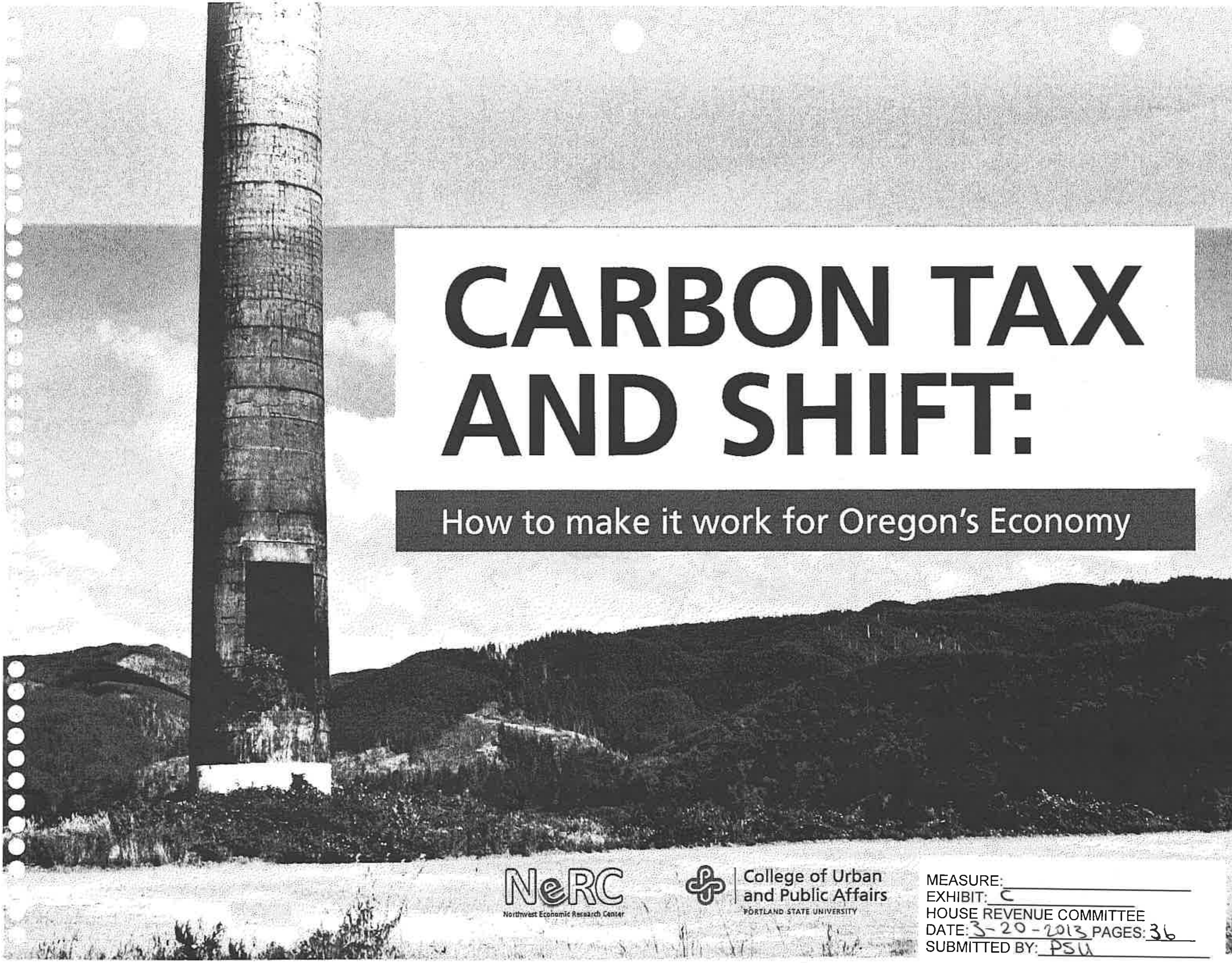

CARBON TAX AND SHIFT:

How to make it work for Oregon's Economy

NeRC
Northwest Economic Research Center

College of Urban and Public Affairs
PORTLAND STATE UNIVERSITY

Acknowledgements

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March 1, 2013

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NERC is based at Portland State University in the College of Urban and Public Affairs. The Center focuses on economic research that supports public-policy decisions-making, and relates to issues important to Oregon and the Portland Metropolitan Area. NERC serves the public, nonprofit, and private sector community with high quality, unbiased, and credible economic analysis. The Director of NERC is Dr. Tom Potiowsky, who also serves as the Chair of the Department of Economics at Portland State University. The report was researched and written by Dr. Jenny H. Liu, Assistant Director, and Jeff Renfro, Senior Economist. Research support was provided by Janai Kessi and Hudson Munoz, NERC Research Assistants. Mauryn Quintero, Administrative Assistant, worked on report formatting and presentation. The report was designed by Brooke Barnhardt.

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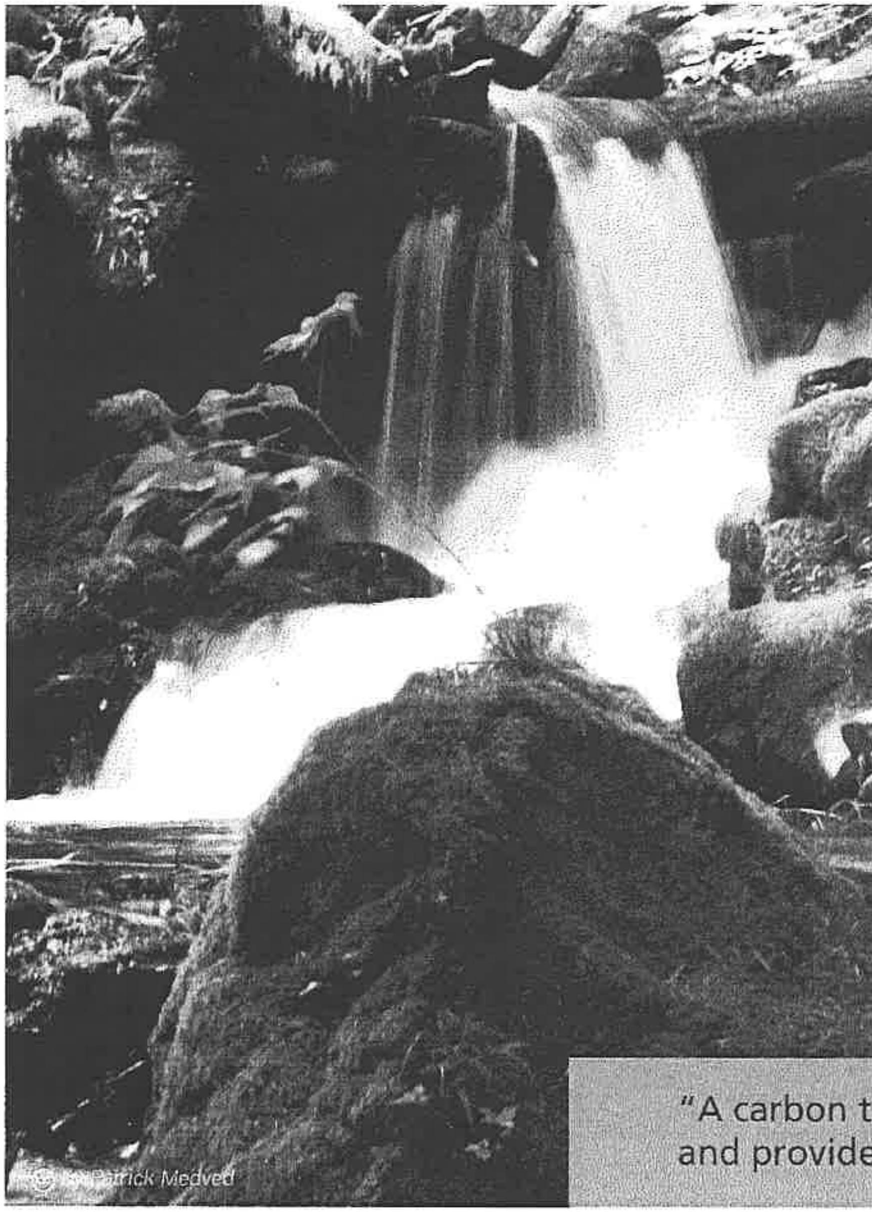
Executive Summary



