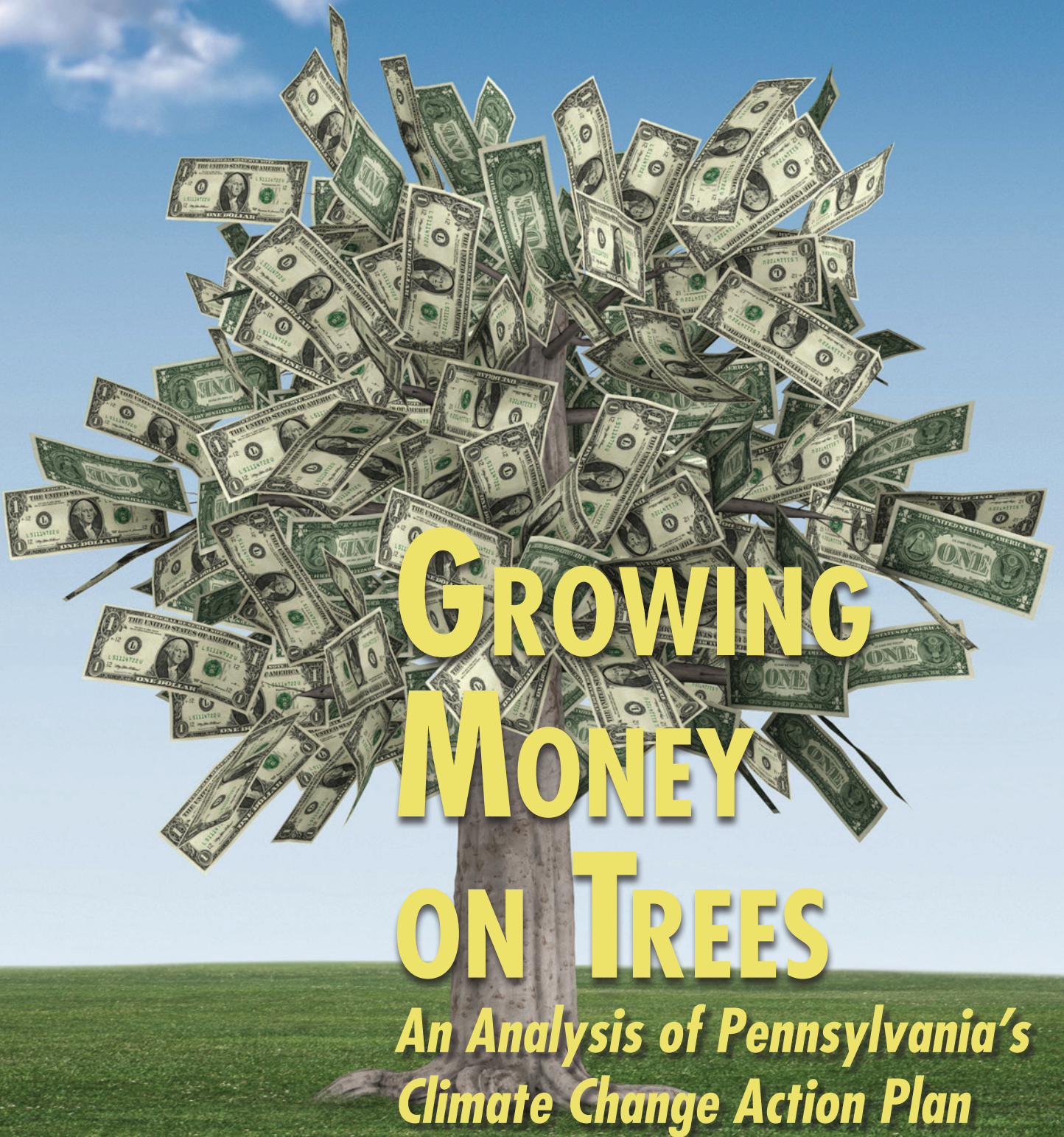


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GROWING MONEY ON TREES

*An Analysis of Pennsylvania's
Climate Change Action Plan*

July 2010



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GROWING MONEY ON TREES

An Analysis of PA's Climate Change Action Plan

BEACON HILL INSTITUTE at SUFFOLK UNIVERSITY

EXECUTIVE SUMMARY

In December 2009, the Pennsylvania Climate Change Advisory Committee (PCCAC), in partnership with the Pennsylvania Department of Environmental Protection (DEP) and the Center for Climate Strategies (CCS), released its report, *Pennsylvania: Final Climate Change Action Plan*. Governor Edward G. Rendell hailed the report's 52 recommendations that "could result in the net creation of 65,000 new full-time jobs and add more than \$6 billion to the state's economy" by reducing greenhouse gas emissions by more than 30%.¹

However, a cost-benefit analysis finds serious flaws in the report, rendering its findings useless for policymakers seeking to make informed policy decisions about climate change and reducing greenhouse gas emissions in Pennsylvania.

We conclude that the PCCAC report fails to perform the most basic task of any cost-benefit analysis—quantifying both the costs and benefits in monetary terms so that they can be directly compared. For example, the report estimates that Pennsylvania can save nearly \$11 billion by planting 35 million trees in Pennsylvania's cities and towns by 2020. However, the report neither mentions the \$8.4 billion cost to plant and maintain these trees nor explains how this urban forestry program would generate an astounding 104% return on investment. Money appears to be growing on trees!

Another unreasonable assumption is that over half of all Pennsylvania housing units will replace 2.5 million toilets by 2020. The report does not calculate the high marginal costs associated with policies needed to induce a large number of consumers to replace existing toilets with more efficient ones.

Beacon Hill Institute cannot find any sound scientific basis for the PCCAC's claims of job creation and economic growth. Thus, policymakers are left with no foundation on which to judge the merits of the Plan's recommendations. Therefore, the report's estimates of cost savings and benefits cannot be trusted and fail to provide legislators with reliable guidance in developing climate change and greenhouse gas mitigation policies.

