Facing the Climate Security Threat

Developing a Practical Risk Management Approach to Climate Security

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"We must plan to avoid the unmanageable and to manage the unavoidable"

John Holdren, Presidential Science Advisor

Climate change impacts national security
Climate change is a well recognized threat to our national security. Analysis over the past years by the National Intelligence Council, DoD, CIA and others has shown that climate change will impact on a broad range of security issues from state instability to border conflicts and energy and food security. Peaceful management of even moderate climatic changes will require investment in increased resilience in national and international governance systems. This analysis is shared by key allies such as the NATO, the EU, UK, Germany and Australia.

The security community is developing the first elements of a multi-faceted response to this threat. Climate security has been highlighted in the QDR and the National Security Strategy. DoD is undertaking work to improve the resilience of US bases and capabilities to future climate impacts. Detailed analysis is being undertaken of climate security threats in high priority regions with high climate vulnerability such as the Sahel. Inter-agency processes are beginning to consider how to deliver US security interest in climate impacted areas such as the Arctic and international water sharing. The Interagency Climate Change Adaptation Task Force is exploring the capabilities of the Federal Government around responses to the impacts of climate change on various critical sectors, institutions, and agency mission responsibilities. Much of this work is at an early stage but it represents a clear process of incorporating the reality of climate change into operational security, diplomatic, development and military activities.

Climate change is not being managed effectively as a security problem
The security analysis is clear: Climate change must be limited to levels where its impacts can be managed effectively without presenting major threats to global and national security. Any strategy to address climate change must be measured in terms of its efficacy in materially reducing the security risks the US faces.

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[1] E3G is a non-profit organisation with the mission to accelerate the transition to sustainable development. This briefing is based on research by Nick Mabey and Shane Tomlinson of E3G, and Jay Guledge of the Pew Centre on Global Climate Change and Bernard Finel of the American Security Project. E3G is fully responsible for the content of this briefing.

There is currently no strategy that passes this test. At UN climate negotiations in Copenhagen in 2009 the world's major countries reached a weak consensus to limit climate change to below a 2C average global temperature rise. However, they have yet to agree to domestic emission reductions consistent with delivering this goal. Current best estimates suggest that if all commitments under the Copenhagen Accord were fully delivered global temperature will still rise between 3-4C; rather than 5-7C in the business as usual case. And even these reductions are not guaranteed as there is not as yet a robust international climate regime that could monitor and enforce these commitments.

US Congress has not yet acted to address military analysis of the climate threat. A lack of US domestic legislation is one major reason for the failure to agree a more ambitious and binding international regime. The reasons for inaction are many. Opponents of action argue that uncertainty about the impacts of climate change is a reason to delay decisions, and that the costs of managing climate risks are too high for the US economy to bear. However, is delay a prudent choice given the scale and likelihood of the risks of climate change?

International action on climate change is analogous to the current situation on nuclear proliferation. All countries formally acknowledge the risks of nuclear proliferation but are collectively failing to enforce a robust enough counter-proliferation regime. However, in the case of the nuclear threat the US is expending significant diplomatic, economic and intelligence efforts to convince other countries of the importance of tackling the threat, and cooperating to build and sustain an effective international control regime. If the security threat from climate change was analyzed as rigorously as nuclear proliferation the question arises: what would be an appropriate US strategy to deliver climate security?

Developing a risk management approach to climate security

The military has generations of practical experience in dealing with uncertain but existential threats. Civilian authorities can learn much from military risk management frameworks to guide decisions in the face of uncertainty. This model has served well to devise strategies to address security threats such as the risks of nuclear proliferation, counter-terrorism strategy and addressing unstable states.

