



Global Warming: The High Cost of The Kyoto Protocol

Executive Study

Executive Summary

Unemployment Rate in 2010:

State	Base	Kyoto
Alaska	7.20	8.51
Alabama	3.63	6.33
Arkansas	4.72	6.13
Arizona	3.03	5.73
California	6.10	7.73
Colorado	3.75	5.32
Connecticut	5.48	6.97
Delaware	4.71	5.64
Florida	4.97	6.56
Georgia	3.92	5.48
Hawaii	6.55	8.15
Iowa	5.07	6.29
Idaho	3.92	5.28
Illinois	3.38	6.06
Indiana	3.65	6.15
Kansas	4.21	5.39
Kentucky	4.60	7.10
Louisiana	6.35	8.85
Massachusetts	4.32	5.50
Maryland	4.71	5.92
Maine	5.31	6.37
Michigan	3.80	5.54
Minnesota	3.45	4.93
Missouri	4.04	5.55
Mississippi	5.86	7.94
Montana	6.04	9.94
North Carolina	3.95	6.14
North Dakota	2.78	3.66
Nebraska	3.09	4.82
New Hampshire	4.39	6.12
New Jersey	5.15	7.84
New Mexico	7.26	8.68
Nevada	4.64	6.48
New York	6.24	7.76
Ohio	3.92	5.74
Oklahoma	3.83	5.41
Oregon	5.47	6.63
Pennsylvania	4.65	6.37
Rhode Island	4.57	5.27
South Carolina	5.48	6.99
South Dakota	3.23	4.81
Tennessee	5.41	6.61
Texas	5.21	6.32
Utah	3.09	3.89
Virginia	4.23	5.06
Vermont	4.12	4.79
Washington	5.35	6.76
Wisconsin	2.59	4.71
West Virginia	4.87	7.09
Wyoming	5.45	8.29
U.S.	5.43	6.95

In Washington, DC and throughout the nation, elected officials and key leaders are debating whether the Kyoto Protocol, an international treaty negotiated by the Clinton Administration that would legally bind developed countries to reduce their greenhouse gas emissions, should be signed and ultimately ratified by the US Senate. By the terms of the Protocol, the US would have to reduce its emissions 7% below 1990 levels by late next decade. And, unless developing countries agree to binding emissions targets, a competitive imbalance would be created between industrial and developing nations.

Meeting the goal of the Kyoto Protocol would be a daunting task. In 1997, carbon emissions from the energy sector, the majority of greenhouse gas emissions, exceed the goal established at Kyoto by 16%. By late next decade, WEFA projects that carbon emissions would exceed the goal by at least 37%. Due to population increases, on a per capita basis, the required reduction would exceed 50%.

WEFA has analyzed the economic consequences to the U.S. of achieving the Kyoto target through domestic actions. These consequences would be severe, a result that others analyzing even less onerous targets also have reported. These include the U.S. Department of Energy, leading academic institutions, and other independent consulting firms. Meeting the Kyoto target would:

- **Nearly double energy and electricity prices, and raise gasoline prices an additional 65 cents per gallon.**
- **Cost 2.4 million US jobs and reduce US total output \$300 billion (1992\$) annually, 3.2% below baseline GDP projections, an amount greater than the total expenditure on primary and secondary education.**
- **Harm U.S. competitiveness, as developing countries will not need to raise energy prices (or product prices) to meet mandatory greenhouse gas targets.**
- **Reduce the average annual household income nearly \$2700, at a time when the cost of all goods, particularly food and basic necessities, would rise sharply.**
- **State tax revenues would be reduced by \$93.1 billion due to job and output losses attributable to lost US competitiveness in the global market and higher energy costs.**

The sharp rise in energy prices would reduce economic growth opportunities. Compounding this effect is the loss of competitiveness the industrialized countries would suffer, as developing countries would not raise energy prices to meet greenhouse gas reduction targets. Although developing countries argue that full responsibility for mitigating the risk of global warming rests with industrialized countries, developing countries exempted themselves from emission limits because they recognize the role energy plays in their economic development.