Even if the PCCAC's projected economic benefits were accurate, the environmental and climate change benefits of its policy recommendations would be negligible. Pennsylvania's share of emissions accounts for just 5.2% in the U.S., and a minuscule 0.9% worldwide. If PCCAC's recommendations worked as projected, they would result in a net decrease of 0.24% in projected 2020 global emissions—a reduction that would bear no discernable impact on global warming but would impose a high cost on Pennsylvanians, lowering their quality of life.

1 "Climate Change Action Plan Presented to Governor Rendell" (December 18, 2009) <http://tinyurl.com/29lztel> (accessed July 25, 2010).

INTRODUCTION

Governor Edward G. Rendell signed the Pennsylvania Climate Change Act (Act 70 of 2008), establishing the Pennsylvania Climate Change Advisory Committee (PCCAC) with the mandate to produce a Climate Change Action Plan (the Plan). The Committee partnered with the state's Department of Environmental Protection (DEP) and the Center for Climate Strategies (CCS) to develop recommendations for reducing emissions of greenhouse gases in Pennsylvania and to estimate the costs and benefits of their recommendations. The final report, *Pennsylvania: Final Climate Change Action Plan*, was released in December 2009.²

Economists at the Beacon Hill Institute at Suffolk University previously reviewed the cost-benefit methodology employed by CCS in seven other states: Colorado, Iowa, Maryland, Minnesota, Montana, North Carolina, and Washington. The Institute found three serious problems with the CCS cost-benefit analyses:

1. CCS failed to quantify benefits such that they can be meaningfully compared to costs;
2. When estimating economic impacts, CCS often misinterpreted costs as benefits; and
3. The estimates of costs omitted important factors, causing CCS to understate the true costs of its recommendations.

Unfortunately for Pennsylvania policymakers, two of these problems plague the PCCAC's study: 1) the failure to meaningfully quantify benefits and 2) the omission of several important factors when estimating costs. These flaws render the study useless for anyone seeking to make policy decisions. Additionally, the study fails to make transparent the costs and benefits required for several of the policy recommendations; the study only reports net costs or benefits and obscures the heavy up-front investment costs required by many policy proposals.