Climate change shares some central features with these more traditional threats. They all present potential hard security consequences which would require military responses, but most of the solutions to reduce long term risk must be implemented by civilian action. For example, controlling the movement of civilian nuclear materials, reducing the influence of radical Islamic ideologies or building effective governance in fragile states. **Effective responses require a whole of government approach that balances prevention, management and rapid response.**

All effective security strategies must rest on a willingness to rigorously, objectively and actively analyze intelligence on potential threats. This analysis must not avoid considering worst-case scenarios which may have critical security impacts but be politically inconvenient. The 9/11 Commission criticized analysts and decision makers for a failure of imagination when considering the nature of likely terrorist attacks on the US. Not considering the full potential impacts of climate change would constitute a similar failure of national security systems.

Current security assessments are perforce mainly based on mid-range scenarios developed by the International Panel on Climate Change (IPCC). While useful they do not cover the full range of climate change risks and do not reflect the most recent research. Sound security planning must explore the full range of reasonable scenarios in order to inform robust risk management strategies.

Understanding the Climate Change Threat

Applying standard security analysis to the risk management of climate change results in a range of questions, many of which are poorly served by current scientific and policy discussions. What is the range of risks we face? What are the biases in current risk assessments? What surprises may exist? How irreversible will impacts be once they have occurred? How well can we monitor the emergence of serious threats? How effectively are we currently managing these risks? What are alternative or additional risk management strategies we should employ?

We know enough about climate science to know that we need to make decisions now. Extensive backcasting analysis shows that the currently observed changes in global climate can only be explained by human emissions of greenhouse gases; natural drivers of change – though present – are not strong enough on their own to generate current climatic changes. We also know that given the inertia in the climate system, global greenhouse gas emissions will need to peak in the next decade and decline by more than half by mid-century if our goal is to stabilize climate change this century.

There is no costless strategy of delaying action to manage climate security. Decisions taken around the world in the next two decades to invest in energy systems, infrastructure and agriculture will largely determine the level of climate change risk we face and the vulnerability of human societies over the century. The question we face is how to make robust decisions on the rate of emissions control and investment in resilience given the unavoidable uncertainties over future impacts.

IPCC estimates for projected average global temperature rise in 2100 is 1.7-7.2°C relative to preindustrial temperatures; average temperatures were 0.6C higher than pre-industrial in 1990. Some of the uncertainty in this estimate comes from differing projections of global economic growth and energy use, but over half comes from pure scientific uncertainty over climate system behaviour. But risks are not symmetrical. While there is virtually no likelihood that climate change will below this range, there is over 15% likelihood that it will actually be greater. This skewed uncertainty creates a “long tail” on the severe end of the probability distribution of likely outcomes. The earliest abrupt changes are likely to be associated with changes in extreme weather, especially heat wave frequency and intensity and drought. The dry subtropics are the most susceptible to switching into a permanent drought-like state.

In addition to the uncertainty over "normal" climatic behaviour, there are several other mechanisms which could amplify the scale, pace and impacts of climate change. As the world warms methane - a strong greenhouse gas – stored in Arctic tundra will be released, further accelerating climate change and releasing even more methane. Similar tipping points exist with the loss of Arctic sea ice which leads to greater warming of the polar seas and potential die-back of the Amazon rainforest which would release large amounts of stored carbon. These and other major climate system tipping points would result in abrupt and irreversible acceleration of climate change what ever we do to reduce man-made emissions. This should not be surprising; evidence shows that the global climate is unstable and has changed abruptly and on a large scale many times in the recent geological past. The thresholds of these changes are not well understood, but estimates suggest the probability of breaching tipping points begins to rise sharply as the world moves beyond a 3C warming level. Currently there are only patchy monitoring systems in place to provide early warning of whether tipping points are being breached, and there are no response plans on how to react if they are.

These "worst case scenarios" are not low probability events, but largely inevitable under current momentum economic behaviour. As atmospheric concentrations increase there is little uncertainty over whether extreme impacts will occur, only when they will happen. Unless current emission trajectories change rapidly we will greatly increase the potential for runaway climate change of over 6-8C by the end of the century. We do not know precisely where these points lie, but we know with certainty they exist. Like a ship navigating through the fog we need to make a judgement about how close we go towards the rocks in order to shorten the route to our destination.