This study analyzes a carbon tax and tax shift in Oregon as a means of reducing market inefficiencies by placing a meaningful price on carbon emissions. This study shows that a carbon tax can reduce distortionary income taxes, and provide new revenue opportunities for Oregon. By taxing carbon emissions and reducing Corporate and Personal Income tax rates, Oregon can reduce the negative incentives created by income taxes while generating revenue and reducing carbon emissions. The report shows that putting a price on carbon in Oregon can result in reductions in harmful emissions and have positive impacts on the economy.

Carbon emissions impose negative externalities on society, such as damage to property and critical infrastructure, increased health costs, losses of natural resources including drinking water supplies and other potential effects of climate change, leading to serious global market failures. Thus, the social costs of climate change need to be incorporated into the decision-making processes of energy suppliers, consumers and policy makers to reduce potential economic inefficiencies and major economic losses.

"A carbon tax and shift can reduce distortionary income taxes, and provide new revenue opportunities for Oregon."

After estimating dozens of repatriation schemes, we arrived at two promising scenarios that:

- Produce additional jobs and overall growth in the Oregon economy
- Include relief for low-income households
- Set aside revenue for targeted reinvestment that offset costs for selected industries and contribute to reaching Oregon's climate goals

10% Reinvestment Scenario

The 10% reinvestment scenario uses 70% of revenue for Corporate Income tax cuts, 20% for Personal Income tax cuts, and 10% for reinvestment in industrial energy efficiency programs. This scheme is structured so that households making less than $35,000 annually incur no extra cost from the program.

25% Reinvestment Scenario

The 25% reinvestment scenario uses 50% of revenue for Corporate Income tax cuts, 25% for Personal Income tax cuts, and 25% for reinvestment in industrial energy efficiency programs, residential energy efficiency programs, and transportation infrastructure. This version also leaves low-income households with no extra cost from the program.

We began the process by estimating boundary scenarios (devoting all revenue to either Corporate or Personal Income Tax cuts) to gain a better understanding of the tax dynamics. The outcomes of these boundary scenarios, or splitting the revenue between them, helped in constructing two promising implementation options. From the boundary scenarios, we learned that Corporate Tax cuts are important to stimulate enough additional economic activity to offset the burden caused by higher energy prices, yet yield inequitable outcomes unless corrected. Personal Income taxes alone do not generate the economic activity necessary to offset losses. Shifting revenues to offset the regressivity of the income tax cuts and increases in energy prices are important for the equity of the program, and increase the positive economic impact of the tax shift to households.

When revenues were split evenly between Corporate and Personal Income Tax cuts, our model showed low growth with concentrated negative outcomes in a few industry sectors. The outcomes that best balance the study's goals include a combination of Corporate and Personal Income tax cuts (with support for low-income households), and targeted reinvestment that uses revenues for energy efficiency and transportation infrastructure programs that create jobs and helps industry stay competitive.

This report shows that a BC-style carbon tax and shift could generate a significant amount of revenue and reduce tax distortions while creating new jobs and reducing carbon emissions. The specifics of the tax shift program are key to ensure equitable distribution of costs and benefits, as well as preserve the strength of the price signal.

Recommended Scenario:
10% Reinvestment of Carbon Tax Revenue
(Scenario 1.1)

Impact Type	Employment	Labor Income *(Million)*
Direct Effect	3,464	153
Indirect Effect	763	34
Induced Effect	-1,439	-66
Total Effect	**2,787**	**121**

Recommended Scenario:
25% Reinvestment of Carbon Tax Revenue
(Scenario 1.2)

Impact Type	Employment	Labor Income *(Million)*
Direct Effect	2,191	93
Indirect Effect	538	25
Induced Effect	-1,498	-71
Total Effect	**1,231**	**47**

British Columbia (BC) Carbon Tax

In 2008, British Columbia implemented a provincial revenue-neutral carbon tax that reduced corporate and personal income taxes using carbon tax revenues. BC's Ministry of Finance included the carbon tax in its 2008 Budget and Fiscal Plan, which was passed by the parliament as the Carbon Tax Act (Bill 37) in May 2008 and became effective on July 1, 2008. The tax was designed to ascribe a price to each metric ton of CO_2-equivalent (CO_2e) emissions from fossil fuels[1] purchased and combusted within the provincial borders, starting at $10 per ton of CO_2e in 2008 and increasing by $5 per ton each year until the cap price of $30 per ton was reached in 2012[2]. Although a number of northern European countries such as Norway, Ireland **(see sidebar)** and Sweden have instituted carbon taxes, the BC carbon tax is unique as the first carbon tax to be implemented across all economic sectors in North America (Sustainable Prosperity 2012).

The BC carbon tax has few exemptions. We believe that this minimal-exemption strategy preserves a strong incentive to reduce fossil fuel use and creates equity amongst sectors. With exemptions, it is possible that an energy-intensive industry will become more competitive based on the cut in their taxes, thereby increasing the incentive to pollute.

Table 1: BC Carbon Tax Revenue and Revenue Repatriation

	Carbon Tax Revenue (\$ Millions)	Revenue Repatriation (\$ Millions)	Net Revenue from Carbon Tax (\$ Millions)
2008/09 Fiscal Year	\$306	\$313	(\$7)
2009/10 Fiscal Year	\$542	\$767	(\$225)
2010/11 Fiscal Year	\$741	\$865	(\$124)
2011/12 Fiscal Year (forecasted)	\$960	\$1,152	(\$192)
2012/13 Fiscal Year (forecasted)	\$1,172	\$1,275	(\$103)

(Source: BC Ministry of Finance Budget and Fiscal Plans)

Exemptions can also be conceptualized as an environmental subsidy paid by the rest of the society. While this should not automatically disqualify the idea of exemptions, it is imperative that the full costs of an exemption are considered and the policy is carefully targeted. During conversations with administrators of the BC tax, it was cited that the broad base of the tax is a major strength of BC's program.