The Administration has argued that new technology can drastically reduce the costs of implementing the Kyoto Protocol, and that international permit trading, sinks and other market-based mechanisms mentioned in the Protocol also will lower costs. WEFA has carefully assessed the ability of technology to reduce costs over the time period in question. Without very powerful price incentives, such rapid technology improvement is

extremely unlikely. Hence, technology implementation does not invalidate the estimates determined through this analysis. As for permit-trading and other international market mechanisms, the Kyoto Protocol leaves all such instruments undefined, to be worked out in the future among the parties. Further, according to the Protocol, they are to be supplemental to indigenous efforts, not primary mechanisms to reach country targets. And finally, there is great hostility on the part of many countries to their use. For these reasons, WEFA does not ascribe significant savings to them.

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The high cost estimates reported would only be justified if catastrophic climate change were imminent. As global warming may be gradual and largely due to natural causes, measures that more closely link economic cost to the still-potential threat of very long-term global warming may be more appropriate. Such measures include encouraging voluntary actions, supporting academic research and educational programs on climate, and investing in the development and deployment new energy technologies.

Key results of this study of meeting the Kyoto target through intra-country tradable permits are:

Energy prices would double

The estimated costs of achieving the Kyoto target are high at both the national and state level because, without carbon limits, the economy, population and energy use are expected to grow steadily. Reducing energy use to 1990 levels within 10 years or more requires sending very powerful price signals through the economy. WEFA's analysis has determined that a \$265 per metric ton of carbon (1992\$) would be required. When added to energy prices, consumers would see an increase of 65 cents per gallon of gasoline and nearly a doubling of natural gas and electricity prices for businesses.

Consumers would see price increases in excess of 55% for electricity and 70% for home heating oil by 2010.

Commercial establishments, including hospitals and schools, as well as industrial facilities, would see electricity price increases of 60% by 2010.

Truckers and railroads would see their fuel costs rise by nearly 70 cents per gallon by 2010.

Energy Price Impact of Limiting Carbon Emissions to 93% of 1990 Levels by 2008-2012 (Percent Difference from Baseline)

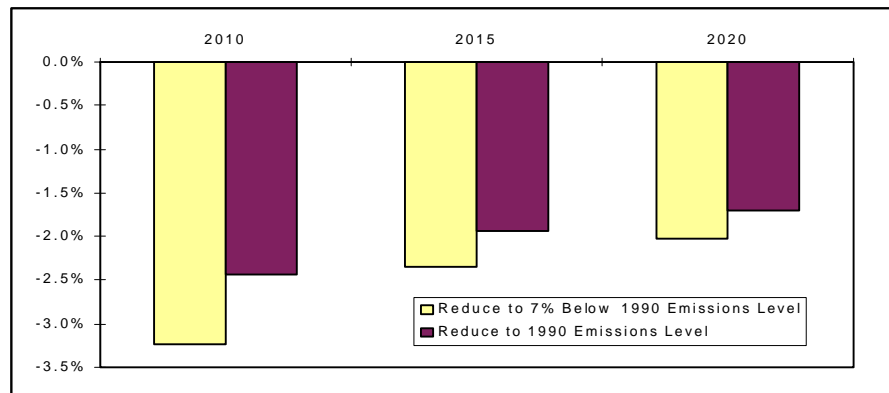
	<u>2010</u>	<u>2015</u>	<u>2020</u>
Carbon Permit Fee (\$96/metric ton)	\$265	\$310	\$360
Consumer Impacts			
Home Heating Oil	73.2	83.7	95.4
Natural Gas	65.7	78.3	94.3
Electricity	55.7	65.7	72.9
Motor Gasoline	47.5	53.6	60.2
Difference, Cents Per Gallon (96\$)	59.1	68.1	78.2
Business Impacts			
Commercial Establishments			
Distillate Fuel Oil	98.3	112.0	127.3
Natural Gas	76.3	89.9	107.5
Electricity	60.2	71.3	79.4
Industrial Facilities			
Residual Fuel Oil	184.5	210.9	240.1
Natural Gas	118.6	135.5	156.4
Electricity	87.7	98.3	105.1
Trucking and Rail			
Diesel	56.2	64.4	73.6
Difference, Cents Per Gallon (96\$)	68.3	78.8	90.7

Economic consequences would be severe: The U.S. would lose \$300 billion in real GDP

The results paint a picture of a less prosperous 21st century America.

