the probability of inadvertent or accidental nuclear conflicts.203 24-Jun-13: Report: "Analysing and Reducing the Risks of Inadvertent Nuclear War Between the United States and Russia" 204 – Research Though the end of the Cold War has reduced the likelihood of deliberate nuclear war, its impact on the risk of accidental nuclear war is much smaller. The arsenals remain on "launch on warning",205 meaning that there is a possibility for a "retaliatory" strike before an attack is confirmed. The most likely cause of such an accident is either a false warning (of which there have been many, with causes ranging from weather phenomena to a faulty computer chip, wild animal activity, and controlroom training tapes loaded at the wrong time)206 or a misinterpreted terrorist attack.207 The report attempted a rigorous estimate of the numerical probability of nuclear war. Such numerical rigour is rare, with the exception of Hellman's estimates.208 This report applied risk analysis methods using fault trees and mathematical modelling to assess the relative risks of multiple inadvertent nuclear war scenarios previously identified in the literature. Then it combined the fault tree-based risk models with parameter estimates sourced from the academic literature, characterising uncertainties in the form of probability distributions, with propagation of uncertainties in the fault tree using Monte Carlo simulation methods. Finally, it also performed sensitivity analyses to identify dominant risks under various assumptions. This kind of highly disaggregated analysis is most likely to elicit the best performance and estimates from experts.209 Their conclusion was that (under the more pessimistic assumption), there was a mean 2% risk of accidental nuclear war a year (a high risk when compounded over several decades), with the risk from false alarm being orders of magnitude higher than that from terrorist attacks. The analysis suggests that the most important inadvertent nuclear war risk factor is the short launch decision times,210 inherent in the "launch on warning" posture. Some ways of improving this were suggested, for instance by moving each country's strategic submarines away from the other's coasts. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 75 3.1 Current risks 03-Sep-13: Report of the UN General Assembly working group on "Taking Forward Multilateral Nuclear Disarmament Negotiations" 211 – Policy The working group had extensive exchanges of view from different participants, and reviewed existing disarmament commitments and proposals, including international law. The issues surrounding disarmament and treaties were analysed in depth, and several proposals were put forward, with an eye to the complete elimination of nuclear weapons. A key recognition was, however, that "participants recognised the absence of concrete outcomes of multilateral nuclear disarmament negotiations within the United Nations framework for more than a decade". Indeed, though the Nuclear Non-Proliferation Treaty212 (NPT) is a multilateral treaty closely connected with the United Nations, and though it committed the nuclear powers to reduce their arsenals, all the major nuclear arms reduction deals have been bilateral treaties between the US and the USSR/Russia. These include the INF treaty213, START I214, SORT215, and New START216, which have significantly reduced the world's stock of nuclear weapons. It has also been argued that the NPT has been undermined by a number of bilateral deals made by NPT signatories, most notably the United States.217 This further serves to emphasise the weakness of international institutions where nuclear arms control is concerned. 15-Nov-13: International Physicians for the Prevention of Nuclear War report: "Nuclear Famine: Two Billion People at Risk?" 218 – Research This report is one of a series of reports and publications in recent years about the potential impacts of nuclear conflicts.219 It looked at the likely consequences of a "limited" nuclear war, such as between India and Pakistan. While previous papers had estimated that up to a billion people might be at risk in such a conflict,220 this report increased the estimate to two billion. The main source of this increase is decreased agricultural production in the United States221 and in China.222 A key component of these estimates was the severe agricultural impact of the relatively mild temperature reduction in 1816, the "year without a summer" 223, due mainly to the "volcanic winter" caused by the eruption of Mount Tambora. The report highlights some significant areas of uncertainty, such as whether a small nuclear conflict and its consequences would lead to further conflicts across the world, and doubts whether markets, governments and other organisations could mitigate the negative impacts. The report is a reminder that even small-scale nuclear conflict could have severe consequences. 24-Nov-13: Nuclear deal with Iran may reduce risk of proliferation 224 – Policy In November, Iran struck a deal with the so called "P5+1" (the five permanent members of the security council, plus Germany). The deal, if it holds, would allow Iran to continue some uranium enrichment, but it would have to submit to inspections to ensure it wasn't developing a nuclear weapons programme (the deal would also result in eased sanctions in return). There have been longrunning fears than Iran may have been attempting to construct a nuclear weapon225, resulting in sanctions being imposed on it.226 This event illustrates the surprising success of the Non-Proliferation Treaty,227 which came into force in 1970. At the time it was proposed there were fears of very rapid proliferation of nuclear weapons.228 And though 40 countries or more currently have the knowhow to build nuclear weapons,229 only nine countries are currently known to possess them: the five security council members, India, Pakistan, and North Korea, plus Israel.230 76 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 77 3.1 Current risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1 Current risks Catastrophe 3.1.3 Ecological Ecological collapse refers to a situation where an ecosystem suffers a drastic, possibly permanent, reduction in carrying capacity for all organisms, often resulting in mass extinction. Usually an ecological collapse is precipitated by a disastrous event occurring on a short time scale. 