This policy report summarizes the main findings of the Pennsylvania Climate Change Advisory Committee's report. It briefly reviews the problem with the Center for Climate Strategies' method of quantifying benefits, and then it provides a more detailed analysis of the second problem, where it examines the individual cost and benefit assumptions of mitigation options proposed in the Pennsylvania Climate Change Action Plan.

PROBLEMS WITH THE PENNSYLVANIA CLIMATE CHANGE ACTION PLAN

The Pennsylvania Climate Change Action Plan report contains 52 recommended policy actions to reduce greenhouse gas emissions. The report quantifies forecasted emissions reductions for all of its recommended policies, estimating that, if these policies were fully implemented, Pennsylvania would reduce its greenhouse gas emissions by 85 million metric tons by 2020.

The Plan recommends enacting many of the same policies in Pennsylvania that similar committees have recommended in other states. In fact, Beacon Hill Institute economists found that many policy recommendations in the report are "carbon copies" of those found

² *Pennsylvania: Final Climate Change Action Plan*, Pennsylvania Department of Environmental Protection (December 2009) <http://www.library.dep.state.pa.us/dsweb/View/Collection-10677> (accessed May 4, 2010).

in other states' greenhouse gas emission mitigation reports that utilized CCS as a consultant. Part of the problem herein lies with the fact that the Center recommends the same policies for states with vastly different demographics, economies, climates, and cultures. These proposals fail to fully account for the differences between the hot southwest and the temperate mid-Atlantic regions.

Surprisingly, the Plan claims that the implementation of these measures would result in net cost savings for the state's economy. The report quantifies costs for 42 of the 52 recommended policy options; of these, it is claimed that 24 would generate net cost savings per ton of greenhouse gas reduced. If all options were implemented, the report estimates that the state would save approximately \$12 billion (present value) between now and 2020. Moreover, the report claims that this savings will translate into 65,000 new full-time jobs and over \$6 billion in increased state Gross Domestic Product. (ExS-2)

The Plan gives the impression that state policymakers can have their cake and eat it too: Pennsylvania can simultaneously reduce greenhouse gas emissions and produce net cost savings for the state's economy. Unfortunately, the seriously flawed nature of the report undermines this conclusion.

PROBLEM #1: The Pennsylvania Climate Change Action Plan fails to quantify benefits such that they can be meaningfully compared to costs.

A scientifically-sound, cost-benefit analysis should clearly spell out all of its assumptions, estimate the physical impacts that a particular policy change will have over time, and then estimate the present value, in dollars, of both the benefits and the costs of the physical impacts. On this basis, a study should be able to conclude whether or not a given policy change is expected to provide benefits in excess of its costs.

However, the Plan fails to estimate the dollar value of the main intended benefit of reduced greenhouse gases (GHG). The authors are explicit about this:

Because monetized dollar value of GHG reduction benefits are not available, physical benefits are used instead, measured as dollars per metric ton of carbon dioxide equivalent (\$/tCO₂e) (cost or savings per ton) or "cost effectiveness" evaluation. Both positive costs and cost savings (negative costs) are estimated as a part of compliance cost (D1).

However, without this information, the report is unable to conduct a cost-benefit analysis at all. The goal, reduced GHG emissions, is measured purely in physical terms (not in dollars) and leaves us with no way to compare the value of reduced GHG to the costs associated with reducing the emissions.

Are the mitigation options desirable? For a cost-benefit analysis to provide any guidance in answering this question the Plan would need to compare the dollar value of reduced greenhouse gas emissions to the \$12 billion cost savings it incorrectly estimates. Since it only quantifies the physical benefits, we are left comparing reduced metric tons of GHG to dollars—essentially comparing apples and oranges.

Estimating a dollar value of reduced GHG emissions would require a number of steps. First, a full accounting of both societal costs and benefits from higher emissions would have

to be constructed. Then the impact on these costs of the marginal changes in Pennsylvania's emissions would have to be estimated.