These powerful price signals result in premature retirement of capital stock, less capital for business investments, and less disposable household income as prices climb for electricity, gasoline, heating oil and air conditioning. As a result, the growth in GDP would be substantially slower, there would be a sharp rise in unemployment, salaries and wages would be lower, and prices for basic necessities such as food, medical care and housing would be significantly higher.

Percent Difference from Baseline GDP



Some workers would lose their jobs through a weaker economic environment.

All workers would face a slowing in their real wage growth as more workers compete for fewer jobs.

Job losses would exceed 2.4 million; wages would be lower

Implementing the Kyoto Protocol would have a devastating impact on workers. Some workers lose their jobs through a weaker economic environment while other workers lose relatively high paying manufacturing jobs and find only lower wage service jobs. All workers face a slowing in their real wage growth as more workers compete for fewer jobs. Hence, though the government compensates workers — through a refund of the fees collected to consume carbon-based energy resources — for their increased energy expenditures, total real disposable income falls due to reduced employment.

Families would suffer as the loss in aggregate income per household exceeds \$2700

On a per household basis, the cost of signing the Kyoto Protocol results in an average real GDP loss in 2010 of \$2,728 per household.

Real GDP Loss per Household	
2010	\$2,728
2015	\$2,083
2020	\$1,876

Low and moderate income families would be hardest hit.

Low and moderate income families would be squeezed: higher costs, lower wages, fewer jobs.

Commodities such as food, medical care, and housing would be nearly 10% more expensive by 2020.

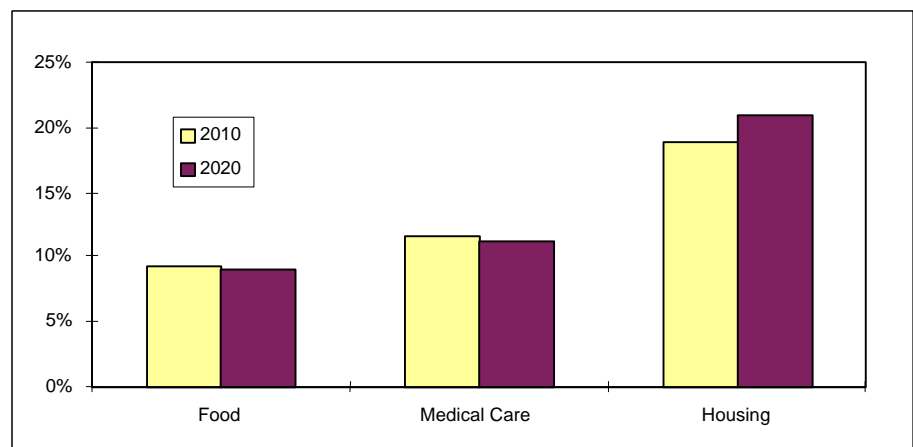
Low and moderate income families would be hurt

Low and moderate income families would be the ultimate losers under a carbon limits regime. Energy use is pervasive: all commercial activities require the use of energy, and energy is a necessity for households. Low and moderate income families spend a significant share of their income on basic necessities including energy. Raising energy prices would present an enormous hardship to these families. In combination with a weaker economy where workers are competing for less-well-paying jobs, families are projected to see a large rise in costs and a reduction in income.

The cost of all necessities would rise substantially

Throughout the forecast period, food, medical care, and housing continue to become more expensive under the carbon stabilization case. By 2020, food is nearly 9% more expensive, medical care is roughly 11% higher, and housing is nearly 21% higher than the base case.

Inflation in the Prices of Food, Medical Care, and Housing: Percent Difference 7% Carbon Limitation Case and Base Case



The most severely impacted industries would be energy producing industries, industries that produce energy-intensive products, and industries that depend on export sales or face strong import competition.