Given these uncertainties even the most ambitious emission reduction scenario still leaves some risk of serious climate instability; if climate sensitivity and tipping points effects are towards the more extreme ends of estimates. If these effects begin to be observed there is a danger that the realization of severe damage will result in badly formulated panic responses which are either ineffective or raise other security problems. A prudent risk management approach would prepare for these extreme scenarios through contingency planning for "crash programmes" of emission reductions. This could include greater RD&D investment in new low carbon energy options or stronger non-proliferation controls to manage a rapid global rollout of nuclear fission power. Frameworks could also be agreed in advance on the management and control of geoengineering options such as large scale capture and storage of carbon from biomass power stations, or more controversially forced acceleration of ocean carbon absorption through iron seeding or use of genetically engineered algae.

Managing biases in current climate change analysis

Scientific modeling is designed to answer scientific questions, not support the policy concerns of decision makers; especially in the security sector. Scientific modeling focuses on long term average changes in global climate, while security impacts are driven by dynamic, short to medium term impacts at regional and local levels. For example, changes to volatility of local rainfall resulting in exceptional drought and/or floods are the most likely trigger of food shortages and local/internal conflict.

These differences matter and averages can obscure critical information on potential threats. A seemingly small change in average daily high temperatures or daily precipitation leads to a large increase in extreme events. A one-standard-deviation increase in the average would increase the frequency of an extreme event that happens only once in 40 years to once every six years.

Recent observations indicate that climate models have been underestimating the rates of change of several key aspects of climate change, including ice loss from the Greenland and Antarctic ice sheets; ice loss from mountain ice caps and glaciers; arctic sea ice decline; global sea level rise; global precipitation increase; latitudinal widening of the tropical belt. All of these changes were predicted before they were detected, but they are occurring sooner or more rapidly than expected.

The professional culture of scientific analysis biases against identifying high impact, low probability events. Official IPCC estimates are that by 2100 sea levels will rise by around 60cm; at a global temperature rise of 2-7C. These estimates excluded – on uncertainty grounds - the impact of melting glacial ice which could raise sea levels to 1.5-2m. But geological measurements show that sea levels rose by 4 - 6 meters about 125,000 years ago when global temperature was only one or two degrees higher than today.

Managing these types of analytical biases is a central and familiar task of intelligence analysis and collection in the security sector. Effective decision support for climate security needs to incorporate these approaches. A critical element of this approach is understanding how we are learning over time about climate impacts, and whether there seems to be any systematic bias in past analysis.

In 2009 scientists reassessed IPCC analysis from 2000 on global vulnerabilities based on a decade's worth of new research. Their conclusion was that all categories of impacts were now likely to be more severe than previously estimated at lower levels of climate change. This comprehensive shift in overall damage estimates is more meaningful to decision makers than any one point impact estimate. It suggests there has been a general underestimation of impacts and future research is more likely than not to point to greater costs from climate change than currently estimated.

Decision makers urgently need to ensure a more balanced decision support system to inform their decisions on climate change. This should augment and draw upon the current structures of climate science, not replace them. In addition a comprehensive, long-lived monitoring system that integrates Earth and socioeconomic observations is a necessary backbone for managing the risks associated with unavoided climate change. Such a system is under development but not complete and its sustained future is not ensured. There are also signs that some major countries are beginning to classify data on climate impacts and modeling as national security information. This is a worrying development as without open sharing of national measurements and analysis the global monitoring system will collapse. Fully funding, implementing and maintaining open data flow inside the global monitoring system should be a national and international priority for all countries as it is essential to minimizing the risks of climate change.

Understanding our Vulnerability and Resilience to Climate Impacts

Good risk management always requires balance. The balance between limiting climate change and adapting to its impacts is not primarily a scientific question but rests on the vulnerability of human systems to climatic changes.