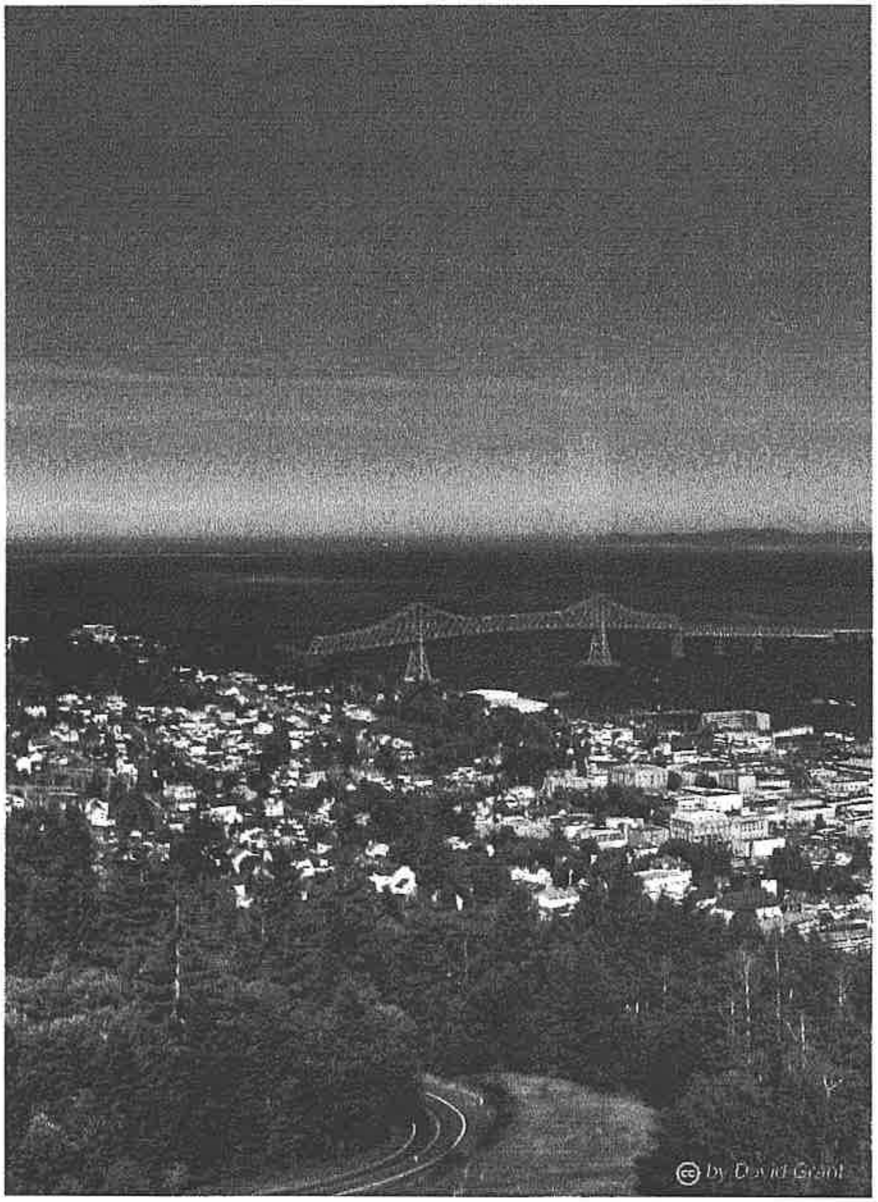
In British Columbia, all of the forecasted carbon tax revenue is repatriated back into the economy as required by law. **Table 1** shows the actual and forecasted BC carbon tax revenue and revenue repatriation amounts[3].

The main repatriation mechanisms ranked by magnitude are:

- general and small business corporate income tax reductions;
- personal income tax cuts in the first two brackets (i.e. income below $70,000);
- Low Income Climate Action Tax;
- benefits of up to $200 to rural and northern homeowners;
- Industrial Property Tax Credit of 60% of school property taxes payable by light and major industrial (BC Ministry of Finance 2012).

Sustainable Prosperity (SP), a policy and research network based at University of Ottawa, published its report on the first four years of the BC carbon tax in 2012. SP finds only a small difference of 0.1% in total economic growth during 2008-2011 between British Columbia and the rest of Canada, as measured by the growth of GDP (gross domestic product) per capita, and concludes that the evidence does not show that the carbon tax is harming the provincial economy. These preliminary results appear to be consistent with previous studies looking at the effect of environmental taxes in European nations on their economic growth (Andersen et al. 2007). Because GHG emissions data was unavailable for 2011 and 2012, SP examined the per capita consumption of refined petroleum products and motor gasoline as proxies for the environmental impacts of the tax. The report finds that the consumption of refined petroleum products between 2008-2011 decreased by 15.1% in

Recommendations & Implementation



NERC ran dozens of scenarios in order to find the combinations of tax cuts and targeted reinvestment that resulted in the best combination of economic growth, fairness, and reduction of emissions. The following scenarios feature two levels of targeted reinvestment that use carbon tax revenues for projects that help reduce carbon and plug persistent funding gaps. Both scenarios include low-income relief, which yields a slightly larger positive economic impact and offsets the regressiveness of the increase in energy prices and cut in personal income taxes. Revenue estimates are based on a maximum carbon price of $60/ton CO_2e.

For more on the process of arriving at these recommendations, see Scenario and Estimation Results (pg. 17)

Scenario 1: Recommended Scenarios Summary

1.1 - 10% Reinvestment of Carbon Tax Revenue:

- Positive Jobs Impact
- More Equitable Distribution of Costs
- Provides Revenue for Targeted Reinvestment

1.2 - 25% Reinvestment of Carbon Tax Revenue:

- Positive Jobs Impact
- More Equitable Distribution of Costs
- Provides Largest Amount of Revenue (of Recommended Scenarios) for Targeted Reinvestment

The reinvestment money offsets the potential negative impact on the industrial sector. The Commercial sector still enjoys the largest positive impact and the Transportation sector is losing approximately 3% of its workforce. The impacts on the Industrial and Residential sectors are so small, that they are effectively zero.

Although the total number of jobs created in Scenario 1.1 is less than the total created in the 100% Corporate Tax cut scenario, the total job creation is still relatively high. Targeting revenue toward the industrial sector (combined with corporate tax cuts) would contribute to the twin goals of making Oregon manufacturing more competitive, while also moving the state toward its climate change goals. This scenario resulted in one of the best combinations of economic growth, fairness, and reduction of carbon emissions.

Table 4: Relative Jobs Impacts by Sector

Sector	2015	
	Change in Total Jobs (% of jobs in sector)	Change in Total Jobs
Residential	0.09%	118.2
Industrial	-0.08%	-290.3
Commercial	0.2%	4,431.7
Transportation	-3%	-1.471.6
Total	**0.17%**	**2788.0**

Interpreting Economic Impact Analysis Results

Direct Impacts: These are defined by the modeler, and placed in the appropriate industry. They are not subject to multipliers. In this case, purchasing, employment, and wage data were collected from the sources described above and placed into the appropriate industry.

