House Permanent Select Committee on Intelligence
House Select Committee on Energy Independence and Global Warming

25 June 2008

National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030

Statement for the Record

of

Dr. Thomas Fingar

Deputy Director of National Intelligence for Analysis and Chairman of the National Intelligence Council

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DR. THOMAS FINGAR
DEPUTY DIRECTOR OF NATIONAL INTELLIGENCE FOR ANALYSIS AND CHAIRMAN OF THE NATIONAL INTELLIGENCE COUNCIL

BEFORE THE
PERMANENT SELECT COMMITTTEE ON INTELLIGENCE AND THE SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING
HOUSE OF REPRESENTATIVES

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Chairman Markey, Chairwoman Eshoo, Ranking Member Sensenbrenner, Ranking Member Issa, and Members of the Committees thank you for the opportunity to brief both committees on the "National Security Implications of Global Climate Change to 2030." I am Tom Fingar, the Deputy Director of National Intelligence for Analysis; I am joined today by Rolf Mowatt-Larssen – Director, Office of Intelligence and Counterintelligence at the Department of Energy, Dr. Mathew Burrows – the NIC's Counselor, and Ms. Karen Monaghan – the National Intelligence Officer for Economics. I would like to divide my remarks into four sections this afternoon. I will first provide an overview of the history and the process the Intelligence Community (IC) used to explore this topic, followed by a summary of our key observations; and then I will provide a brief description of some of the collection and analysis challenges, and lastly our future plans.

History and Process

We began our effort following a National Intelligence Priorities Framework review in 2006, believing the time was right to develop a community level product on the national security significance of future climate change. It had obviously become an important global issue. Following draft Congressional language in the Spring of 2007, we elevated the level of our effort to a National Intelligence Assessment (NIA), developed terms of reference, and initiated the study.

This study used a fundamentally different kind of analytical methodology from what is typical for an intelligence product such as a National Intelligence Estimate (NIE). We depended upon open sources and greatly leveraged outside expertise. Since the Intelligence Community does not conduct climate research, we began our effort by looking for other US government entities that were experts in this area. We worked with the US Climate Change Science Program and visited with climate modelers and experts from the Department of Energy national laboratories and the National Oceanic and Atmospheric Agency (NOAA). We also relied upon support from the Joint Global Change Research Institute—a joint research program between the University of Maryland and the Pacific Northwest National Laboratory—Columbia University's Center for International Earth Science Information Network, and the Naval Postgraduate School in Monterey California.

Our primary source for climate science was the United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, which we augmented with other peer-reviewed analyses and contracted research. We used the UN Panel report as our baseline because this document was reviewed and coordinated on by the US government and internationally respected by the scientific community. For this analysis, we relied predominately upon a mid-range projection from among a range of authoritative scenario trajectories provided by the IPCC.

Our overall strategy consisted of developing a good understanding of climate science, and supplementing this with state specific information on water scarcity, overall vulnerability to climate change, and populations at risk of sea level rise. In consultation with the Naval Postgraduate School, we analyzed this material to assess the capability of specific nation-states to cope with the effects of climate change. We did not evaluate the science of climate change per se; nor did we independently analyze what the underlying drivers of climate change are or to what degree climate change will occur.

Throughout our effort, we remained mindful of what the effects of future climate change would mean for US national security. We used a broad definition for national security. We first considered if the effects would directly impact the US homeland, a US economic partner, or a US ally. We also focused on the potential for humanitarian disaster, such that the response would consume US resources. We then considered if the result would degrade or enhance one of the elements of national power (Geopolitical, Military, Economic, or Social Cohesion), and if the degradation or enhancement, even if temporary, would be significant. In the end, we reported on key effects that we judged would meet this threshold.

The NIA focuses on the implications of global climate change for US national security interests by 2030. In the study, we assume that the climate will change as forecast by the IPCC. The year 2030 is far enough out to have witnessed climate-induced changes to the physical and biological worlds, yet close enough to allow judgments about the likely impact of such changes. We offer a glimpse of climate change impact beyond 2030 because expectations about the relative severity of climate changes projected later in the century will color the perceptions of policymakers between now and 2030.