The Plan estimates that Pennsylvania emitted a total of 284 million metric tons (MMt) of carbon dioxide (CO₂) in the year 2000 on a consumption basis. In this same year, the World Resources Institute estimated that global CO₂ emissions to be 31,640 MMt and U.S. emissions to be 5,364 MMt.³ Accordingly, Pennsylvania accounts for just 5.2% of U.S. emissions and a minuscule 0.9% worldwide.

The Plan suggests that its recommendations would result in a 30% reduction in Pennsylvania emissions by 2020 (270.7 vs. 186 MMt), which amounts to a net decrease of 0.24% in projected 2020 global emissions. Because Pennsylvania's GHG emissions are so small relative to the world's, it is quite apparent that no policy adopted by Pennsylvania would have any discernable impact on global climate change and thus no measurable economic benefit.

PROBLEM #2: When estimating economic impacts, the Pennsylvania Climate Change Action Plan often misinterprets costs to be benefits.

The Plan routinely mistakes costs for benefits. In particular, jobs are erroneously viewed as benefits. The report claims that the implementation of its recommendations would create 65,000 jobs for the state of Pennsylvania over the next 10 years, and that such job creation would boost state GDP by \$6 billion during that time.⁴

Jobs themselves are not a benefit; if they were, workers would be paying their employers for the privilege of working, rather than vice versa. It is the value created by performing those jobs that is the benefit, while doing the job is the cost an individual must pay to obtain a benefit. For example, the state could mandate employers hire 65,000 new workers to create jobs, but this mandate obviously has costs associated with it, as do the recommendations of the Plan.

PROBLEM #3: The estimates of costs leave out important factors, causing the Pennsylvania Climate Change Action Plan to understate the true costs of its recommendations.

Although the Plan does not estimate the monetary value of benefits (reduced GHG emissions), it does attempt to quantify the monetary costs of 50 of its policy recommendations—finding a net cost savings of \$12 billion. But as mentioned above, the report claims that there would actually be net savings, not net costs, for 24 of its mitigation recommendations.

3 Kevin A Baumert, Tim Herzog, Jonathan Pershing, Navigating the Numbers: Greenhouse Gas Data and International Climate Policy, World Resources Institute, December 2005, Internet, available at <http://www.wri.org/publication/navigating-the-numbers>.

4 Maryland Commission on Climate Change, "Comprehensive Greenhouse Gas and Carbon Footprint Reduction Strategy," (August 2008):13, <http://www.mde.state.md.us/assets/document/Air/ClimateChange/Chapter4.pdf> (accessed May 28, 2010).

This finding—that mitigating GHG emissions amounts to a free lunch—doesn't withstand scrutiny, and is an artifact of the Plan's unrealistic assumptions and incomplete costs. These shortcomings are highlighted in a detailed examination of four policies that, according to the Plan, would generate net cost savings. The four policies, one from each of the four major areas, are listed in Table 1, next to the net cost savings that report claims would result if the policies were implemented.

Stabilized Load Growth (EGTD-3)

This proposal would require the state Public Utilities Commission to assess the potential for additional cost-effective reductions in electricity consumption beyond those already called for under Act 129 of 2008. Act 129 requires reductions in consumption of 1% by 2011 and 2% by 2013, for a total of 3%, measured against 2010 consumption (E-11). Energy efficiency investments under this policy would make additional annual reductions of 0.75% from 2015 to 2017, 0.85% in 2018 and 1.6% between 2019 and 2025. The annual reductions in 2018–2025 would be based on the previous year's consumption figures (E-11).

It is not clear that the reductions in electricity consumption would be achieved by adopting the measures proposed by the Plan. After all, higher electricity prices, coupled with technological advances, are expected to improve the efficiency of electrical appliances anyway. Additionally, the report indicates that state electricity rate caps will be removed, causing prices to increase by 6.2% in 2010 (E-5). The report is unclear as to whether or not the analysis accounts for price increases in subsequent years. Nevertheless, any price increase will prompt energy consumers to make energy efficiency investments on their own, in the absence of the policy. Therefore, any efficiency gains should be measured relative to the relevant baseline—what would have happened in the future, not to the current levels of electricity consumption.