The climate of the past two centuries is the ideal climate for our modern society because we have deliberately built our systems around that climate. Many megacities are at sea level, most of our food is produced in a few, rain-fed "breadbasket" regions, and our built environment is designed to weather familiar extremes. **Industrial civilisation has been built on the assumption of a stable climate; this assumption no longer holds.**

Policy makers often assume that the climate system will only change gradually and smoothly, offering ample time for society to develop policy responses as changes develop and new technologies permit. Compared to the smooth, gradual, predictable changes that many people expect, the sudden, unpredictable changes that may be a common feature of regional climates will be more difficult to plan and prepare for. There are particular risks of overinvesting in specific adaptations to predicted climate change which are highly uncertain; for example, current modeling cannot predict whether rainfall will increase or decrease over many of the worlds major river basins in the next few decades. In the face of such uncertainty "soft" adaptation approaches which deliver flexible and community based resilience to climatic changes are probably more useful than top down "hard" engineering responses; particularly in preventing conflict over scarce resources. However, both approaches will be needed in most areas.

Uncertainty over climate impacts will be the source of tensions inside and between countries as different groups argue for interventions to protect against scenarios damaging to their core interests. Countries such as India already spend over 2% of GDP in managing climate-linked vulnerabilities; the scale and competition for such funds will only increase as the unavoidable impacts of climate change worsen. At the extreme disputes over the management of increasingly scarce and volatile resources may result in violence and internal instability. The widespread political instability across the globe seen in 2008 as food prices rocketed due to drought, high oil prices and trade restrictions is a foretaste of the type of "perfect storm" events we can expect to see more of in the future.

There is a perception that climate change is an issue for poor societies in the tropics and rich temperate countries will be largely unaffected. This is not true. High latitude regions are changing faster than tropical regions; hence damage to pipelines and infrastructure in Russia and Alaska from melting permafrost. The Midwestern United States experienced two "once-in-500-year floods" in 1993 and 2008 which is consistent with climate projections. European fishing management is beginning to collapse as climate change alters the distribution of fish stocks. **While a combination of wealth and good governance does make developed countries more resilient to natural disasters, the distinction is one of degree. No region escapes vulnerability.**

Climate change and growing resource scarcity will put great strain on international agreements to manage water, food trade, borders and other climate sensitive resources. These international agreements underpin the open global economy our prosperity depends on, but there are clear trends showing major countries are hedging against the collapse of this order by securing bilateral access to vital strategic resources. While such a hedging strategy is understandable in national security terms, collectively these moves undermine overall trust in the sustainability of international rule of law. It is in the interest of the US to counter-act these trends with targeted interventions to improve the resilience and effectiveness of international agreements to climate change impacts, and strengthen the perception that the international system will deliver reliable security for all.

Despite intensive analysis it is clear that information on the regional and local impacts of climate change is still very weak, and this hampers the development of effective strategies to increase resilience. State fragility and existing communal and international disputes over climate sensitive resources such as rivers, maritime borders and fisheries will further complicate the design of adaptation strategies. Improving societal resilience will not be a politically neutral act in many of the most vulnerable countries of Africa, Asia and the Middle East. These conflict issues should be factored into international cooperation and a whole of government approach developed to improving resilience; including development, diplomacy and security analysis approaches.

Reducing the risks of climate change

A comprehensive strategy to manage climate change must also assess the likelihood that global greenhouse gases can be controlled in line with current goals. Reaching a 2C goal will require dramatic shifts in energy systems; with the electric power sector and domestic energy use in developed countries being effectively carbon neutral soon after 2030. China will need to peak its emissions before 2030 and other emerging economies soon afterwards; despite being in the middle of their fastest period of urbanization and infrastructure construction. These changes are technically feasible; however achieving these changes involves significant political, investment and policy challenges.