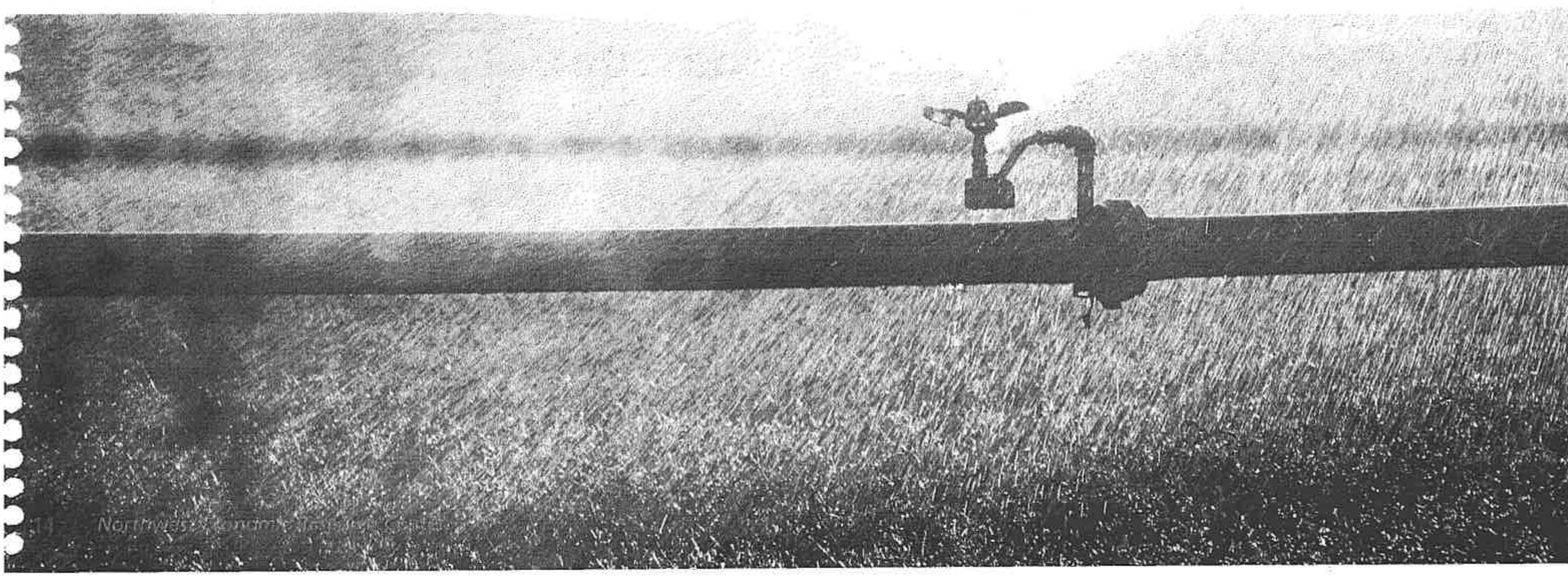
Indirect Impacts: These impacts are estimated based on national purchasing and sales data that model the interactions between industries. This category reflects the economic activity necessary to support the new economic activity in the direct impacts by other firms in the supply chain.

Induced Impacts: These impacts are created by the change in wages and employee compensation. Employees change purchasing decisions based on changes in income and wealth.

"Measures to correct for regressivity in the carbon tax structure should be considered in any policy package."

The investment in transportation infrastructure as modeled here does not explicitly relate to climate change goals. This portion of the reinvestment is modeled as benefiting the Industrial sector (the economic sector responsible for infrastructure projects). An example of how these funds could be used would be to cover the persistent shortfall in road construction funding. This investment could be conceptualized as any other large-scale public works project with funds targeted to construction and manufacturing firms.

This scenario produces a smaller net increase in jobs than Scenario 2.1, but the Industrial sector is effectively held harmless, and the Residential sector has its strongest positive increase in jobs. These increases come at the expense of the Commercial sector, which still has a large, but smaller, increase in jobs. The smaller employment impact in this scenario is partially offset by the large investment in climate change mitigation projects. The tradeoff in these two scenarios is between greater overall employment impact in Oregon or additional assistance for the Industrial and Residential sectors. Targeted assistance to industries can be effective, but it comes at the price of economic efficiency. This scenario also resulted in one of the best combinations of economic growth, fairness, and reduction of emissions.



Issues for Implementation: Competitiveness

One concern of applying a carbon tax at the state level is that it could reduce the competitiveness of Oregon-based industries. Competitiveness within a region is linked to the issue of emissions leakage, "the movement of economic activity from high carbon price to low or no carbon price" regions and resulting in higher emissions in less regulated regions (Metcalf 2009; Reinaud 2009), and potential capital flight, where businesses shift investments to jurisdictions where the cost of doing business is lower (Parry and Williams 2011). A carbon tax in Oregon would have disparate impacts on industry sectors operating within the state with varying carbon-intensities. For example, the service sector would shoulder less of a carbon tax burden than fossil fuel intensive industries such as concrete manufacturing (Kuik and Hofkes 2009). However, a carbon tax is a straightforward price mechanism that provides businesses with the most certainty about the cost of compliance, as opposed to a quantity mechanism like the cap-and-trade system where the carbon outcomes are more certain, but the price varies (Aldy and Stavins 2012). Both carbon tax and cap-and-trade systems place a price on carbon, which can increase the cost of doing business for regulated industries and create competition from other less regulated markets.

One way to mitigate this negative economic consequence and maintain competitiveness is through a border carbon adjustment tax, which would increase the price of fossil-fuel intensive products imported into Oregon or decrease the price of fossil-fuel intensive products as they are exported outside of the region (Cosbey 2008; Fischer and Fox 2009). It will be important for such a border tax to differentiate between similar goods made with different levels of fossil fuel input. Under current reporting protocols, gathering accurate information on the CO_2e emitted during the production of an imported project may be difficult, or impossible. Using estimates or standard rates for similar goods could weaken the price signal of the tax by punishing low-carbon goods or rewarding high-carbon goods. Zabin et al. (2009) estimated cost increases and job losses to be small for carbon intensive industries[5] in Oregon at a carbon price of $15 per ton of CO_2e. They additionally suggest sectoral agreements, free allowances to industries prone to leakage, output-based rebates, and incentives for energy efficiency investments as mechanisms to mitigate these effects. Furthermore, Fullerton et al. (2011) found that capital mobility is one of the main determinants of emissions leakage. Further research will need to be conducted in order to appropriately characterize the magnitude of emissions leakage and capital flight due to a carbon tax in Oregon.

Parameters for Scenarios

When designing scenarios for this study we did not have one set target; instead, we found tax program structures that significantly reduced emissions, created a net increase in jobs, and distributed costs and benefits fairly between industry sectors and households.

In order to understand the effects of changes in each variable, NERC ran scenarios that estimated outcomes of different combinations of carbon prices and repatriation schemes. The two recommended scenarios above are examples that we feel balance all of the study's goals, and could form the basis of workable carbon tax programs that reduce emissions while providing economic benefits and addressing equity concerns. The four boundary scenarios in this section represent the boundaries and demonstrate the effects of different repatriation options.

For all scenarios, we chose to use a carbon price of $60/ton of CO_2e. This price goes beyond the $30/ton cap currently in place in BC. This is partially motivated by our conversations with people in BC responsible for implementing the carbon tax. Because of the positive initial results of the BC tax, an effort is being made to increase the cap. Based on our conversations and review of news reports, we expect this the cap to be raised eventually. At $60/ton, the price would place Oregon ahead of regional efforts to price carbon, but well below the world's highest prices.

With a tax starting in 2013 with a $60 maximum and $10 annual increase, in 2015 emissions would be 2% below the baseline forecast and $1,173M in revenues would be generated[6]. In 2025, the emissions would be 12.5% below the baseline forecast and the revenues would be $2,157M[7].

Scenario 2.1
100% Corporate Income Tax Cuts

In this scenario, we model a revenue-neutral option that uses 100% of revenues generated by the tax to reduce Corporate Income Tax rates. In order to model a uniform reduction in tax rates, we calculated the distribution of tax revenue contributions by sector and returned the revenue to each industry according to this distribution. The BC carbon tax has few exemptions, and industry support or assistance is provided using funds raised from the tax. We believe that this minimal-exemption strategy preserves a strong incentive to reduce fossil fuel use.

Returning 100% of the revenue through Corporate Income Tax cuts would offset enough of the revenue projected for 2025 to eliminate the Corporate Income tax, and leave an additional 17% of projected revenues left to be redistributed.

This scenario results in the highest positive employment impact in the study, but the impact on households is extremely regressive and the positive impacts are concentrated in the Commercial sector. It should be noted that all positive job impacts in the study are small relative to Oregon's current 1.6M total nonfarm jobs (2012). In this scenario, the impact on the Commercial sector is only a 0.4% increase in employment, 0.4% decrease in Industrial employment, 0.2% increase of Residential employment, and a 7% decrease in Transportation employment.