On the National Intelligence Council this effort was conducted by the National Intelligence Officers for Science and Technology, and for Economics, and the NIC's Long Range Analysis Unit. Within the Intelligence Community, we were supported by the Defense Intelligence Agency's Armed Forces Medical Intelligence Center, the Office of Naval Intelligence, the Department of State Bureau of Intelligence and Research, the Office of Transnational Issues from the Central Intelligence Agency, and the National Geospatial-Intelligence Agency. We received inputs to the document and critiques from outside experts and allied partners. We used contract studies, previous research, and consultations with many others.

Summary of Key Observations

Allow me to provide a summary of our key observations. We judge global climate change will have wide-ranging implications for US national security interests over the next 20 years. Although the United States will be less affected and is better equipped than most nations to deal with climate change, and may even see a benefit owing to increases in agriculture productivity, infrastructure repair and replacement will be costly. We judge that the most significant impact for the United States will be indirect and result from climate-driven effects on many other countries and their potential to seriously affect US national security interests. We assess that climate change alone is unlikely to trigger state failure in any state out to 2030, but the impacts will worsen existing problems—such as poverty, social tensions, environmental degradation, ineffectual leadership, and weak political institutions. Climate change could threaten domestic stability in some states, potentially contributing to intra- or, less likely, interstate conflict, particularly over access to increasingly scarce water resources. We judge that economic migrants will perceive additional reasons to migrate because of harsh climates, both within nations and from disadvantaged to richer countries.

Climate Change…

Looking more specifically at the future global climate, current scientific observations indicate the Earth's climate is changing. Changes cited by the IPCC include rising global temperatures, increasing heavy precipitation events, and rising sea levels. The global mean annual average temperature has risen 0.13 degrees Celsius (C) per decade during the period 1955-2005—double the rate observed in 1906-2005. However, temperature changes vary across the planet, and impacts vary as a function of local circumstances. Some areas are experiencing less warming or even cooling. Precipitation has generally increased over land north of 30 degrees latitude over the period 1900 to 2005, but the tropics have experienced less precipitation since the 1970s. IPCC says that intense tropical cyclone activity is likely to increase. Global sea level rose 1.7 mm per year during most of the 20th century, but has risen approximately 3 mm per year since 1993.

Many physical and biological systems are changing in ways consistent with the present warming trend. Among the most significant changes highlighted by scientists are the thawing of the northern latitude permafrost[1] which is forcing repair or replacement of buildings and pipeline infrastructure, and the increase of heat waves and droughts (both in frequency and intensity), although attribution of increased droughts to greenhouse gas (GHG) emissions remains controversial.

In some cases, changes in ecosystems and natural resources are occurring faster and with larger magnitude than scientists anticipated as recently as ten years ago. Temperatures in the Arctic are rising almost twice as fast as the global rate, and temperatures are rising faster over land masses than over open oceans.

Looking out to 2030, certain broad-brush projections of climate change can be made. Global temperature change is expected to increase approximately one half degree C over the next two decades and sea level rise is expected to be no greater than 75mm (.075m).[2] The IPCC and others project that water will become increasingly scarce across several regions, including parts of Asia and parts of Africa and the southwestern United States. Water scarcity can be caused by many factors—absence of precipitation, increased evaporation, demographics, land use, or reductions in river flows.

…And National Security

From a national security perspective, climate change has the potential to affect lives (for example, through food and water shortages, increased health problems including the spread of disease, and increased potential for conflict), property (for example through ground subsidence, flooding,

[1] Permafrost is soil, rock, sediment or other material with a temperature that has remained below zero degrees centigrade for two or more consecutive years.
[2] The change is reference to the average global temperature for the period 1980 to 1999.

coastal erosion, and extreme weather events), and other security interests. The United States depends on a smooth-functioning international system ensuring the flow of trade and market access to critical raw materials such as oil and gas, and security for its allies and partners. Climate change and climate change policies could affect all of these—domestic stability in a number of key states, the opening of new sea lanes and access to raw materials, and the global economy more broadly—with significant geopolitical consequences.

In addition, anticipated impacts to the Homeland—including possible increases in the severity of storms in the Gulf, increased demand for energy resources, disruptions in US and Arctic infrastructure, and increases in immigration from resource-scarce regions of the world—are expected to be costly. Government, business, and public efforts to develop mitigation and adaptation strategies to deal with climate change—from policies to reduce greenhouse gasses to plans to reduce exposure to climate change or capitalize on potential impacts—may affect US national security interests even more than the physical impacts of climate change itself.

Regional Climate Trends to 2030 [3]

I will now summarize some regional climate change trends.