The 2C goal requires a massive increase of global energy investment over the next 20 years from $26 trillion to $37 trillion, with much of baseline investment moving from high carbon to low carbon options. Even the weaker Copenhagen Accord commitments will require an additional $4 trillion in investment to 2030. Given the financial crisis it is unclear whether existing energy companies and investors will be willing or able to deliver this scale of investment without significant levels of public support and risk sharing.

The economic and technical feasibility of rapid global decarbonisation depend on the delivery of a majority of near term emission reductions through energy efficiency and reducing tropical deforestation. Though in theory these are cheap options, delivery requires complex policy packages that must impact literally billions of local investment and consumption decisions. If these polices fail to deliver at the scale and pace anticipated then a far larger amount of - more expensive – zero carbon energy will be needed. Given the immaturity of many large scale low carbon energy options an increased rate of expansion may not be possible on current technological trends.

Finally, achieving real impacts in lowering climate security risks requires strong collective action by all twenty or so major emitting countries. It is unlikely that action will be rapid enough to hit a 2C or similar target unless countries agree to be bound into a binding global regime. Assuming such a regime can be agreed it will need to be resilient against the inevitable policy failures and mistrust as countries fail to meet their promises, or do not deliver the support for international cooperation which was promised. Public support for the regime in all countries will also critically depend on a perception of fairness on all sides, and effective use of international funds. Managing the risk of regime failure will critically depend on transparent and objective monitoring of country performance which allows discrimination between honest policy failures and deliberate non-compliance. Public transparency of emission reductions and financial transfers at national and international level will also help underpin political sustainability of agreements. Given its intrinsic complexity the climate regime will need to be an exemplar of public openness to allow scrutiny of all countries' actions if it is to retain broad confidence.

Strategies to reduce emissions must be subjected to as rigorous a risk assessment as climate science and impact estimates. Current climate change policy discussions tend to assume the best-case scenario of efficient and timely delivery; despite ample evidence from Europe and elsewhere of the difficulties in delivering large-scale carbon reduction policies. One way to mitigate these risks will be to invest in rapid lesson learning from cutting edge policy practice to learn from both failures and best practices; achieving the challenging timetables for change will require faster institutional learning than currently occurs. Stronger international cooperation will also be needed to more rapidly develop new large-scale low carbon energy sources (e.g. new solar power sources; generation IV nuclear power) so they may compensate for the impact of major policy failures.

A Forward Risk Management Agenda on Climate Security

Risk management is both an art and a science. It depends on collecting the best data possible, but also being aware of what we don't know and cannot know. It requires complex – and often unquantifiable – trade-offs between different strategies to prevent, manage and respond to risks. It is both long term and reactive.

The security arena is full of useful lessons of effective and ineffective risk management strategies in areas at least as complex and vital as climate change. In the Cold War the NATO alliance invested in massive nuclear and conventional deterrence which prevented the worst scenarios of future conflict. The high costs – and even overkill – of deterrence has been seen as justified in retrospect given the scale of the risks we faced. In contrast the inability of the French high command in the 1930s to adapt their strategy of passive defence – exemplified by the Maginot line - in the face of the emergence of mobile armoured warfare is an object lesson in how incumbent interests can prevent effective response to dynamic emergent risks. Strategies against bioterrorism have taken a different approach, eschewing the possibility of comprehensive prevention and focusing on building capability for effective rapid response and early detection and containment.

There is no perfect off-the-shelf risk management approach to address national security threats. However**, the lessons of past show all effective responses rest on setting clear objectives, a willingness to address worst case scenarios and a process for explicitly managing the uncertainties that inevitably occur in large scale, complex problems.** It has often taken a decade or more of intense debate for robust and sustainable risk management strategies to emerge to tackle national security issues. However, we do not have the luxury of such time in the case of climate change. We must explicitly apply the lessons of how we have successfully responded to other vital national security issues. Everyday we fail to act the risk of catastrophic climate change becomes incrementally and irreversibly higher. Like the hands of a ticking clock the risks of climate change can only really move forward.