Scenario 2.2
100% Personal Income Tax Cuts

In this scenario, we model a repatriation scheme that returns all revenues in the form of Personal Income Tax Cuts. To model this, we calculated the distribution of Personal Income Tax Revenues and returned the revenue according to this distribution. Low-income households devote a larger proportion of their income to energy expenditures, and would be disproportionately negatively impacted by the increase in energy costs. Because high-income households pay a disproportionate portion of personal income tax, when rates are cut, high-income receives most of the benefit.

Returning revenues to households does not generate the same level of economic activity as the 100% corporate scenario. In this scenario, a larger portion of the repatriated revenue would go toward consumption. This type of spending is associated with a smaller economic multiplier because the impact is fleeting, as opposed to longer-term investments which continue to provide economic benefits into the future. In 2025, the revenue generated by the tax would replace 8.6% of projected Personal Income tax revenue.

Table 8: 2015: 100% Corporate Income Tax Cuts

Impact Type	Employment	Labor Income *(Million)*
Direct Effect	5,955	266
Indirect Effect	1,413	64
Induced Effect	-2,504	-115
Total Effect	**4,864**	**215**

Table 9: 2025: 100% Corporate Income Tax Cuts

Impact Type	Employment	Labor Income *(Million)*
Direct Effect	10,176	448
Indirect Effect	2,172	97
Induced Effect	-4,309	-197
Total Effect	**8,039**	**347**

Table 10: 2015: 100% Personal Income Tax Cuts

Impact Type	Employment	Labor Income *(Million)*
Direct Effect	- 4,139	- 213
Indirect Effect	- 2,093	-101
Induced Effect	2,965	135
Total Effect	**- 3,267**	**-179**

Table 11: 2025: 100% Personal Income Tax Cuts

Impact Type	Employment	Labor Income *(Million)*
Direct Effect	- 8,131	- 418
Indirect Effect	- 4,101	- 198
Induced Effect	5,945	271
Total Effect	**- 6,287**	**- 344**

Conclusion

The results of this report (along with initial results out of BC) show that there does not need to be a tradeoff between correcting market failures associated with emissions and economic growth. In fact, if revenues are used to eliminate the distortionary effects of existing income taxes, a carbon tax might stimulate growth. This would leave Oregon with a tax system that disincentivizes emissions while promoting less-energy-intensive output. Additionally, a carbon tax offers a significant revenue generation option at a time when the state is evaluating new options to diversify Oregon's revenue mechanisms.

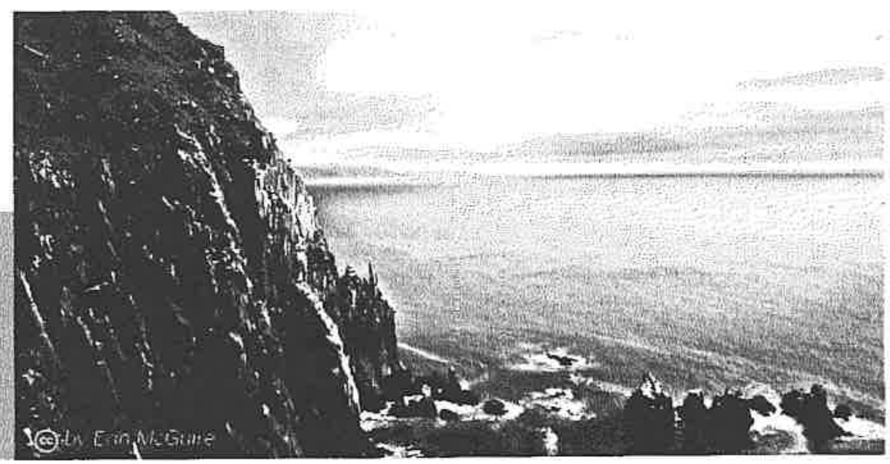
Our scenarios show that reinvestment in public works and energy efficiency programs can be part of a successful plan. These reinvestments can also be used to offset competitiveness issues, contribute to Oregon's climate goals, and provide revenue for traditionally underfunded state activities.

According to our results, some level Corporate Income Tax cuts would be necessary to have net economic growth. Returning money to households through Personal Income Tax cuts should be included for equity reasons, but it does not generate enough economic activity to offset the tax burden. Careful program design can also offset the potential extra burden on low-income households.

"A carbon tax offers a significant revenue generation option at a time when the state is evaluating new options to diversify Oregon's revenue mechanisms."

It is impossible to institute a Carbon Tax without negatively affecting some industries. Good program design can more than make up for these negative outcomes by increasing the competitiveness of some industries. Targeted revenue shifting can result in a successful Oregon-only program, but many of the potential negative outcomes of the tax could be eliminated if a national or regional carbon price was instituted. BC and California already have put a price on carbon, and there are carbon pricing discussions happening in Washington State. If Oregon adopts carbon pricing as a significant source of revenue, and other states follow, Oregon companies would have a head start on the adaptation and industry reconfiguration necessary under a new tax regime.

"If Oregon adopts carbon pricing...Oregon companies would have a head start on the adaptation and industry reconfiguration necessary under a new tax regime."



Appendix A
Modeling

The gold-standard for energy forecasting is the National Energy Modeling System (NEMS) run by the Energy Information Administration (EIA). NEMS includes sophisticated economic modeling modules as well as dynamic feedbacks. Running simulations on this model requires extensive training and is expensive. In order to run estimates of the net impacts of an Oregon Carbon Tax, we combined two different modeling techniques that draw from more complicated analysis.

The process began with the Carbon Tax Analysis Model (C-TAM) (Mori 2012), originally created by Keibun Mori for the Washington State Department of Commerce. C-TAM incorporates NEMS energy forecasts and local economic projections, and features an interface appropriate for non-technical users. We took the Washington State model and adapted it for use in Oregon.

C-TAM is a production-based model, meaning not all sources of GHG emissions are captured in the model. The emissions from fuel use in the production of cement are captured, but the GHG given off by the materials are not captured. Emissions from tractors and trucks used on agricultural land are captured, but GHG given off by fertilized fields are not captured. We chose to use a production-based model because the BC Carbon Tax (our model) applies to fuels combusted in BC, and is not applied to non-production emissions sources. As emissions monitoring technology improves, it is possible that these non-production sources could be subject to the tax, but for now, the costs and viability of this expansion is unknown. The model also ignores the emissions created during the manufacture of products imported into Oregon or the generation of imported electricity. This issue and the challenges of assigning an appropriate price to these emissions were discussed in the Implementation section in this report.

C-TAM begins with the energy-usage forecast for the Pacific Region created using NEMS. This baseline forecast can be customized to include the effects of different carbon mitigation policies. We chose to use the Extended Policy forecast as the baseline. Extended Policy incorporates all laws and regulations currently on the books and assumes that energy efficiency and carbon mitigation regulations that are normally renewed will continue to be renewed, and that energy efficiency standards that are normally altered upon renewal will continue to be altered accordingly. This forecast also assumes full implementation of the new CAFE standards[8], the Renewable Energy Portfolio Standard, and the Clean Fuels Program. It is important to note that the following results assume continued carbon mitigation efforts from policy-makers, and the ensuing changes in behavior by consumers and businesses.

This forecast is then pro-rated using historical Oregon energy-consumption data to create an Oregon energy-usage forecast. Tax revenue and population forecasts from the Oregon Office of Economic Analysis are also used as inputs. In order to estimate the effect of the Carbon Tax, we shock this system by increasing the price of fuels according to the price of carbon and the carbon content of each fuel. Change in usage is predicted based on elasticities drawn from multiple published papers. These elasticities are fuel-specific when possible; when an elasticity estimate has not been computed (or has not been computed recently), the fuel is assumed to have the same elasticity as a comparable fuel. This change in consumption is used to calculate the change in emissions, and the revenue generated by the tax. Figure A diagrams the C-TAM process.