Africa [4]

Climate-induced tensions are a main contributor to instability in

[3] While the NIA is based predominately upon a midrange scenario, some of the analysis cited in this section refers to IPCC reports with multiple scenarios. However, scientists indicate that even if humans stopped releasing CO2 tomorrow, climate changes projected for 2030 would still occur. Scenario trajectories—including those emphasizing concerted emissions reductions—do not vary significantly over the next 20-25 years. Not all IPCC or peer-reviewed research is targeted to the 2030 time frame of this assessment. Therefore when the targeted research reflects a different period of time we specifically mention the targeted time period.

[4] Regions are listed in alphabetical order.

several areas of Africa. We judge that sub-Saharan Africa will continue to be the most vulnerable region to climate change because of multiple environmental, economic, political, and social stresses. Observed temperatures have become warmer since the 1960s. This has been true across the varied climates of Africa. In addition, from 1961-2000 the number of warm spells increased over southern and western Africa. Rainfall varies a good deal over most of Africa, but increased seasonal variability has been observed since 1970, with higher rainfall anomalies and more intense and widespread droughts.

Scientific studies indicate that climate change is likely to cause agricultural losses, possibly severe in the Sahel, West Africa, and southern Africa. Agricultural yields from some rainfall dependant crops could be reduced by up to 50 percent by 2020.

Many African countries already challenged by persistent poverty, frequent natural disasters, weak governance, and high dependence on agriculture probably will face a significantly higher exposure to water stress owing to climate change.

Asia

In Asia, despite future climate change that is expected to produce increased precipitation, current research indicates that South, Southeast, and East Asia will face risks of reduced agricultural productivity as large parts of the region face increased risk of floods and droughts. By 2025, cereal crop yields will decrease 2.5-10 percent, according to some calculations.[5]

[5] This assumes no CO_2 fertilization. Most plants growing in normal atmospheric CO_2 exhibit higher rates of photosynthesis and elevated CO_2 alone tends to increase growth and yield of most agriculture plants. Most of the studies have been conducted either under controlled environmental conditions (chambers), or under optimal field conditions. Potential CO_2 effects on plant biomass depend on the nutrient and water

Observed increases in surface air temperature in recent decades range from less than 1 to 3 degrees C per decade, with the most pronounced warming in north Asia. Annual average rainfall has decreased in Russia, northeast and north China, coastal belts and arid plains of Pakistan, parts of northeast India, Indonesia, Philippines, and some areas of Japan; it has increased in western and southeastern coastal China, Bangladesh, and the western coasts of the Philippines. In parts of Asia extreme weather events[6] are more frequent and severe and intense rains and floods come more often. Droughts have intensified and/or affected more areas in Central, South and Southeast Asia. Tropical storms are more frequent in the South China Sea, and the Bay of Bengal is experiencing fewer but more intense storms.

Some projections indicate as many as 50 million additional people could be at risk of hunger by 2020, although climate change may moderate water stress in some regions of Asia. By the 2020s increases in precipitation and glacier run-off will relieve some of the water stress in Asia, but increasing consumption patterns and growing populations indicate that 120 million to 1.2 billion people will continue to experience some water stress.

Australia and New Zealand

Australia and New Zealand will likely see increased temperature by 2030 and continued changes in precipitation patterns. Since 1950 there has been a 0.3 to 0.7 degrees C warming in the region, with more heat waves, fewer frosts, and an increase in the intensity of Australian droughts. Recent reports indicate more rain in northwestern Australia and southwestern New

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levels. With CO2 fertilization, the Asian cereal crop yields will vary from +2.5 to –10 percent, with China and Mongolia showing the slight rise in one of three data runs.

[6] The IPCC defines an extreme weather event as an event that is rare within its statistical reference distribution at a particular place. Definitions of “rare” vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile.

Zealand, and less rain in southern and eastern Australia and northeastern New Zealand.

According to scientific research, floods, landslides, droughts and storm surges are likely to become more frequent and intense, and snow and frost are likely to become less frequent. Infrastructure design criteria[7] for extreme events, here as elsewhere, are likely to be exceeded more frequently.

