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ECONOMIC EFFECTS OF NOT TAKING ACTION ON CLIMATE CHANGE

By Pamela W. Person

On October 12, 2007, the Nobel Foundation announced that the Intergovernmental Panel on Climate Change and Albert Gore, Jr., are the recipients of the 2007 Nobel Peace Prize "for their efforts to build up and disseminate greater knowledge about man-made climate change … Indications of change in the earth's future climate must be treated with the utmost seriousness, and with the precautionary principle uppermost in our minds. Extensive climate changes may alter and threaten living conditions of much of mankind. They may induce large-scale migration and lead to greater competition for the earth's resources. Such changes will place particularly heavy burdens on the world's most vulnerable countries. There may be increased danger of violent conflicts and wars, within and between states**."** [1]

And, as Lehman Brothers Bank wrote, "…global warming, we judge, is likely to prove one of those tectonic forces that, like globalization or the aging of the populations, gradually but powerfully changes the economic landscape in which our clients operate and one that causes periodic sharp movements in asset prices. Firms that recognize the challenge early and respond imaginatively and constructively will create opportunities for themselves and thereby prosper. Others, slower to realize what is going on or electing to ignore it, will likely do markedly less well."[2]

Using two of the 2007 Intergovernmental Panel on Climate Change reports (the Working Group II report, "Impacts, Adaptation and Vulnerability," [3]and the Working Group III report, "Mitigation of Climate Change"[4]) as our main sources, we will examine the following four types of costs that can be reduced by acting now to decrease greenhouse gas (GHG) emissions.

1. The higher direct economic damages that would occur in a high-emissions trajectory that would be lower in a low-emissions trajectory.
2. The higher costs of compliance if we wait until the emissions reductions needed are much higher and therefore much more expensive.
3. The lost opportunities for economic growth in all sectors if barriers are not removed and costs not correctly placed to change the fossil-based energy systems.
4. The current and future costs occurring to citizens, businesses and governments who are using energy too inefficiently.[5]

DIRECT ECONOMIC DAMAGES

The Stern Review on the Economics of Climate Change, commissioned by the British Chancellor of the Exchequer, estimates that dealing effectively with climate change now might cost one percent of Gross Domestic Product (GDP). Failing to do so and continuing with business as usual could cost 20 percent of GDP or more.[6]

The three 2007 reports prepared for the Fourth Assessment Report from the Intergovernmental Panel on Climate Change assess the extent and causes of climate change, detail the likely impacts and identify ways to lower the rates of growth in greenhouse gas (GHG) emissions. The

impacts will depend on the level of these emissions and the resulting increases in temperatures. The reports project wide differences in temperature rise – an increase of "only" 3.5 to 4.3 degrees Fahrenheit (1.5 to 2.5 degrees Celsius) or 6-8 degrees Fahrenheit (4-5degrees Celsius). The projected rise is dependent on the level of greenhouse gases emitted – ranging from 25 to 135 gigatons of carbon dioxide equivalent per year ($GtCO_2$-eq/yr). [4]

The 2007 Physical Science Working Group I found GHG emissions have increased markedly as a result of industrial activities since 1750. Carbon dioxide concentrations in the atmosphere, from fossil fuel use, have grown from 280 parts per million (ppm) in 1750 to 379 ppm in 2005. Its report notes that this reading "exceeds by far the natural range over 650,000 years as determined by ice core data," and states that "warming of the climate system is unequivocal.". [7]
Scientists are forewarning that at approximately 450 ppm of CO_2 equivalent in the atmosphere "runaway climate change" can occur (see LWVUS Climate Change Task Force paper "Positive Feedbacks and Climate Runaway").