The Plan estimates that by implementing this program, the state would become more than \$990 million dollars wealthier between now and 2020. These gains are entirely attributable to cost savings associated with the implementation of energy efficiency programs. The report estimates that new efficiency actions will cost \$415 million annually by 2020 (E-13), and that the program will provide cost savings of \$1.4 billion in net present value (NPV) from 2009 to 2020. The report also indicates that the policy would save \$593 million in 2007 NPV in 2020, but does not indicate if the \$415 million in program costs for 2020 is presented in 2007 NPV dollars. For our purposes, we assume this is not the case.

TABLE 1: Estimated Savings Due to Implementation of Selected Greenhouse Gas Emission Mitigation Measures

Program Title	Net Cost Savings by 2020 (\$ millions)
Stabilized Load Growth (EGTD-3)	\$990
Relight Pennsylvania (RC-6)	\$4,020
Demand Side Management-Water (RC-13)	\$1,011
Increment Existing Urban Forest by 25% (F-7)	\$10,997
Total	\$14,996

Source: Pennsylvania Final Climate Change Action Plan (December 2009)

The \$415 million in costs for 2020 would be \$231 million in 2007 NPV dollars using the 5% interest rate from the Plan. Therefore, the report estimates \$824 million in gross savings attributed to the program

for 2020 in 2007 NPV dollars. This means that \$231 million invested in energy efficiency by 2020 will produce \$593 million in net benefits, a return on investment of over 100%. This is quite a return on investment, especially when one considers that the program would have been making energy efficiency investments for almost the entire decade. One would have expected a lower return on investment, considering the law of diminishing marginal returns should place significant and consistent downward pressure on the investment returns over the 10 year period, unless of course a technological breakthrough raised the rate of return on investment.

Moreover, if the Plan is correct that fuel savings will offset the investment costs without negatively impacting the level of other spending and investments, say in increasing labor productivity, then surely consumers will demand such choices to reduce their electricity use out of their own self interest, and there is no need for public policy incentives. On the other hand, if we observe that people are not demanding energy-efficient products, then there is good reason to believe that the report's estimates of the cost savings are simply wrong; indeed, the presumption here is that the policy imposes a net cost. The policy poses net costs, not savings, because the Plan has underestimated costs by failing to accurately account for diminishing returns, opportunity costs and price-induced effects.

Relight Pennsylvania (RC-6)

The Plan estimates a whopping net savings of nearly \$4.2 billion by mandating more energy-efficient lighting fixtures or related lighting applications. The entirety of the net savings stems from money saved from reduced energy consumption in excess of the cost of installing more energy-efficient lighting. This raises the same fundamental error described previously: if the private benefits really are so large, why are people not taking advantage of them already?

If the Plan is right that electricity savings will offset compliance costs without negatively impacting other investments, then surely self-interest would spur consumers and businesses to demand such choices, then there would be no need for the public policy incentive. On the other hand, if consumers and businesses find that the opportunity cost of making these investments is too high in the absence of mandates or incentives, then the policy imposes a cost.

The Plan appears to be inaccurate in defense of criticism. A commenter states that the report:

... does not specifically identify the starting baseline mix of commercial lighting fixtures would be before the implementation of the recommendations. However, based upon the supporting calculation tables, the study apparently assumes that commercial operations will use 100 percent incandescent lighting in the baseline. (M-71)

The Plan responds:

...[there] is an erroneous note in the model that implies that incandescent lights were the baseline. In fact, inefficient T12 fluorescent lamps were the baseline for the commercial sector under the "fixture performance" component of the goal. (M-72)

Beacon Hill Institute checked the reference and found that the webpage was no longer valid. However, Professor T.J. Keefe (who is referenced in the link) has a website indicating that “General Electric standard light bulbs” providing 60 watts of power produces 14.5 L/W.⁵ This matches the figure in the Plan report on page F-22.⁶ It appears that the report, in fact, uses incandescent light bulbs in its baseline, failing to account for the compact fluorescent (CFL), light emitting diode (LED), and other bulbs that are more efficient than incandescent technology.