231 78 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.3.1 Expected impact disaggregation 3.1.3.2 Probability Humans are part of the global ecosystem and so fundamentally depend on it for our welfare. Species extinction is proceeding at a greatly increased rate compared with historic data232, and attempts to quantify a safe ecological operating space place humanity well outside it.233 Furthermore, there may be signs of a "sudden" biosphere collapse, possibly within a few generations.234 Many of the problems of ecological degradation interact to multiply the damage and (unlike previous, localised collapses) the whole world is potentially at risk, 235 with severe challenges to countering this risk through global policy.236 If animals are seen to have intrinsic value, 237 or if human quality of life is dependent on a functioning ecosystem, 238 the current situation already represents a large loss. Whether such a loss will extend to human lives depends on technological and political factors - technological, because it seems plausible that some human lifestyles could be sustained in a relatively ecosystem-independent way, at relatively low costs.239 Whether this can be implemented on a large scale in practice, especially during a collapse, will be a political challenge and whether it is something we want is an ethical question. There is currently more than enough food for everyone on the planet to ensure the nutrition needed, 240 but its distribution is extremely uneven and malnutrition persists. Thus ecological collapse need not have a strong absolute effect in order to result in strong localised, or global, effects. Even a partial collapse could lead to wars, mass migrations, and social instability. It is conceivable that such a scenario, if drawn out and exacerbated by poor decision-making, could eventually lead to mass deaths and even the collapse of civilisation. Extinction risk is possible only if the aftermath of collapse fragments and diminishes human society so far that recovery becomes impossible241 before humanity succumbs to other risks (such as climate change or pandemics). After a post-civilisation collapse, human society could still be suffering from the effects of ecological collapse, and depending on what form it took, this could make the recovery of human civilisation more challenging than in some of the other scenarios presented here. Five important factors in estimating the probabilities and impacts of the challenge: 1. The extent to which humans are dependent on the ecosystem. 2. Whether there will be effective political measures taken to protect the ecosystem on a large scale. 3. The likelihood of the emergence of sustainable economies. 4. The positive and negative impacts on the eco systems of both wealth and poverty. 5. The long-term effects of an ecological collapse on ecosystems. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 79 3.1 Current risks ECOLOGICAL CATASTROPHE Long-term ecological effects Post-eco-collapse climate change Moral tragedy from ecosystem loss Quality of life loss from ecosystem loss Ecological collapse Economic costs Disruption to politics and economy Threat to food supply Loss of biodiversity Rebuilding the ecosystem Vulnerabilities to flood and other disasters Sustainable or non-sustainable economies Post-eco-collapse politics Pollution Preservation efforts Pre-eco-collapse climate change New, environmentally damaging industries Meta-uncertainty on the true dependence of humanity on the ecosystem Total short-term casualties Civilisation collapse Extinction Pre-eco-collapse mitigation efforts Human survivability in "closed" systems Global poverty Global coordination Sustainability research Technological innovations Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts GOVERNANCE DISASTERS Global povety Global instability New system of governance Smart sensors Global coordination Improvements to global governance Deliberate attempts to construct world dictatorship Technological innovations Enduring poverty Not achieving important ethical goals Climate change Lack of human flourishing Undesirable world system (e.g. global dictatorship) Global pollution Disruption to world politics and economy Total short-term casualties Collapse of world system Post-disaster politics General mitigation effort Long-term negative effects Civilisation collapse Extinction Failing to solve important problems Making things worse Uncertain events Key Meta-uncertainties Risk events Direct impacts Indirect impacts Current intervention areas Bad decisions Accidents Severe impacts Meta-uncertainty on tradeoffs between e.g. poverty, survival, freedom 80 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 1. Global coordination and cooperation will be important to any attempt to control ecological damage on a large scale and prevent "races to the bottom". 2. Poverty is often seen as exacerbating ecological damage through unsustainable practices, while richer countries introduce environmental regulations – but richer nations exploit many resources (such as fossil fuels) in non-sustainable and damaging ways. 3. Transitioning to sustainable economies, or sustainable economic trajectories, could control ecological damage. 