The 2007 Impacts, Adaptation and Vulnerability Working Group II reported that changes in many physical and biological systems are linked to anthropogenic warming. It also reports that more specific information is now available across a wide range of systems and sectors concerning the nature of future impacts by mid-century. [3]

The 2007 Working Group III "Mitigation of Climate Change" report reviewed a series of possible future emissions scenarios and concluded: "Both bottom up and top-down studies indicate that there is a substantial economic potential for the mitigation of global GHG emissions over the coming decades, that could offset the projected growth of global emissions or reduce carbon emissions below current levels. (*high agreement, much evidence*)" [4]

The Working Group III report found that by 2100, under the various scenarios, GHG emissions could range "from a low of 25 to a high of 135 Gigatons of CO_2-eqivalent per year. (*high agreement, much evidence*)" The actual level of greenhouse gases will depend on how the countries work separately and together to make energy and technological choices, assign economic and social costs, and reduce market barriers**.**[4]

Some of the economic sectors identified as most adversely affected will be:

- utilities
- insurance (property, life and health)
- integrated oil and gas
- mining and metals
- chemicals and pharmaceuticals (because of their reliance on oil and gas for many of their products)
- building and construction
- real estate
- tourism
- agriculture
- resource based economies such as fisheries and forests
- human health

Some of the possible/probable negative economic and consequent political/social effects that are occurring and will occur due to increased air and ocean temperatures, changes in precipitation patterns, changes in climate zones, and rising sea levels are listed below. These effects will last varying lengths of time: *Temporary (up to two months), Short term (two months to one year), Long term (one to 99 years), Permanent (more than 100 years).* In the list below, we have included italicized notations on the expected duration of a particular effect.

International System-Wide Effects

- Populations displaced due to sea level rise, storm damage, drought, lack of water or food supplies, or storm damage. Sea level and storm areas: Pacific Islands, New Orleans, Bangladesh, the Delmarva Peninsula, Florida and low-lying shorelines even in Alaska (85 percent of population lives with 25 miles of coastline). Drought affected areas in Africa, Australia and even parts of our Southwest may cause some residents to become environmental refugees. Christian Aid reported in *Human Tide: The Real Migration Crisis*: "We estimate that, unless strong preventative action is taken, between now and 2050 climate change will push the number of displaced people globally to at least one billion."[8] *Temporary, short or long term, or permanent.*
- Potential for violence due to resource disputes [wars] over water, energy fuels, and access to food-growing capacity or supplies. The Center for Naval Analyses reported in April 2007 that "projected climate change poses a serious threat to America's national security; climate change acts as a threat multiplier for instability in some of the most volatile regions of the world; projected climate change will add to tensions even in stable regions of the world; climate change, national security and energy dependence are a related set of global challenges."[9] *Long term or permanent.*

National Taxpayer Costs

- A Government Accountability Office Report released at a Senate Homeland Security hearing April 19, 2007, estimates that U.S. taxpayers will face up to $919 billion in payouts for flood and crop losses due to global warming.[10] *Long term or permanent.*
- The Energy Security Leadership Council believes that the failure to replace our oil-based economy also increases our vulnerability to events in the Middle East, Africa, Russia, former Soviet republics, and Central and South America. Additional funds are being spent in the regular U.S. Department of Defense and Department of State budgets for expenses in protecting our interests in petroleum resources from the oil- and gas-rich regions of the world.[11] As of September 2007, the cost for the current Iraq war was $567 billion. *Long term or permanent.*

Increased Human Health Costs

- As temperatures rise, the costs related to the health of millions of people are likely to increase because of malnutrition and consequent disorders with implications for child growth and development; increased deaths, disease and injury due to heat waves, floods, storms, fires and droughts; increased burden of diarrheal disease; increased frequency of cardio-respiratory diseases due to higher levels of ground level ozone; altered spatial distribution of some infectious disease vectors.[3] (53,000 people died in the European heat wave of 2003.)[12] *Temporary, short or long term, or permanent***.**