As the imposition of carbon limits is not borne equally by all countries, U.S. exports would be relatively more expensive on world markets.

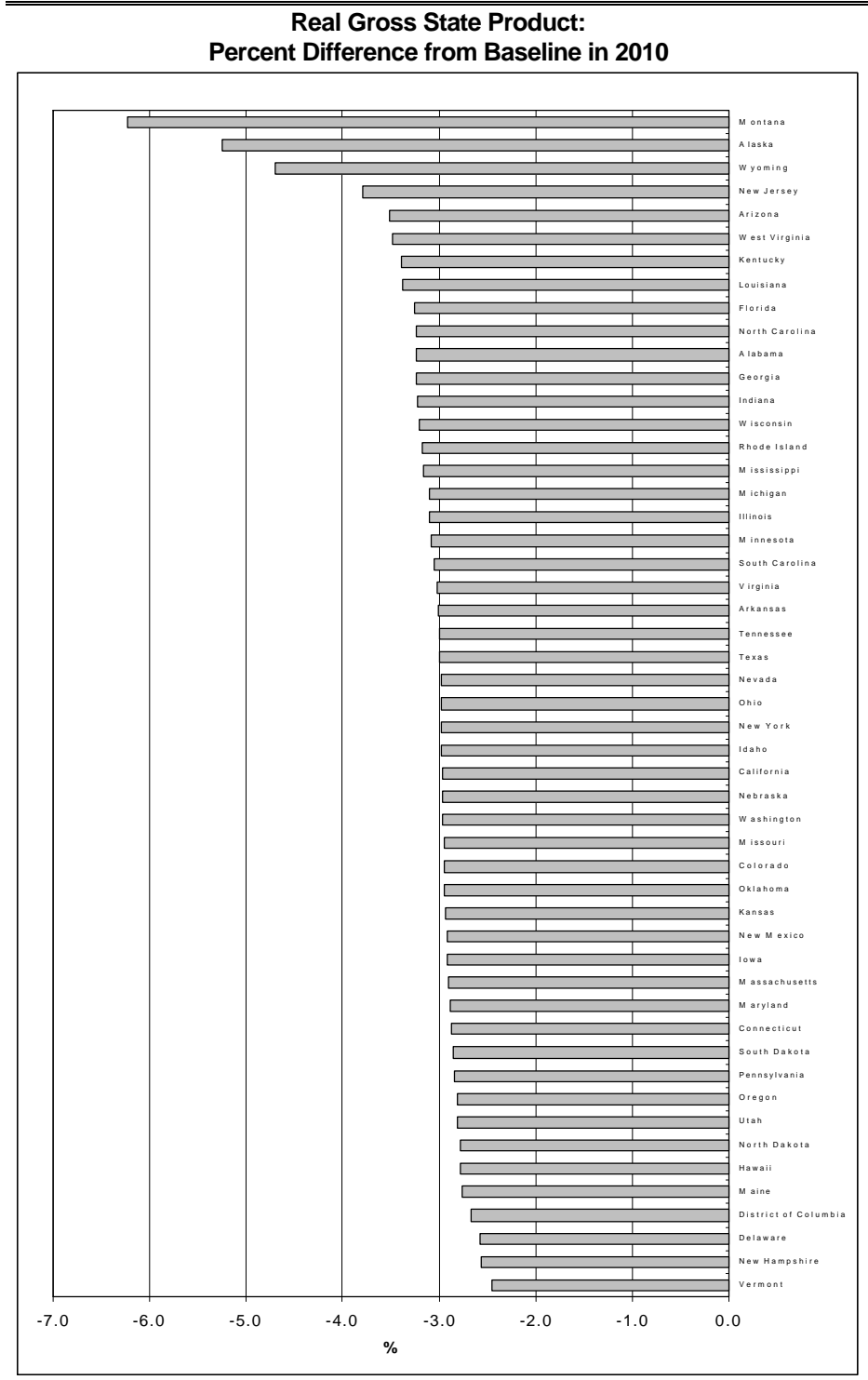
Every state would suffer output and job losses