Europe

In the coming years, Europe will likely become hotter—with more frequent and severe heat waves—and there will be greater differences in regional precipitation. Europe warmed 0.90 degrees C between 1901 and 2005. However, the rate of warming has accelerated since 1979. During this latter period, the rate was higher in central and northeastern Europe and in mountainous regions but lower in the Mediterranean regions. Precipitation change varies in different areas of Europe. Average winter precipitation is increasing in most of Atlantic and northern Europe, while yearly precipitation trends are decreasing in eastern Mediterranean regions. Most parts of the continent are receiving more precipitation per wet day, even in some areas that are becoming drier.

By the 2020s, increases in winter floods are likely in maritime regions and more flash floods are likely throughout Europe.

Latin America and the Caribbean

By 2020, temperature increases in Latin America will vary across the region, with the highest temperatures projected to occur over tropical South America. Temperature increases are likely to increase from 0.4 to 1.8

[7] Infrastructure design criteria include such things as maximum and minimum temperature, rates of precipitation, snow and ice accumulation, and wind intensity and direction.

degrees C over the 1980-1999 period. Highly unusual extreme weather events have occurred in some areas of South America including intense rainfall, flooding, drought, hailstorms, and the unprecedented Hurricane Catarina in the South Atlantic. In addition, the Caribbean Basin experienced a record hurricane season in 2005. Increases in rainfall in selected regions of South America have affected land use and crop yields, and increased flood frequency and intensity. Precipitation has decreased in other regions including western Central America.

Latin America may experience increased precipitation by the 2020s; by some estimates tens of millions of people could be removed from water stress in considering only the effects of climate change. However, despite the greater water availability from climate change, an estimated 7-77 million people are likely to remain stressed due to growing populations and increasing water consumption.

Middle East [8]

Prospects for the Middle East are harder to anticipate because of limited climate research. By 2020 the region is expected to see an increased temperature of slightly over one degree C. Precipitation is expected to decrease between 3 and 8 percent in winter and spring, and increase 5 to 18 percent in summer and fall.[9] From 1951 to 2003, several stations in different climatological zones of Iran reported significant decreases in frost days due to a rise in surface temperatures.

Surface water availability from major rivers like the Euphrates and Tigris may be affected by future alterations in river flows. River flows are

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[8] The Middle East is not an IPCC region, but is generally reflected in research and reporting as the West Asia sub-region.
[9] Changes expressed are relative to 1980-1999 values.

likely to increase in winter and decrease in spring, which could negatively affect existing uses of river water.

North America

Most of North America in the mid-latitudes will likely be less affected by climate change in the next few decades than either the tropics or the polar regions. Net cereal crop yields likely will increase by 5-20 percent,[10] for example, and most studies suggest the United States as a whole will enjoy modest economic benefits over the next few decades largely due to the increased crop yields. Costs begin to mount thereafter, however, and some parts of the United States—particularly built-up coastal areas—will be at greater risk of extreme weather events and potentially high costs related to losses in complex infrastructure. From 1955 to 2005, annual mean air temperature increased to the greatest extent in Alaska and northwestern Canada, followed by the continental interior. The growing season has lengthened an average of two days per decade since 1950 in Canada and the contiguous United States.

For most of North America, annual precipitation has increased, with the most marked increase in northern Canada. However, precipitation has decreased in the southwest United States, the Canadian prairies, and the eastern Arctic.

Polar Regions

Scientists state that the polar regions, which are already affected by climate change, will see further change by 2030 to include loss of land- and sea-based ice and greater exposure of bare ground. For several decades,

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[10] The increase assumes CO_2 fertilization. Without CO_2 fertilization, the range is –2.5 to + 10 percent change in cereal yields, with the poorer yields in Mexico and to a lesser extent, the United States (two of three data runs).

surface temperatures in the Arctic have warmed about twice as fast as the global rate, with associated reductions of sea ice and glaciers. In addition, the duration of river and lake ice has decreased in northern latitudes, and (since 1980) permafrost has warmed in nearly all areas for which measurements are available. Evidence reported in the IPCC Fourth Assessment Report indicates that the Greenland ice sheet's interior is thickening at a decreasing rate while its edges are thinning. The Antarctic shows more variability; meteorological stations show strong and significant warming over the past 50 years, but other long-term records are mixed.

Economic Impacts Projected to Rise Over Time

We assess that no country will be immune to the effects of climate change, but some will be able to cope more effectively than others. Most of the struggling and poor states that will suffer adverse impacts to their potential and economic security are in Sub-Saharan Africa, the Middle East, and Central and Southeast Asia. However, the spillover—from potentially increased migration and water-related disputes—could have a harmful global impact. The global impact on economic growth out to 2030 or so is likely to be minimal, but the effect in particular countries or regions could be substantial.