The report also appears to assume 100% compliance for the RC-6 policy by 2020. This assumption is unrealistic, as some will be non-compliant merely by accident. This assumption serves to overstate the cost savings of the proposal.

The report states that “cost-effective improvements to lamps, fixtures and controls will create demand that spurs investment in manufacturing, sales, green collar jobs, and green building infrastructure” (p. 5-9). First, the report does not indicate where the investment in manufacturing will take place. Once again, the Plan misinterprets “green collar” jobs as a benefit and not a cost.

Does Pennsylvania have a significant electrical lighting and fixture manufacturing sector? According to the U.S. Census Bureau’s 2007 Economic Census, Pennsylvania had 62 firms with 4,368 employees in the electric lighting equipment manufacturing sector and eight firms with 988 employees in the electric lamp bulb and part manufacturing sector.⁷ Moreover, the Plan provides no assessment of the status of the local industry or estimates of the cost to retool production to meet the new mandate. If the industry is producing “old” bulbs and fixtures that will be eliminated under the mandate, then these current jobs would be displaced by the policy. Given these rather modest numbers, it is likely that the program will be creating manufacturing and other “green-collar jobs” outside of Pennsylvania, most likely at low-cost producers outside the United States.

The analysis of the “Relight Pennsylvania” policy suffers numerous deficiencies that undermine the net cost saving calculations. At a more fundamental level, for the policy to generate the level of cost savings reported in the Plan, it would need to demonstrate a significant market failure. For example, Apple Corp. does not need a public policy to sell millions of *iPhones* and *iPads*, because consumers obtain benefits that they value more than the cost of the products. It is not clear with Relight Pennsylvania.

Once again, either the program matters, in which case it imposes costs; or it is irrelevant because the changes would have been made anyway, in which case the policy generates no benefits. In either case, there is not the \$4.2 billion in cost savings that the Plan estimates.

5 T. J. Keefe, “The Nature of Light,” (February 2007) <http://www.ccri.edu/physics/keefe/light.htm> (accessed May 28, 2010).

6 *Pennsylvania: Final Climate Change Action Plan*, F-23.

7 U.S. Census Bureau, Economic Census, “Sector 00: EC0700A1: All sectors: Geographic Area Series: Economy-Wide Key Statistics, 2007,” (2007) <http://tinyurl.com/2uto3lb> (accessed May 28, 2010).

Demand Side Management-Water (RC-13)

The Plan estimates that Pennsylvanians would save \$990 million by installing water efficient household plumbing fixtures, toilets, washing machines and business irrigation systems. In fact, the policy recommends the installation of 2.5 million new toilets and bathroom fixtures (faucets and shower heads) and 500,000 new washing machines over the next 10 years.

The report hints at the significant costs of the program, but without being transparent. The study states that the “major barrier to water conservation is the upfront cost of replacing fixtures. While low-flow faucets have very low costs, low water consumption toilets and washers, as well as rain barrels have first costs and installation costs that are often prohibitive for building owners and renters” (F-49). The report never explicitly provides estimates of the up-front costs. Instead, the Plan provides estimates of the investment costs in terms of dollars per thousands of gallons of water. For example, they estimate toilets cost \$1.47 per thousand gallons of water, while washing machines are \$0.01 per thousand gallons of water.

Beacon Hill Institute estimated the cost of making the 3 million purchases recommended by the Plan. We used average prices of “Eco Option” products from the Home Depot website and assumed that product improvements will offset any sales tax and price increases over the 10-year period.⁸ The gross cost to purchase the items listed is \$850 million dollars, with toilets and washing machines comprising the lion’s share at \$365 million and \$431 million, respectively. Moreover, these figures do not include other costs, such as delivery and installation charges. If we assume these charges add an additional 20%, the total upfront costs of this program would likely exceed \$1 billion through 2020.