The most severely affected industries would be energy producing industries, industries that produce energy-intensive products, and industries that depend on export sales or face strong import competition. Because the imposition of the carbon target and permit system is not borne equally by all countries (the developed economies of the OECD face comparable energy price increases, but the developing countries do not) U.S. exports are relatively more expensive on the world market. As a consequence, real exports are lowered dramatically, while imports are increased substantially, affecting:

- the chemicals and paper industries, which are both energy-intensive and already subject to stiff price competition from new producers in developing countries,
- the textile and apparel industries, which have difficulty competing on price due to higher U.S. labor rates, and

- the computer and electronic products industries, particularly from imports. (It is worth noting that the trade deficit in this area would escalate dramatically under the carbon emission limitation case.)

As a result, all states would suffer output and job losses that would persist as long as developing nations exempt themselves from the similar constraints on carbon emissions.



Proponents of ratifying the Kyoto Protocol offer a rejoinder to WEFA's analysis: 1) technology can greatly reduce the cost to the US economy; and 2) several conceptual mechanisms in the Protocol – such as sinks and international emission trading – can reduce the economic impact on the US. In response:

The Kyoto Protocol's Call for Early Action Reduces the Role Technology Could Play in Mitigating the Risk of Global Warming

Implementing the Protocol would require significant reductions in energy use.

The Administration has argued that the economic cost estimates from WEFA, the Energy Information Administration, and other independent firms and academics are overstated. Relying on its own technology assessments, the Administration concludes that substantial technological progress is available with little or no price incentives.

WEFA, through its on-going assessments of energy technology and analysis of the aggregate performance of the economy in improving energy use, comes to a different conclusion. Substantial improvements in energy-efficiency, particularly in newly restructured electric power markets, are included in WEFA's baseline. Further efficiency gains would be increasingly expensive. The extraordinary efficiency gains required for achieving the Kyoto target would only occur in response to extraordinary price incentives.

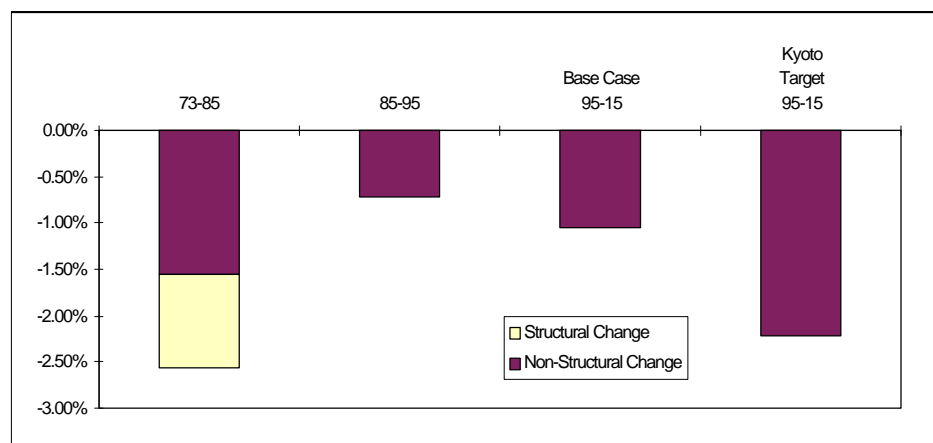
Any carbon permit fee must be high in order to provide the economic incentive for dramatic improvements over a base case, which already includes many technology advances and lower carbon emission estimates.

The carbon fee has to bring about a large reduction in the demand for energy services, major improvements in energy efficiency, as well as improve the opportunity for substitution of low carbon and non-carbon emitting fuels. The required change in energy efficiency to meet the goal is unprecedented. As shown in the chart, energy use per dollar of real GDP would need to improve at a rate in excess of 2.0% per year. Historically, the only period that experienced a similar rate of energy improvement was the late 1970s and early 1980s -- and nearly half of that improvement is attributable to structural changes in the economy (the loss of energy intensive well-paying manufacturing jobs overseas.) Without price incentives, the goal would not be reached.