Food, Fiber and Forests

- Crop productivity is projected to increase in mid-latitudes with temperature increases from 1-3ºC, but decrease with higher temperature increases. At lower latitudes, crop production will decrease even with 1-2 ºC temperature changes. Adaptations such as altered cultivars and planting times will allow cereal yields to be maintained at modest warming. Increases in flood and drought will decrease local productivity. *Temporary, short or long term or permanent.*

- Globally, commercial timber productivity projected to increase slightly in short to medium term with large regional variability around this trend. Adverse effects on aquaculture and fisheries are expected.[3] *Short or long term or permanent*
- Loss of land and topsoil from storm surges, sea-level rise, wind- and water-driven erosion. *Short or long term or permanent.*
- Costs from extreme weather events/irrigation/depletion of aquifers/fires. Farmland has traditionally been located near rivers to take advantage of fertile soils. Floods caused by extreme weather events can destroy crops and livestock. Droughts can also deplete food production and cause food producers to increase irrigation to replace normal precipitation as well as raise production. Irrigation uses energy, raises costs and depletes aquifers. Fires can destroy crops, livestock and forests. *Temporary, short or long term or permanent.*
- Costs from increased or new insect infestations or diseases in crops, livestock or forests *Short or long term.*
- Costs due to inability to harvest or transport the food to destinations because of extreme weather events that cause infrastructure damage. *Temporary, short term, long term*.

Fresh Water Resources and Their Management

- Decreases in water resources of 10 to 30 percent in mid-latitudes. Drought-affected areas will likely increase in extent. Heavy precipitation events will augment flood risk and may not alleviate drought affected areas as water will simply run off. Some countries are starting to adapt (e.g., The Netherlands). Reduced water supply is projected in areas dependent on meltwater from glaciers that are disappearing and where one-sixth of the world population lives. Increases of 10 to 40 percent in water resources are expected in high latitudes.[3] *Temporary, long term or permanent*.
- Costs from loss or pollution of potable water supplies. *Temporary, long term or permanent*.
- Costs from pollution of freshwater and marine waters from storm waters, sewage overflow. *Short or long term*.

Coastal Systems and Low-Lying Areas

- Risks and costs in these areas will increase due to sea-level rise and storm surge erosion exacerbated by population pressures and development. Millions more people are projected to be flooded each year and will become environmental refugees by 2080.[3] *Temporary, long term or permanent*.

Ecosystems

- If temperature increases exceed 1.5-2.5ºC (3.5-4.3°F) as projected, major changes in ecosystem structure and function are expected. Roughly 20 to 30 percent of species are likely to be at increased risk of extinction.[3] *Long term or permanent.*
- Natural estuarine systems are at risk if sea level rise happens too quickly or there is no place to move because of development. *Long term or permanent.*
- Marine systems such as fisheries and coral reefs already are being affected by higher ocean temperatures and could be seriously threatened by increasing ocean acidity. *Long term or permanent*
- Terrestrial systems may not have time to migrate if climate change happens too quickly. *Long term or permanent*

Industry, Settlement and Society

- Costs will vary widely by location. In the aggregate, the larger the change in the climate and the more rapidly it occurs, the more negative will be the effects. Poor coastal and river flood plain communities and nations are especially vulnerable, particularly those in high-risk areas. *Long term or permanent*.
- Economic and social costs of extreme weather events will be substantial and will spread to other sectors and geographic areas through complex linkages. Environmental refugees will create multiple problems.[3] *Temporary, short or long term or permanent*.
- Loss of real estate and income tax base to towns, states and nations. *Temporary, short or long term, or permanent.*
- Loss of built properties (e.g., homes, businesses, hospitals, schools and civic infrastructure). *Short or long term*.
- Loss of transportation systems such as roads, bridges, airports, ports and rail lines. *Temporary, short or long term*
- Business interruption losses. Insurance companies usually estimate two to three days lost; with Hurricane Katrina many losses are now over two years. *Temporary, short or long term*.
- Loss of production and distribution from manufacturing plants during extreme weather events. *Temporary, short or long term*.
- Loss of jobs. *Temporary, short or long term, or permanent*.
- Increased costs for insurance (if available at all). *Long term or permanent*.