Interpreting Economic Impact Analysis Results

The impact summary results are given in terms of employment, labor income, total value added, and output:

Employment represents the number of annual, 1.0 FTE jobs. These job estimates are derived from industry wage averages.

Labor Income is made up of total employee compensation (wages and benefits) as well as proprietor income. Proprietor income is profits earned by self-employed individuals.

Total Value Added is made up of labor income, property type income, and indirect business taxes collected on behalf of local government. This measure is comparable to familiar net measurements of output like gross domestic product.

Output is a gross measure of production. It includes the value of both intermediate and final goods. Because of this, some double counting may occur. Output is presented as a gross measure because IMPLAN is capable of analyzing custom economic zones. Producers may be creating goods that would be considered intermediate from the perspective of the greater national economy. However, these intermediate goods may leave the custom economic zone, making them a local final good.

Table 14-$30/ton Maximum Price; $5 Annual Increase

Price/Ton CO_2e	2015 $20	2025 $30	2035 $30
GHG Change from Baseline Forecast			
Residential	-3.8%	-10.8%	-13.3%
Commercial	-4.9%	-14.0%	-16.8%
Industrial	-3.0%	-10.5%	-13.0%
Transportation	-2.6%	-1.9%	-3.0%
Total	-1.3%	-6.1%	-7.3%
GHG Change from 1990 Levels	**26.7%**	**24.7%**	**20.8%**
Carbon Tax Revenues (million)			
Residential	$101	$145	$138
Commercial	$89	$138	$147
Industrial	$198	$293	$269
Transportation	$400	$579	$546
(Individual)	$360	$486	$429
(Business)	$428	$669	$671
Total	**$788**	**$1,155**	**$1,101**

Figure 5: Oregon's GHG Emissions at $30/ton

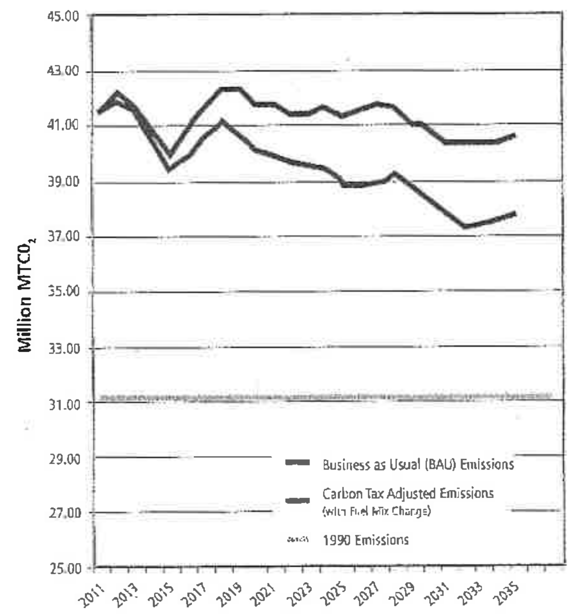


Table 15-$60/ton Maximum Price; $10 Annual Increase

Price/Ton CO_2e	2015 $30	2025 $60	2035 $60
GHG Change from Baseline Forecast			
Residential	-4.7%	-20.3%	-25.6%
Commercial	-6.1%	-26.0%	-32.2%
Industrial	-4.0%	-20.3%	-25.5%
Transportation	-3.0%	-5.2%	-6.0%
Total	-2.0%	-12.5%	-15.1%
GHG Change from 1990 Levels	**25.7%**	**16.1%**	**10.6%**
Carbon Tax Revenues (million)			
Residential	$150	$259	$237
Commercial	$132	$237	$240
Industrial	$295	$548	$494
Transportation	$597	$1,113	$1,052
(Individual)	$535	$913	$796
(Business)	$638	$1,244	$1,227
Total	**$1,173**	**$2,157**	**$2,023**

Figure 6: Oregon's GHG Emissions at $60/ton

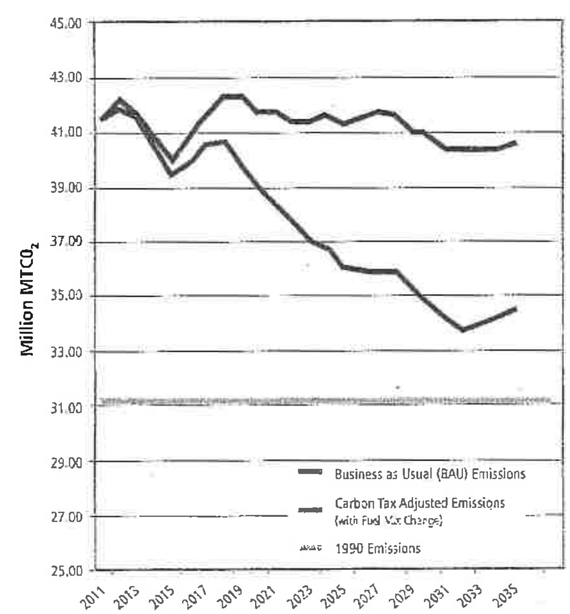
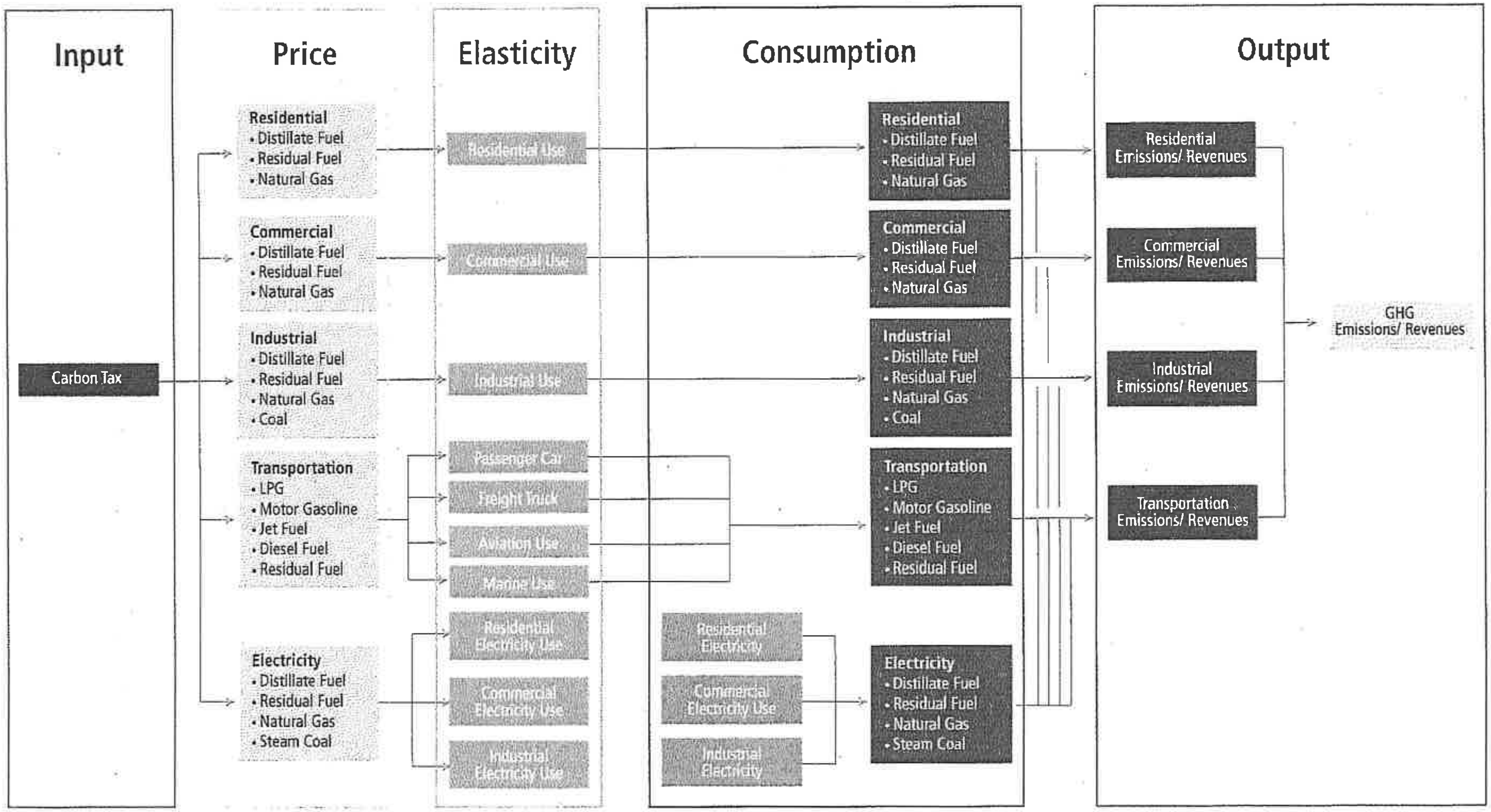