Most estimates—including the UK commissioned Stern Review—show limited aggregate damage to the world economy by the 2030s. One model, for example shows a decline of 0.3 percent annually of global GDP by 2030. A couple of economic models yield net benefits for OECD and other countries with small increases in global mean temperature—the most likely scenario in the next decade or two. However, the impact on global economic growth begins to mount over time and even conservative estimates put the costs at up to 3 percent of global GDP annually if the Earth's temperature were to rise 2-3 degrees C, which many scientists believe could begin to happen as early as mid-century.

Agricultural Production Most at Risk

Global cereal yields likely will increase out to 2030, but regional differences in production are likely to grow stronger over time with declines proportionately concentrated in developing countries, particularly in Sub-Saharan Africa. Although the precise impact of climate change on agriculture production will differ by region and crop, damages broadly speaking will be greater in countries located closer to the equator and where temperatures are higher today. For many developing countries, reduced agriculture output can be devastating as agriculture represents a large share of their economy, a majority of their populations rely on subsistence farming, and their governments and people have less adaptive capacity.

International Migration

We judge that economic refugees will perceive additional reasons to flee their homes because of harsher climates. Besides movement within countries, especially to urban areas, many displaced persons will move into neighboring developing countries, sometimes as a staging ground for subsequent movement onward to more developed and richer countries with greater economic opportunities. Many likely receiving nations will have neither the resources nor interest to host these climate migrants. Receiving nations probably will have increased concern about migrants who may be exposed to or are carrying infectious diseases that may put host nation populations at higher risk.

Winners and Losers from Climate Change

Most developed nations and countries with rapidly emerging economies are likely to fare better than those in the poorer, developing world, largely because of a greater coping capacity. Nevertheless, many regional states important to the United States will be negatively impacted. Rapidly developing states could experience economic setbacks and uneven growth leading to political change or disruption. And most US allies will experience negative impacts but also have the means to cope.

Implications for the United States

On the homefront, responding to thawing in and around Alaska, water shortages in the Southwest, and storm surges on the East and Gulf Coasts will involve costly repairs, upgrades, and modifications. A warming climate also will encourage wildfires throughout the longer summers. The IPCC estimates annual costs from severe weather in damage to property and loss of economic productivity for the United States to be in the tens of billions of dollars. Nonetheless, most models predict that the United States on balance will benefit slightly from climate change over the next few decades, largely due to increased agricultural yields. Current infrastructure design criteria and construction codes may be inadequate for climate change and exacerbate vulnerability to increasing storm intensity and flooding. A number of active coastal military installations in the continental United States are at a significant and increasing risk of damage, as a function of flooding from worsened storm surges in the near-term. In addition, two dozen nuclear facilities and numerous refineries along US coastlines are at risk and may be severely impacted by storms.

The United States' new military area of responsibility—Africa Command—is likely to face extensive and novel operational requirements. Sub-Saharan African countries—if they are hard hit by climate impacts—will be more susceptible to worsening disease exposure. Food insecurity, for reasons both of shortages and affordability, will be a growing concern in Africa as well as other parts of the world. Without food aid, the region will likely face higher levels of instability—particularly violent ethnic clashes over land ownership.

Closer to home, the United States will need to anticipate and plan for growing immigration pressures. Although sea level rise is probably a slow and long-term development, extreme weather events and growing evidence of inundation will motivate many to move sooner rather than later. Almost one-fourth of the countries with the greatest percentage of population in low-elevation coastal zones are in the Caribbean, so assisting these populations will be an imminent task. Broad Western hemispheric cooperation will be necessary to mitigate the impact on harder-hit countries.

As climate changes spur more humanitarian emergencies, the international community's capacity to respond will be increasingly strained. The United States, in particular will be called upon to respond. The demands of these potential humanitarian responses may significantly tax US military transportation and support force structures, resulting in a strained readiness posture and decreased strategic depth for combat operations.