Historically, the only period that experienced a rate of energy improvement similar to the one needed to meet the Kyoto target was the late 1970s and early 1980s.

Nearly half of that improvement is attributable to structural changes in the economy (the loss of energy intensive well-paying manufacturing jobs to overseas competitors.)

**Compound Annual Growth Rates in the Energy to GDP Ratio
(Quadrillion BTU/Billion 1992\$)**



Measures not included in WEFA's analysis are international emission trading, sinks, the inclusion of an additional three gases, and mechanisms for promoting technology transfer.

WEFA believes that a better climate strategy would be to match policy actions to an evolving understanding of climate science.

The developing economies of the world will not meaningfully participate in a greenhouse gas emission reduction or limitation program *until* technological alternatives exist that provide an equal or better opportunity for economic growth than is offered by fossil fuels.

The principal contributors to GHG emission growth are the emerging economies.

Reducing carbon emissions from participating industrialized countries by 5% would not substantially impact global emissions.

Trading, Sinks And Other Mechanisms

While the Kyoto Protocol includes provisions that have been touted by its proponents as a means for alleviating the cost of complying with the Protocol's goals, these measures have not been tested and have been heavily discounted in WEFA's analysis. These provisions are currently only conceptual or have very uncertain implications for meeting the target. Measures not included in WEFA's analysis are international emission trading, sinks, the inclusion of an additional three gases, and mechanisms for promoting technology transfer (Joint Implementation and the Clean Development Fund).

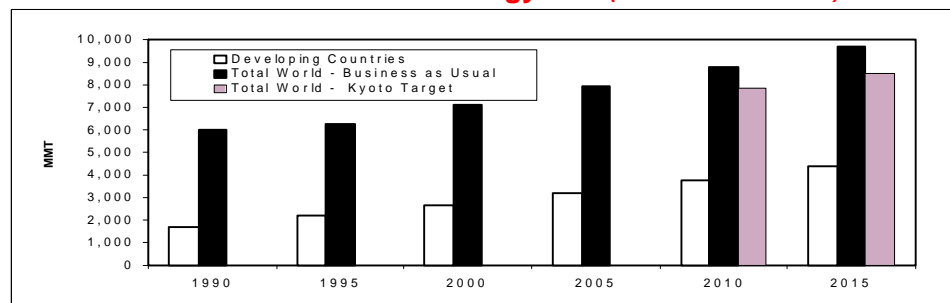
However, these "market based" mechanisms are undefined in the Protocol and hence have to be negotiated by a large number of UN nations, many of whom have expressed open hostility toward such ideas. Further, the Protocol itself indicates these may only be supplemental to a country's internal programs. And finally, most are limited in scope--emissions trading, for example, won't involve the developing nations--, have no history in international relations, will be costly and difficult to administer, and may conflict with existing GATT or other agreements. For these reasons, it is premature at best to assume costs can be significantly reduced by these measures.

The Kyoto Protocol Is Not the Only Option

As the present study and the work of others make clear, the Kyoto Protocol forces policymakers to decide whether they are willing to risk the economic well being of their nation. From both economic and risk-assessment viewpoints, WEFA believes that there is a better climate strategy; namely to match policy actions to an evolving understanding of climate science; to increase investments in technology (should it prove necessary to substantially reduce fossil fuel use); and to gradually retire existing capital stock.

Further support for investing in a technologically based solution is evident from the chart below. It is the developing countries that are the principal contributors to annual global emission increases. Driven by their expanding economies and their rising populations, the less developed economies of the world will emit more emissions than the industrialized economies by 2015. The reduction in carbon emissions that would result from the developed economies fully meeting their targets under the Kyoto Protocol would not significantly affect the annual global emissions. The developing economies of the world will not meaningfully participate in a greenhouse gas emission reduction or limitation program *until* there are technological alternatives that provide equal or better opportunities for economic growth than is offered by fossil fuels today.

Global Carbon Emissions from Energy Use (Million Metric Tons)



Source: Energy Information Administration, *International Energy Outlook 1997*