Figure 8


Input
Carbon Tax
Price
Residential
• Distillate Fuel
• Residual Fuel
• Natural Gas
Commercial
• Distillate Fuel
• Residual Fuel
• Natural Gas
Industrial
• Distillate Fuel
• Residual Fuel
• Natural Gas
• Coal
Transportation
• LPG
• Motor Gasoline
• Jet Fuel
• Diesel Fuel
• Residual Fuel
Electricity
• Distillate Fuel
• Residual Fuel
• Natural Gas
• Steam Coal
Elasticity
Residential Use
Commercial Use
Industrial Use
Passenger Car
Freight Truck
Aviation Use
Marine Use
Residential Electricity Use
Commercial Electricity Use
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Industrial
• Distillate Fuel
• Residual Fuel
• Natural Gas
• Coal
Transportation
• LPG
• Motor Gasoline
• Jet Fuel
• Diesel Fuel
• Residual Fuel
Electricity
• Distillate Fuel
• Residual Fuel
• Natural Gas
• Steam Coal
Output
Residential Emissions/ Revenues
Commercial Emissions/ Revenues
Industrial Emissions/ Revenues
Transportation Emissions/ Revenues
GHG Emissions/ Revenues

Appendix B
Detailed Scenario Results

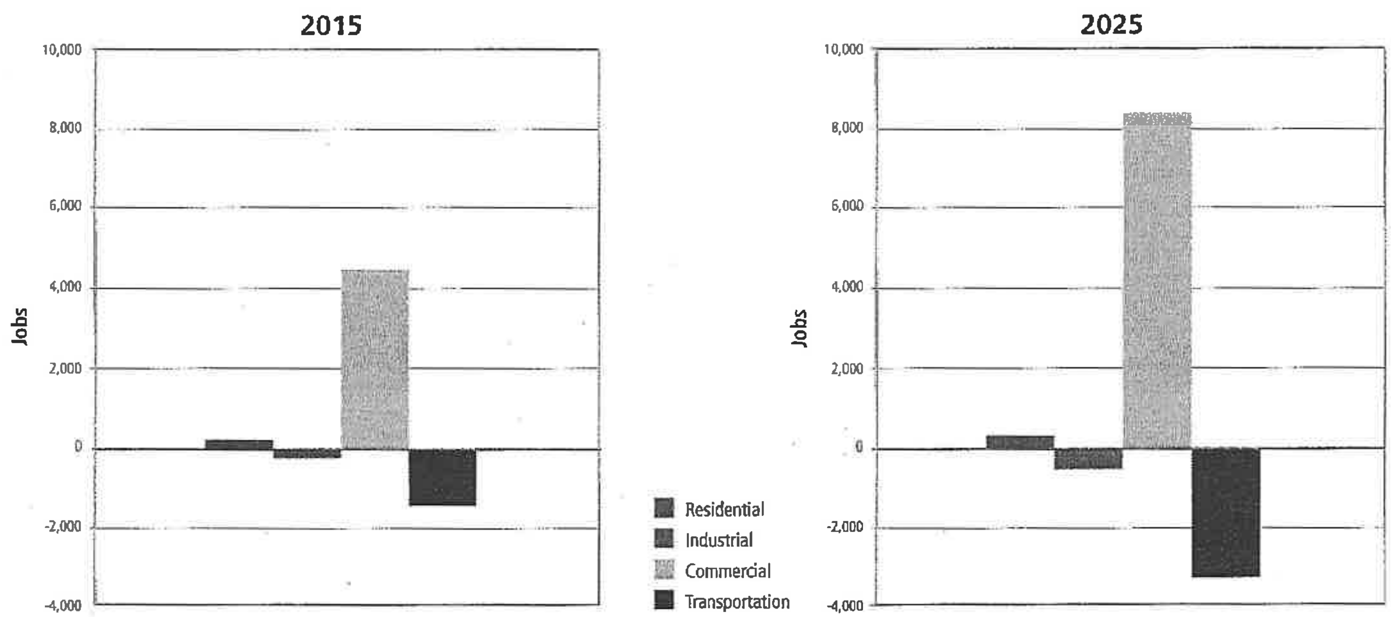
1.1 10% Reinvestment
Table 17: 2015

Impact Type	Employment	Labor Income *(Million)*	Total Value Added *(Million)*	Output *(Million)*
Direct Effect	3,464	153	217	287
Indirect Effect	763	34	55	81
Induced Effect	- 1,439	- 66	- 108	- 171
Total Effect	**2,787**	**121**	**164**	**197**

1.1 10% Reinvestment
Table 18: 2025

Impact Type	Employment	Labor Income *(Million)*	Total Value Added *(Million)*	Output *(Million)*
Direct Effect	5,852	255	360	454
Indirect Effect	1,154	51	84	120
Induced Effect	- 2,161	- 99	- 163	- 254
Total Effect	**4,845**	**207**	**282**	**318**