To insert a sense of urgency into the debate and pressure international institutions and countries to adopt adaptation and mitigation strategies, environmental and human rights NGOs may press to broaden the definition of "refugee" to include environment or climate migrants. Such a change would have implications for the United States, other donors, and organizations like UNHCR to provide assistance to displaced populations similar to recent efforts to provide aid to internally displaced peoples. Elsewhere, developing countries—particularly major greenhouse gas emitters—may demand that the WTO Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) be amended to allow for the production and development of generic copies of green technologies, citing the precedent of HIV AIDS drugs. Indeed, last year the European Parliament asked for an examination of whether TRIPS presented a significant barrier to technology transfer.

In multinational forums, we assess that the climate change issue will become more prominent on the agenda, and the US's leadership overall in the global arena will be judged by the extent to which it is perceived as forging a viable and effective global consensus for tackling climate change. Expectations are that US leadership will be pivotal in helping the international community set meaningful long-term goals for greenhouse gas emissions reductions and mitigating and adapting to climate change through technological progress and transfers, financial assistance, and support for climate migrants.

Collection and Analysis Challenges

Let me now discuss collection and analytic challenges we faced in the development of this assessment. As I indicated in my opening remarks, we used a fundamentally different type of collection and analytic methodology and were fortunate to have assistance from talented expertise inside and outside of the Intelligence Community.

To answer the question of national security impacts from Global Climate Change, we needed first and foremost to understand what the future climate might look like and what the physical and ecosystem impacts of change might be. For this, we were critically dependant upon open source science and, as I indicated, elected to use the IPCC reports and other peer-reviewed scientific material. From an intelligence perspective, the present level of scientific understanding of future climate change lacks the resolution and specificity we would like for detailed analysis at the state level. Most of the IPCC material is based upon an understanding of how the climate may change at the global level. We require improved and better validated regional and local models (accounting for regional and local processes) of strategic climate change, particularly models that provide details on hydrological consequences and changes in the frequency and intensity of extreme events.

Finally, there is a need for better information on physical, agricultural, economic, social, and political impacts from climate change at state and regional levels. This research does not necessarily require classified sources or methods and may be performed in an open and unclassified environment. From an IC perspective we do not seek to duplicate capability that exists in the open scientific community, but we will benefit from continued support for research to resolve the above issues.

From an analytical perspective, the IC examines state stability as a critical part of determining potential threats to US interests. When evaluating state stability, water shortages, disease, and the environment are considered along with other factors. The IC also considers the effects that climate change negotiations and mitigation efforts will have on the US economy, its trade goals, and its diplomatic relationships with the international community.

Near term, additional analysis is required to determine the world-wide potential vulnerability to storm tracks and severe weather. This analysis should consider changes in anticipated storm tracks and severe weather patterns, populations and infrastructure at risk, and local physical factors. In addition, detailed agriculture vulnerability should be studied; this would include anticipated changes in temperature, precipitation levels and patterns. Much, if not all, of this analysis can be performed with open source data, and much of the basic analytical work can be performed outside of the Intelligence Community by academia or non-IC components of the US Government.

Our analysis could be greatly improved if we had a much better understanding and explanation of past and current human behavior. Continued research to model social human dynamics at the individual and society level would support this improved understanding. This would necessitate the ability to integrate social, economic (infrastructure, agriculture, and manufacturing), military, and political models. Continued research in these efforts—while a significant challenge—could have high analytical payoff. In the interim, assessing the future of a society's evolution will by necessity be a scenario-driven exercise and an imprecise science. The continued use of outside experts is critical to our success.

Future Research Plans

I would like to conclude with a summary of our tentative plans for future work. The National Intelligence Council plans on three follow-on efforts. As I alluded to earlier, we were challenged in the present effort to get detail information on specific states. However, the science of modeling is continuously improving and we believe that more focused and targeted studies can be of value today. For one effort, we would like to explore in depth the potential effects of climate change on a set of countries and regions of the world and the resulting impact to US security interests.

For the second effort, we would like to conduct a scenario exercise and report on the potential national security impacts from possible climate change remediation strategies. We call this type of work "alternative analysis." We recognize that global remediation efforts will most likely come from a wide variety of sources and that the final determination of what strategies a state chooses will be dependant upon many factors aside from national security. Our objective with this effort is to better inform the policy community as to the national security ramifications from each of these strategies. At present the four remediation strategies we are considering include a predominant dependence upon either carbon capture and sequestration, biofuels, a family of renewables, or nuclear power.

Our third effort will be to explore the geopolitics of climate change and how that may shift the relationships between major powers. Some of this will also be explored in the NIC's Global Trends out to 2025, which is expected to be published in December 2008.