However, the estimates outlined above are gross costs, not marginal costs. It is marginal costs that count. If consumers plan to replace 250,000 toilets in each of the next 10 years, say due to remodeling, with new water-efficient toilets without the policy incentive, then both the marginal cost and marginal benefits would be zero. In this case the policy has no effect on behavior and does not matter. If the policy induces consumers that already plan to replace their toilets with water-efficient ones and the cost difference is small, then the policy would have a net benefit. However, if the policy induces consumers to replace toilets, washing machines, and fixtures when they otherwise would not have done so, then the policy would have a large marginal cost that would likely lead to a large net cost when compared to the benefits. Moreover, one would need a reasonably large incentive to change behavior under this scenario, which, in turn, would mean a higher cost.

One would first need to calculate the percentage that each of the three scenarios outlined above represent of the total number of toilet, washing machine, and fixture replacements, and then calculate the total costs and benefits for each scenario and sum them to estimate the net costs of the program. It is not clear that the Plan made this effort, since the “note 2 on this sheet” appears to be missing. (F-49)

8 See Home Depot online catalog for the following items: Toilets, <http://tinyurl.com/3xfvrok>; Faucets, <http://tinyurl.com/33a26wx>; Showers, <http://tinyurl.com/34fdqsv>; Laundry, <http://tinyurl.com/33mghfc> (accessed May 28, 2010).

Using toilets as an example, the policy calls for 2.5 million toilets to be replaced by 2020. Pennsylvania had 4.877 million occupied housing units in 2008.⁹ Is it reasonable to assume that over 50% of housing units will replace a toilet by 2020 on their own or that new construction will make up the difference? It seems unlikely. Therefore, this policy would likely need to induce a large number of consumers to replace existing toilets that they otherwise would not with more efficient ones, thus inducing high marginal costs.

Increment Existing Urban Forest by 25% (F-7)

The Plan estimates that Pennsylvania can save \$11 billion by planting 35 million trees in Pennsylvania's cities and towns. These trees would reduce energy consumption by shading workplaces and residences in the summer to reduce cooling costs and providing windbreaks in the cold months to help reduce heating costs. However, there are several problems with the analysis that undermine estimated savings when we look closer at their numbers.

First, the Center for Climate Strategies uses an "average annualized cost per tree" estimated at \$37.28 that includes "planting, pruning, pest management, administration, removal, and infrastructure repair due to damage from trees, the costs of planting trees." (K-69). The report's Scenario 2 calls for the planting of 2,896,250 trees per year for 11 years, for a total of 34.755 million trees. If we multiply the \$37.28 in annual costs by the number of trees planted each year plus the number planted in previous years, for example for 2009, we would multiply 2,896,250 trees by \$37.28 to get our total. In 2010, we add the 2,896,250 trees planted in 2009 to the new 2,896,250 planted in 2010 and multiply this total by \$37.28. If this process is repeated through 2020, the total cost to plant and maintain the 34.755 million trees is \$8.415 billion.

The report never mentions the \$8.415 billion needed to generate their \$10.977 billion dollars in economic value! Instead, the report mentions figures such as \$8 million or \$50 million and even \$650,000 under the heading "Implementation Steps"—significantly less than the \$8.415 billion!

We repeat the above calculation for the benefits using the report's net benefits figure of \$75.96 per tree per year. The result is that the trees generate net benefits of \$17.160 billion, before discounting back to 2007 dollars. To check our figures, we discounted back to 2007 and arrived at the \$10.997 billion noted in the report. This urban forestry program would generate an astounding return on investment of over 104%. Money appears to be growing on trees!

In order to arrive at this astonishing and implausible result, the Pennsylvania Climate Change Action Plan cites a 2007 study from New York City that estimates the annual \$37.25 per-tree cost and a \$206.91 annual per-tree benefit, and another study from Philadelphia that estimates annual per tree benefits of \$19.57. They average the two benefit figures as \$113.27 and then subtract the cost figure of \$37.28 to get a net cost figure of \$75.96 per tree per year.

