Poverty may be defined as the shortage of common things such as food, clothing, shelter, electricity and safe drinking water, which determine our quality of life. All too often it includes limited or no access to opportunities such as education and employment which aid the escape from poverty.

Security usually refers to an individual's employment, health or ability to be shielded from violence. It is also a concept that applies to nations. Historically, national security had a military connotation – i.e., could a country protect itself against internal disruptions and foreign invaders. Today it is clear that a nation's security also depends on the state of its economy and the quality of its governance. Recognition of the critical relationship among economics, governance and security was a major outcome of the Bretton Woods conference of 1944 that led to the creation of the International Monetary Fund and the International Bank for Reconstruction and Development. More recently it has been recognized that states with little security, often referred to as fragile states, can undermine their neighbors and regions as well.

Especially since the attacks of 9/11, a theme often expressed is that poverty leads to terrorism and that addressing poverty will diminish instability and the terrorism threat. This is certainly true to some extent, as most people need to have hope of a better tomorrow if they are not to be receptive to extreme measures. However, several recent studies have concluded that poverty alone does not automatically lead to terrorism, as evidenced by the relative affluence of many of the 9/11 terrorists and many others in the ranks of Al-Qaeda and other terrorist organizations. The missing factor appears to be governance and its link to economic development.

In a statement to the United States Institute of Peace earlier this year, Robert Zoellick, President of the World Bank, defined the problem as follows: "Fragile states are a witches' brew of ineffective government, poverty, and conflict. ……Weak governance, corruption, and insecurity combine in a downward cycle. Fragility does not just mean low growth, but a failure in the normal growth process, such that grinding, hopeless poverty becomes a persistent condition. ….Too often, the development community has treated states affected by fragility and conflict simply as harder cases of development. ….Yet these situations require looking beyond the analytics of both security studies and development – to a different framework of building security, legitimacy, governance and economy. This is not security as usual or development as usual. ….This is about 'securing development' – bringing security and development together first to smooth the transition from conflict to peace and then to embed stability so that development can take hold over a decade and beyond. Only by securing development can we put down roots deep enough to break the cycle of fragility and violence."

To secure development and sustainably create the jobs that reduce poverty, governments must first establish their legitimacy by providing basic services - e.g., access to clean water and electricity – in an environment safe for economic activity. This must go hand-in-hand with establishing the rule of law, including respect for property rights. The following discussion will focus on the energy part of this equation, while recognizing that issues related to energy and water, two critical elements of stainable development, are closely linked. (see " The Connection: Water and Energy Security

," Institute for the Analysis of Global Security, August 13, 2004).

A discussion of energy must start with the recognition that people do not value energy itself but rather the services that energy makes possible. These include heating, cooling, lighting, transportation of people, water and goods, entertainment and a broad range of commercial activities. It follows that governments will want to provide these services with the least amount of energy feasible, to minimize energy costs and environmental and national security impacts. Global energy today is provided largely by fossil fuels (coal, oil, natural gas) and this will be true for several decades into the future, given large reserves and devoted infrastructure. Nevertheless, fossil fuel resources are finite and nonrenewable, their combustion releases carbon dioxide, a greenhouse gas, into the atmosphere unless captured and sequestered, and they will eventually have to be restricted. Cost increases and volatility, as well as global warming concerns, are likely to limit fossil fuel use before resource restrictions become dominant, and increasing concentration of supplies in just a few countries raises serious national security concerns. In addition, the world's current energy delivery infrastructure is highly vulnerable to natural disasters, terrorist attacks and other breakdowns, and energy imports constitute a major drain on financial resources.

Current global energy consumption is approximately 500 quadrillion British Thermal Units (quads) and is projected to increase to 700 quads by 2030 according to the US Department of Energy's Energy Information Administration. Under business-as-usual it is projected that 86% of this total will be provided by fossil fuels, 8.5% by renewables, and 5.4% by nuclear. If accurate, and energy prices stay level or most probably increase, energy poverty – i.e., limited supplies of energy that people can afford to buy - will be likely for many of the world's poorer countries. Combined with climate changes due to global warming we may be facing an increasingly unstable political situation in many developing economies over the next few decades. For example, increasingly limited water supplies due to changing precipitation patterns will lead to internal migrations within countries and across national borders. Even developed economies will be seriously impacted by increasing energy costs and climate change.

What can be done to change this situation? How quickly can we reduce growth in global energy demand? How quickly can renewable alternatives and nuclear power replace fossil fuels? How quickly can global emissions of carbon dioxide and other greenhouse gases be reduced? The answers to these questions are critical to addressing our security concerns but are less than encouraging. Barriers are more political and financial than technological.

Population growth and increasing levels of per capita resource consumption will drive growing energy demand in the 21st century. While not preordained, this growth will be significant even if other countries do not achieve US or other developed country per capita levels of consumption. Major sources of this growth will be in (a) transportation, 90% fueled by petroleum today and the world's fastest growing energy consumer, and (b) electrification, which increased dramatically in the 20th century and will continue to increase in the 21st century. Alternative transportation fuels, such as ethanol and methanol, can meet some of this demand. A driver of continued electrification will be the substitution of electricity for liquid transportation fuels. Thus the question becomes how quickly can we replace internal combustion engine vehicles with electric

motor-driven vehicles and bring on renewable and nuclear electricity sources? In the building sector, a major contributor to global energy needs, much can be done to reduce demand by retrofitting existing buildings, building new structures to increasingly stringent standards, incorporating new solid state lighting technologies, and utilizing renewable energy wherever feasible (e.g. for space heating and cooling and hot water production). Cost is the principal barrier.

2008 was a banner year for clean energy, with three major sectors (photovoltaics, wind, biofuels) achieving a combined 53% annual growth in global revenues to $115.9 billion (Clean Energy Trends 2009, Clean Energy, Inc., March 2009). This is on top of annual growth rates of more than 30% over the past decade. The global credit crisis will limit this growth in 2009, but new government policies and spending should help the clean energy industry weather the financial storm better than most. In fact, clean energy investments are seen by many as key to job creation and economic recovery, and Clean Energy, Inc. projects that annual global revenue of their three tracked technologies will grow to $325 billion by 2018. This is encouraging, but the reality is that renewable deployments start from small bases and the inevitable transition to a more renewables-based energy economy will take time. This time can be shortened considerably if nations agree to put a steadily increasing price on carbon emissions.

Rapid deployment of non-CO2-emitting nuclear power faces greater uncertainty. It must address four critical issues: cost, power plant safety, radioactive waste storage, and weapons nonproliferation. Individual power plants also face a 5-10 year time scale for construction. Most energy projections see slow growth for nuclear in the next few decades while these issues are addressed

To summarize, the world can reduce its rate of energy demand growth if the political will exists and the finances are available. The world can also move more quickly than anticipated to replace fossil fuels with renewables, and perhaps nuclear, if a price is placed on carbon emissions, innovation is unleashed, and the necessary investments are made. The initial costs will be high and strong leadership is required, but the results will be a more stable and ultimately lower cost, energy future, long-term economic development, reduced poverty, and greater national and global security. This is the world that, hopefully, we will leave to our children and grandchildren.

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