Utilities

- Loss of electric power transmission supply due to storms or blackouts caused by too high a demand for air conditioning. *Temporary or short term*.
- Loss or reduced production of electric power from hydroelectric plants due to low water/loss of snow pack. *Short or long term*.
- Loss of internet, television and radio access due to loss of electricity**.** *Temporary or short term.*
- Increased costs for air conditioning in areas experiencing heat waves. *Long term/permanent*
- Increased costs for back-up power where storms cause disruption. *Short term*.
- Increased costs to repair/replace power and phone lines for utilities passed on to ratepayers. *Temporary, short or long term.*

HIGHER COST FOR COMPLIANCE

Because the various greenhouse gases last for different lengths of time in the atmosphere (up to 100 plus years), it is important to stop adding larger and larger amounts if we want to stop the temperature rise from going above a 2°C increase over the 1750 levels. This 2 percent increase is equal to about 400-500 parts per million (ppm) of CO_2 equivalent, generally accepted as the maximum level to which the planetary systems can adapt.[13] The higher the emissions, the more it will cost the world's economies to reduce them through various compliance mechanisms.

Possible compliance mechanisms include: [4]

- Carbon standards
- Carbon taxes
- Regulatory cap to reduce emissions with tradable permits
- Renewable energy portfolio
- Reduction in fossil fuel subsidies
- Mandatory increase in fuel economy standards for vehicles
- Incentives for clean technologies or clean production processes
- Investment in public transit
- Land use regulations
- Appliance standards
- Building codes and certification
- Demand side management (efficiency) programs to reduce energy use
- Provision of benchmark information
- Performance standards
- Biofuels for transportation sector
- Government procurement programs for buildings and transportation and products
- Taxpayer assisted insurance
- Private sector instruments such as insurance, utility rates, and heating and transportation fuel costs.

The sooner compliance mechanisms are established and enforced, the sooner emissions can be stabilized so that the compliance cost curve does not have to be as steep.

LOST OPPORTUNITIES

Not only will there be direct economic losses from climate change in the future, but, according to many economists, the U.S. economy is already experiencing repercussions. The economy is feeling the effects of not taking action and seizing new economic opportunities, such as developing alternative energy products, processes, and fuels and making energy use in all sectors more efficient. These could be called lost opportunities. "The future of the U.S. competitiveness is innovation. We should put in place policies that support decarbonizing our economy through performance-based benchmarks. We should encourage new industries that can take advantage of business opportunities from a lower carbon economy as well as technological adaptation in traditional manufacturing sectors."[14]

The United States has fallen behind some of our major economic competitors in the following sectors:

- Transportation – higher efficiency technologies, hybrid, clean diesel and hydrogen
- Renewable energy – such as wind, solar, hydro, tidal and geothermal
- Biofuels
- Buildings – the envelope, the lighting, as well as the heating and air-conditioning systems
- Appliances
- Manufacturing processes

Barriers That Need to Be Removed [4,15]

- Resistance by vested interests
- Public acceptance of economic/social/health risks from climate change and acceptance of the new energy technologies
- The lack of education for the public about the availability, benefits and cost effectiveness of new energy technologies
- Reluctance to change - individuals, public and private entities
- Firms unwilling to do R&D if they cannot capture all the profits from new products once they enter the market
- Higher income citizens or businesses being willing to pay rather than reduce usage
- Building code enforcement
- Lack of access to financing
- Lack of stable policies and long-term incentives
- Lack of stable price signals
- Unequal tax and subsidy treatment for new energy sources vs. fossil fuel sources
- Patents on some new energy technologies being held and not developed by major fossil fuel corporations or transportation corporations
- Land use and zoning policies that adversely affect wind and solar energy placement and promote sprawl
- Utility regulations that do not allow individual home energy systems to feed into the grid.
- Utility regulations that do not assign a portion of the energy supply from efficiency programs

Correctly Assigning Costs

(1) Total life cycle cost accounting for all energy used – from mining/drilling/production to distribution to final use and, ultimately, to disposal costs.
(2) Defense and foreign aid costs to fossil fuel supplying regions of the world.
(3) Indirect costs of all energy used – human and ecosystem health, infrastructure damage (acid rain) and extreme weather events.