9 U.S. Census Bureau, 2006-2008 American Community Survey 3-Year Estimates, <http://tinyurl.com/36urv2l> (accessed May 28, 2010).

The benefit figure from New York is \$187.34 greater than the Philadelphia figure, or an extraordinary **957% difference** from the home state number. The average of \$113.27 is not representative of the New York or the Philadelphia benefit number. This method begs the question: why did the report not give the figure from Philadelphia study more weight, since Philadelphia is actually in the state of Pennsylvania and, presumably, Pennsylvania costs for heating and cooling were used? A careful analyst would have at least searched the literature for more and better figures and/or dismissed the New York study figure as too high.

The answer is, of course, that had the report used the number from Philadelphia, this program would have a positive net cost, instead of a cost savings, of \$2.6 billion in 2007 NPV. Using the \$2.6 billion figure would completely change the report's macroeconomic results, since the urban forestry program drives most of the economic gains through its large cost saving.

Another problem with the analysis is that the Plan does not account for diminishing marginal returns. It simply takes the average return from the two studies and applies this figure to all trees that are planted over the period. It is far more plausible that such investments will face diminishing marginal returns. In other words, one assumes that the first tree planted would be located in a place that produces the highest heating and cooling savings, and the last tree planted would produce the lowest savings. Moreover, the report does not account for the different mix of trees that can be planted. A computer simulated study by the USDA shows that the net benefits for a small tree, such as a crabapple, are one-fifth that of a large tree, such as a hackberry.¹⁰ The Plan report does not mention the mix of trees to be used.

There another problem of a more conceptual nature. If the projects proposed by the Plan are really expected to generate a 100% return—remarkable by any standard—why does the report recommend Scenario 2, or planting 34.5 million trees? Why not recommend Scenario 3, which the report shows would plant 65.91 million trees to save \$21.994 billion dollars? A plausible answer is that the Plan researchers do not themselves believe that they could achieve a 100% return on additional investment from their proposals. But then the case needs to be made that diminishing returns set in, quite dramatically, once one devotes more than a certain dollar amount annually to these GHG mitigation activities. The Plan does not address this issue.

CONCLUSION

The Pennsylvania Climate Change Action Plan provides zero guidance to policymakers regarding the desirability of policies aimed at reducing greenhouse gas emissions. It fails to perform the most basic task of any cost-benefit analysis—quantifying both the costs and benefits in monetary terms so that they can be directly compared. It also finds net economic

10 E. Gregory McPherson, James R. Simpson, Paula J. Peper, Scott E. Maco, Shelley L. Gardner, Shauna K. Cozad, and Qingfu Xiao, "Midwest Tree Guide: *Benefits, Costs, and Strategic Planting*, U.S. Department of Agriculture Forest Service, Pacific Southwest Research Station (Berkeley, Ca: November 2006).

savings from many policies intended to reduce greenhouse gasses, even *without* counting the value of those reduced emissions.

In this peer review analysis, we have briefly examined the cost-benefit assumptions for one policy in each of the four main mitigation areas. In each case we have found the analysis to be seriously flawed. Despite the Plan's claim that these four programs have a net benefit of more than \$14.996 billion, we can find no sound scientific basis for their claim. The Plan's cost savings estimates are not just wildly optimistic; they are the product of a purely fictitious analysis. The Plan cost savings estimates of other mitigation options suffer from similar problems causing their estimate of cost savings to their overall package to grossly understate the true costs.

More importantly, the Pennsylvania Climate Change Action Plan economists used the net cost savings estimates of the recommended policies in the report as inputs to the macroeconomic modeling that projected the policies would create 65,000 new full-time jobs and over \$6 billion in increased state GDP. With such flawed inputs, the results of the economic modeling are as equally flawed and not credible.

Policymakers should treat the Pennsylvania Climate Change Action Plan with skepticism. Its cost savings estimates cannot be believed, and it fails to quantify the monetary benefits of reduced carbon emissions. Thus, policymakers are left with no basis on which to judge the merits of the Pennsylvania Climate Change Action Plan's recommendations for action on the mitigation of greenhouse gas emissions.

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