4. Research into sustainability could allow the construction of sustainable economies or environments at costs that people are willing to bear. 5. Climate change exacerbates the pressure on the ecological system by changing weather patterns and increasing natural disasters in ways ecosystems find hard to adapt to. 6. Global pollution is a visible source of ecological damage, one that global agreements have had moderate success at tackling. 7. Truly global preservation efforts may be needed for some threatened ecosystems that stretch beyond natural boundaries (e.g. in the seas and oceans). 8. Beyond general all-purpose mitigation efforts, addressing this threat could include the preservation of ecosystems, species or genetic codes, to allow a subsequent rebuilding. 9. New, profitable, but environmentally damaging industries could put extra strain on the ecosystem. 10. According to some systems of value, the loss of certain animals and ecosystems constitutes a moral tragedy in and of itself. 11. Humans derive much pleasure and many benefits from various parts of the ecosystem, and losing this would result in a loss to human quality of life. 12. Ongoing and continuous biodiversity loss is a clear consequence of ecological collapse. 13. Ecological damage can put the human food system in danger, triggering famines. 14. Ecological damage increases vulnerability to floods and other natural disasters. 15. Disruptions to the world's political and economic systems could trigger further conflicts or instabilities, causing more casualties and impairing effective response. 16. Since a lot of the world's carbon is locked up in trees, ecological collapse could exacerbate climate change. 17. The ecosystem is of great economic benefit to humanity, so its loss would have large economic costs. 18. Ecological damage is likely to be long-term: the effects will last for many generations. 19. Technological innovations may result in more sustainable economies, or in more environmentally damaging products. 20. It may be possible to ensure human survival in semi- "closed" systems (solar power, hydroponic food, distilled water), with minimal dependency on the external ecosystem. 21. Over the long term, it may become possible and necessary to go about rebuilding the ecosystem and healing its damage. 22. Political decisions will be the most likely factors to exacerbate or mitigate an ecological disaster. 23. It is unclear how dependent humans truly are on the ecosystem, and how much damage they could inflict without threatening their own survival. Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 81 3.1 Current risks during 2013 3.1.3.3 Main events 22-Jan-13: Current extinctions probably the result of past actions; many future extinctions to come 242 – Research An estimated 40% of world trade is based on biological products or processes such as agriculture, forestry, fisheries and plant-derived pharmaceuticals, and biodiversity comprises an invaluable pool for innovations.243 And yet this biodiversity is being lost at an alarming rate – the rate of extinctions for plants and animals is 100 to 1,000 times higher than their pre-human levels.244 A variety of methods have been suggested to halt or slow this loss, ranging from putting an explicit value245 on biodiversity and ecosystem services (human benefits from a multitude of resources and processes that are supplied by ecosystems), 246 to performing triage on the most valuable species.247 This research paper suggests, however, that there is a lag of several decades between human pressure on the ecosystem and ultimate species extinction. This suggests that many extinctions will continue in decades to come, irrespective of current conservation efforts. 05-Apr-13: Ocean data added to Microsoft Eye on Earth project – Initiative In order to safeguard ecological resources, it is important to track and quantify them. This has traditionally been the role of governments or non-governmental organisations.248 Recently, however, private organisations have started developing tools to enable companies and individuals to track ecological damage and make decisions in consequence. One such tool was Eye on Earth, developed by Microsoft in alliance with the European Environment Agency and Esri.249 It was launched with three services – WaterWatch, AirWatch and NoiseWatch – keeping track of the levels of different pollutants, using official sources and inputs from citizens.250 This was subsequently expanded to include other environmentally sensitive pieces of information, such as the states of coral reefs and invasive alien species. It was primarily land-based, so the oceans were missing from this visualisation tool. This lack has been partially overcome with the inclusion of data from the MyOcean 2 project251 (partly funded by the European Commission). The data cover sea surface temperature, salinity and currents for the Mediterranean Sea and the Black Sea. 30-May-13: Improvement in managed fisheries in Europe 252 – Research Human action has been shown to be able to mitigate some ecosystem damage. Overfishing is expected by standard economic theory: the sea's resources are a (global) common, where the rational behaviour of individual fishermen must lead to dilapidation of the resource.253 Unlike on land, where nature reserves or parks can be established, there are no easy ways of establishing property rights in the sea254 (thus privatising that "common"). A typical example of this behaviour is the collapse of the Grand Banks fisheries off Canada's Atlantic coast in the 1990s, where cod biomass fell by over 95% from its peak and has currently not recovered.255 It is therefore significant that the European Union has been partly successful in its attempts to control over-fishing through legislation. For instance, despite the fact that North Sea cod remains vulnerable, there has been a recent increase in stock size and a decrease in fish mortality. This may point to the potential for further ecological improvements through well-chosen policy interventions. 