CURRENT AND FUTURE COSTS OF INEFFICIENT ENERGY USE

To date, direct and indirect costs to the economies and societies of the world from climate change have exceeded many billions of dollars, and these costs are mounting. The United States

has much it can do to adapt our societies and make all of our economic sectors more energy efficient and thereby reduce our greenhouse gas emissions.

A U.S. Government Accountability Office report published in late January 2007 noted that the U.S. Department of Energy had not met 34 deadlines (ranging from months to 15 years) for setting stricter efficiency standards for 20 product categories. Delays in setting standards for the products that use the most energy (refrigerators/freezers, central air conditioners and heat pumps, water heaters, and clothes washers) will cost consumers at least $28 billion in forgone energy savings by 2030. This "lost" savings "is equal to the primary energy consumption of approximately 20 million households."[16]

The U.S. vehicle fleet's average fuel efficiency had been decreasing until 2006. There is, finally, a bill headed for conference in the fall of 2007 that would raise the corporate average fuel efficiency standards – the first in about 20 years – but there is no assurance that this legislation will be passed.

The "envelope" (windows, doors, insulation, walls, roofs) of buildings is, currently very energy inefficient in the U.S. U.S. heating, air conditioning, refrigeration and cooking systems could be much more efficient. Currently, buildings use almost half of total US annual energy consumption and 76% of all electrical energy produced at coal fired power plants – this use can be reduced by 50% by 2030. [17]

The "always on - fugitive" electricity, used by our televisions, computers, DVDs, radios, CD players and cell phone chargers when plugged in, amounts to somewhere between 5 to 10 percent of all electric usage in the United States – this is totally wasteful.

The incandescent electric light bulb is very old and wasteful technology. Compact fluorescent light bulbs can now be used in almost all fixtures. LED (light emitting diode) bulbs are also much more efficient.

The land use pattern called "sprawl" adds a significant amount to energy costs not only for the household as its members travel (usually in single occupancy vehicles), but also for all service sectors. Examples of extra costs from sprawl include longer utility lines, more miles for fuel deliveries, school buses, mail delivery, snowplowing, road maintenance, plus more miles and therefore longer wait times for fire trucks, ambulances and police.

CONCLUSION

In February 2007, the United Nations Foundation issued *Confronting Climate Change – Avoiding the Unmanageable and Managing the Unavoidable*. Written by 18 eminent scientists, the report stated that "significant harm from climate change is already occurring, and further damages are a certainty. The challenge now is to keep climate change from becoming a catastrophe. There is still a good chance of succeeding in this, and of doing so by means that create economic opportunities that are greater than the costs and that advance rather than impede other societal goals. But seizing this chance requires an immediate and major acceleration of efforts on two fronts: mitigation measures (such as reductions in emissions of greenhouse gases

and black soot) to prevent the degree of climate change from becoming unmanageable; and adaptation measures (such as building dikes and adjusting agricultural practices) to reduce the harm from climate change that proves unavoidable." [18]

In this paper, we have concentrated on four types of costs that can be reduced by acting now (see the list on page one of this paper). As Dr. Gro Harlem Brundtland, the UN Special Envoy on Reducing Greenhouse Gas Emissions, has aptly noted: **"It is not as if what needs to happen is plainly impossible for economic or other reasons. The challenge is political."**[19]

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ENDNOTES:

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