From the analysis above we suggest seven priority areas laid out below for further work to move towards a comprehensive risk management approach to climate change.

1. **Stronger Mitigation Goals**: The most critical security threats in most parts of the world are associated with runaway climate change and crossing crucial climate tipping points. Dramatically lowering the possibility of exceeding 3-4C – the broad threshold estimate for many climate change tipping points – would require stronger global mitigation actions than currently agreed. Effective risk management of climate change requires a clear objective for an acceptable level for climate change and a medium term strategy for delivering this.

2. **Climate Regime Resilience**: There is significant potential for delivery failure in the main planks of current global and national climate change policies; for example, preventing deforestation. The climate regime needs to be resilient to underdelivery as break down would delay global action for a decade. Tensions inside the climate regime over country mitigation performance are best dealt with by a strong regime of reporting and transparency so problems can be identified early and countries facilitated back into compliance with their obligations. As in arms control, the principle of "trust and verify" is a good foundation for regime sustainability. High levels of additional cooperative investment in RD&D of low carbon energy technologies are also needed to provide a hedge against the risks of mitigation policy failure.

3. **Independent Regime Assessment**: As with other security issues it is critical that progress towards achieving stated goals is independently assessed outside the policy chain. If the likely outcome of current climate regime is 3-4C of warming this needs to be factored into domestic adaptation, military, development and humanitarian planning. This will result in increased adaptation costs of billions of dollars unless it inspires additional effort to credibly reduce climate change risks.

4. **Contingency "Crash Mitigation" Programmes**: The most likely response to higher estimates of climate sensitivity or a major impact event (e.g. major Antarctic sea ice

melting) would be a rapid move to a “crash mitigation” programme, possibly including geoengineering. It is vital to have contingency plans for this eventuality which ensure effective responses which do not cause other security problems, including international frameworks to control the deployment of geoengineering technologies and ensure safe build out of nuclear power if that is a major response option.

5. **Systematic monitoring of key climate tipping points**: Currently there is little systematic monitoring of major climate system tipping points e.g. the North Atlantic Circulation. The IPCC system relies heavily on existing academic funding systems and is not driven by decision support needs. There is an urgent need for greater investment of at least $1.2-4 billion per year to provide policy makers early warning capacity for dangerous climate scenarios[2].

6. **Monitoring and modelling “perfect storm” climate impacts**: Current climate change impacts research does not capture the most important near term risks for human and national security. By analysing individual impacts it often misses the compound impacts of climate change on food supply, energy security, human and animal health and ecosystems, and how they interact with conflict and instability in areas of fragile governance and resource mismanagement. There is also a need for dynamic risk modelling of “perfect storm” events – as happened in 2008 on fuel and food prices – to give early warning for humanitarian and preventive interventions.

7. **Increase resilience in international resource management regimes**: Peaceful management of resource tensions created by climate change will need stronger international management regimes in order to preserve a rule-based global order. These changes could include reforming resource sharing mechanisms, enhancing international arbitration and improving scientific cooperation. The time to strengthen regimes is now, when the impacts of climate change are still at relatively low levels. This will require actions across a wide range of international, regional and bilateral agreements. In some areas - e.g. transboundary water – international adaptation funding could be conditional on countries agreeing to formulate a climate resilient and equitable management regime.

8. **Improve cooperation on preventive and humanitarian intervention**: Climate change will require a major increase in humanitarian and preventive missions by the international community and regional organisations. These will require better coordination, high levels of capability (e.g. civilian lift) and greater investment in preventative approaches to natural disasters. Collaborating countries (for example the EU and AU) should begin planning for responses to these high impact scenarios, developing regional scenarios based on a 3-4C a planning assumption to drive the development of contingency plans and enhanced capability.

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[2] See Global Climate Observing System, Provisional Cost estimates, UNFCC SBSTA Submission, Nov 2009