Figure 9: Sector Job Impacts: 10% Reinvestment



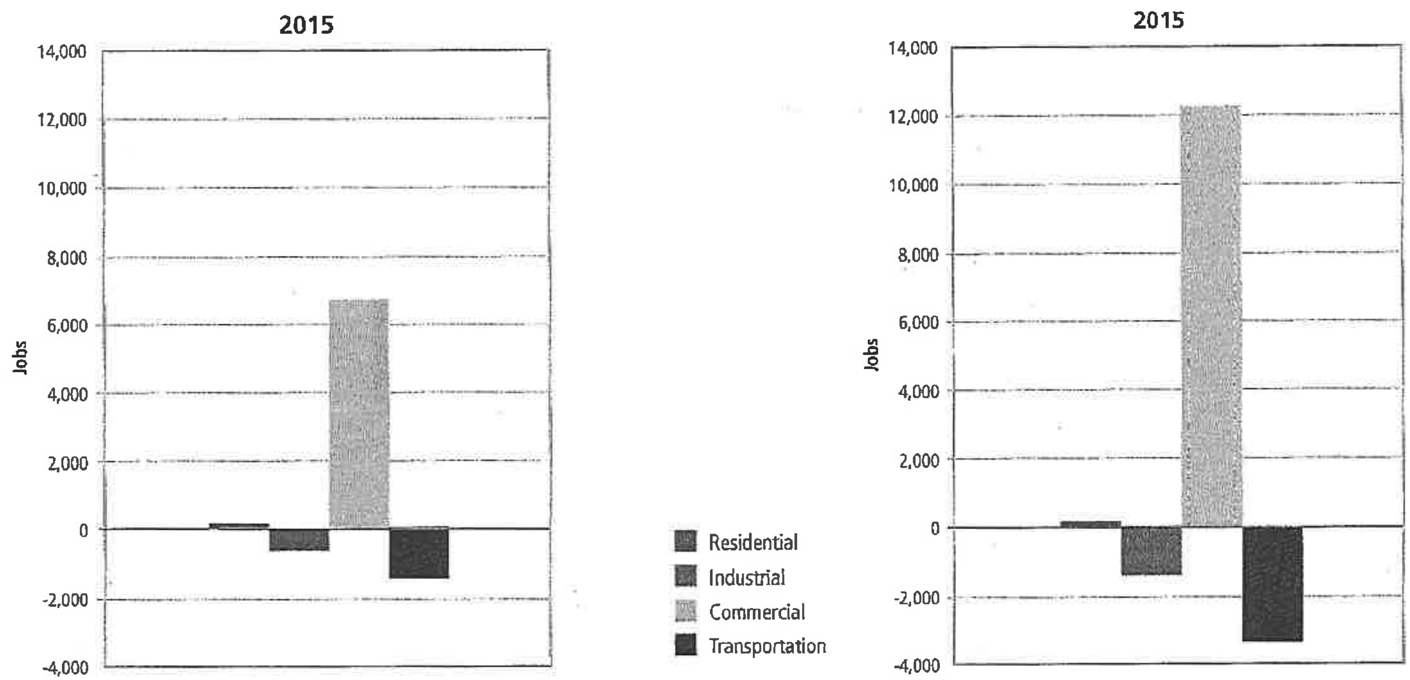
2.1 100% Corporate Income Tax
Table 21: 2015

Impact Type	Employment	Labor Income *(Million)*	Total Value Added *(Million)*	Output *(Million)*
Direct Effect	5,955	266	376	503
Indirect Effect	1,413	64	101	150
Induced Effect	-2,504	-115	-189	-297
Total Effect	**4,864**	**215**	**288**	**362**

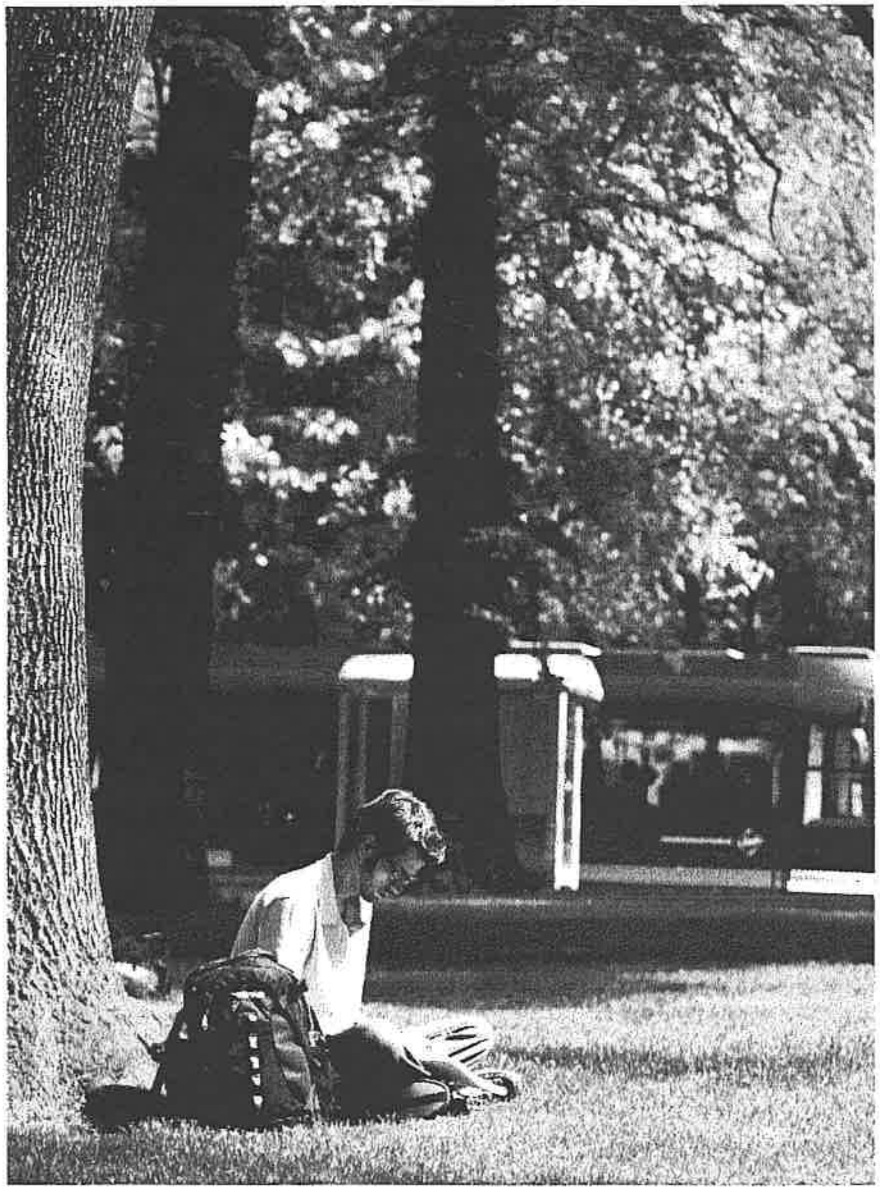
2.1 100% Corporate Income Tax
Table 22: 2025

Impact Type	Employment	Labor Income *(Million)*	Total Value Added *(Million)*	Output *(Million)*
Direct Effect	10,176	448	630	810
Indirect Effect	2,172	97	156	222
Induced Effect	-4,309	-197	-325	-511
Total Effect	**8,039**	**347**	**460**	**521**

Figure 11: Sector Jobs Impact: 100% Corporate Income Tax



Endnotes



1. The fossil fuels taxed in BC include gasoline, diesel, natural gas, fuel oil, propane and coal. Emission factors are calculated by Environment Canada for each fuel type based on carbon content. In other words, the tax on each ton of CO_2e is translated into carbon tax rates for each fuel type.
2. Due to the closed-door budgeting process of the Ministry of Finance in BC, NERC was unable to obtain documentation to explain the rationale behind the specific price points and the cap price.
3. The amount of carbon tax revenue repatriated back into the economy is determined by revenue forecasts. Therefore, the net revenues from the BC carbon tax have been negative due to inaccurate revenue forecasts. BC's Ministry of Finance is exploring options to further refine their revenue forecasts.
4. The Low Income Climate Action Tax Credit is $115.50 per adult plus $34.50 per child as of July 1, 2011.
5. Iron and steel mills were the only manufacturers with a substantial employment base (more than 1000 workers) that experienced a cost increase of more than 2% with the $15 per ton of CO_2e price. (Zabin et al. 2009)
6. This corresponds to 15% of Annual General Fund and Lottery Revenues from the 2011-2013 budget.
7. Which is 29% of Annual General Fund and Lottery Revenues from the 2011-2013 budget.
8. For full description of new CAFE Standards, see National Highway Traffic Safety Administration: http://www.nhtsa.gov/fuel-economy (Retrieved February 22, 2013)

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