82 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks Figure 18: Increase in the number of species assessed for the IUCN Red List of Threatened SpeciesTM (2000–2013.2). Source: http://www.iucnredlist.org/about/summary-statistics 02-Jul-13: About 21,000 Species Face Extinction, says International Union for Conservation of Nature (IUCN) 256 – Event In 2013 the IUCN added an additional 4,807 species to its Red List of Threatened Species. This brings the total to about 21,000. Some have argued that we are entering a new geological era in Earth's history: the Anthropocene257 , when human actions are one of the major impactors on the planet's biosphere. The graph shows a fairly steady growth in the (estimated) number of threatened species. This steadiness may be illusory, as the biosphere shows signs that it may be approaching a planetary-scale tipping point, where it may shift abruptly and irreversibly from one state to another. As a result, the biological resources humans presently take for granted may be subject to rapid and unpredictable transformations within a few human generations.258 This could be seen as a great tragedy beyond purely human concerns, if animals (and animal welfare) are seen to have intrinsic value.259 Figure 17: Collapse of Atlantic cod stocks (East Coast of Newfoundland), 1992 Source:

http://en.wikipedia.org/wiki/File:Surexploitation_morue_surp%C3%AAcheEn.jpg) Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 83 3.1 Current risks Extreme Climate Change Ecological Nanotechnology Nuclear War Catastrophe Global System Collapse Major Asteroid Impact Global Pandemic Future Bad Global Governance Super-volcano Synthetic Biology Artificial Intelligence Unknown Consequences 3.1 Current risks Pandemic 3.1.4 Global A pandemic (from Greek πᾶν, pan, "all", and δῆμος demos, "people") is an epidemic of infectious disease that has spread through human populations across a *large region*; for instance *several continents*, or even *worldwide*. Here only worldwide events are included. A widespread endemic disease that is stable in terms of how many people become sick from it is not a pandemic. 260 84 Global Challenges – Twelve risks that threaten human civilisation – The case for a new category of risks 3.1 Current risks 3.1.4.1 Expected impact disaggregation 3.1.4.2 Probability Influenza subtypes266 Infectious diseases have been one of the *greatest causes of mortality in history*. Unlike many other global challenges pandemics have happened recently, as we can see where reasonably good data exist. Plotting historic epidemic fatalities on a log scale reveals that these tend to follow a *power law with a small exponent*: many plagues have been found to follow a power law with exponent 0.26.261 These kinds of power laws are *heavy-tailed*262 to a significant degree.263 In consequence most of the fatalities are accounted for by the *top few events*.264 If this law holds for future pandemics as well,265 then the majority of people who will die from epidemics will likely die from the *single largest pandemic*. Most epidemic fatalities follow a power law, with some extreme events – such as the Black Death and Spanish Flu – being even more deadly.267 There are other grounds for suspecting that such a highimpact epidemic will have a *greater probability* than *usually assumed*. All the features of an extremely devastating disease *already exist in nature*: essentially *incurable* (Ebola268), nearly always *fatal* (rabies269), *extremely infectious* (common cold270), and *long incubation periods* (HIV271). If a pathogen were to emerge that somehow *combined these features* (and influenza has demonstrated *antigenic shift*, the ability to combine features from different viruses272), its death toll would be extreme. Many relevant features of the world have changed considerably, making past comparisons problematic. The modern world has better sanitation and medical research, as well as national and supra-national institutions dedicated to combating diseases. Private insurers are also interested in modelling pandemic risks.273 Set against this is the fact that *modern transport* and *dense human population* allow infections to spread much more rapidly274, and there is the potential for urban slums to serve as breeding grounds for disease.275 Unlike events such as nuclear wars, pandemics would not damage the world's infrastructure, and initial survivors would likely be resistant to the infection. And there would probably be survivors, if only in isolated locations. Hence the risk of a civilisation collapse would come from the *ripple effect* of the fatalities and the policy responses. These would include *political and agricultural disruption* as well as *economic dislocation* and damage to the world's *trade network* (including the food trade). *Extinction risk* is only possible if the aftermath of the epidemic *fragments and diminishes human society* to the extent that recovery becomes impossible277 before humanity succumbs to *other risks* (such as *climate change* or *further pandemics*). Five important factors in estimating the probabilities and impacts of the challenge: 1. What the true probability distribution for pandemics is, especially at the tail. 2. The capacity of modern international health systems to deal with an extreme pandemic. 3. How fast medical research can proceed in an emergency. 4. How mobility of goods and people, as well as population density, will affect pandemic transmission. 5. Whether humans can develop novel and effective anti-pandemic solutions.