7 June 2019
Chief Strategists
Country X: The Committee of Sustainability and Carbon Regulation

Dear members of the Committee,

As climate change poses increasing threats to the world, 195 countries have pledged to reduce their carbon emissions at the 2016 Accord on Climate Change in Paris.

As a newly sovereign country, X, your government must now determine its own carbon emission reduction policy. You have asked Marrirlar & Co. to analyze three emission reduction strategies, in addition to considering a carbon-credit trading system with industry D, located in neighboring Country Y. To this end, we compared the following: a mandatory reduction of 100 tons of carbon on your three prominent sectors (A, B, and C); a tax on all carbon emissions to promote an optimal level of emissions (still leading to an overall carbon abatement of 300 tons); and a cap-and-trade system (both domestic and international, with industry D in Country Y). We used calculations in R to derive aggregate curves for the marginal cost of abating to each sector under the various scenarios (see Technical Appendix). We find that while there are behavioral similarities between the tax option and an internal cap-and-trade system, the cap-and-trade system offered a cheaper way to achieve the same abatement for each sector.

Under an internal cap-and-trade system, Sectors A, B, and C all enjoy the benefits of either buying or selling carbon credits to ultimately contribute their "optimal" levels of pollution that they would have similarly emitted under a tax, but more cheaply. The introduction of international trade, however, presents an even more optimal solution. Marrirlar & Co. explored the economic benefits of trade, where internal sectors could purchase additional carbon credits from Sector Y, and found that this option would behoove all sectors and, in certain ways, benefit both countries X and Y. That being said, there are environmental concerns under this system. We recognize that the public health effects of altering local carbon emissions may pose problems in country X, where industries would likely purchase and emit more carbon than their neighboring country.

We ultimately recommend an international trading system for carbon credits. See our Technical Appendix for an extrapolation of the following possibility: Countries X and Y may collectively reduce their overall carbon emissions by 300 tons under a cap-and-trade system. Sectors A, B, and C could purchase the rights to pollute an additional 77.38 tons of carbon from Sector D in country X. Sector D would enjoy $778.13 in profits under this scenario, where they would abate these tons of carbon and instead sell the rights to Country X. We highly suggest working with your budding environmental and public health departments in this decision. Local mitigation strategies will be especially necessary in Sectors A and C, which are places where pollution will likely occur due to carbon permits being purchased.

Sincerely,

Eva Marrero and Daphne Virlar-Knight

Cap and Trade Technical Appendix

Daphne Virlar & Eva Marrero

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Problem 1

Sector	Intercept	Slope	R-Squared
A	-8.64	0.58	0.90
B	9.32	0.20	0.54
C	-11.66	0.78	0.88
D	9.69	0.26	0.54

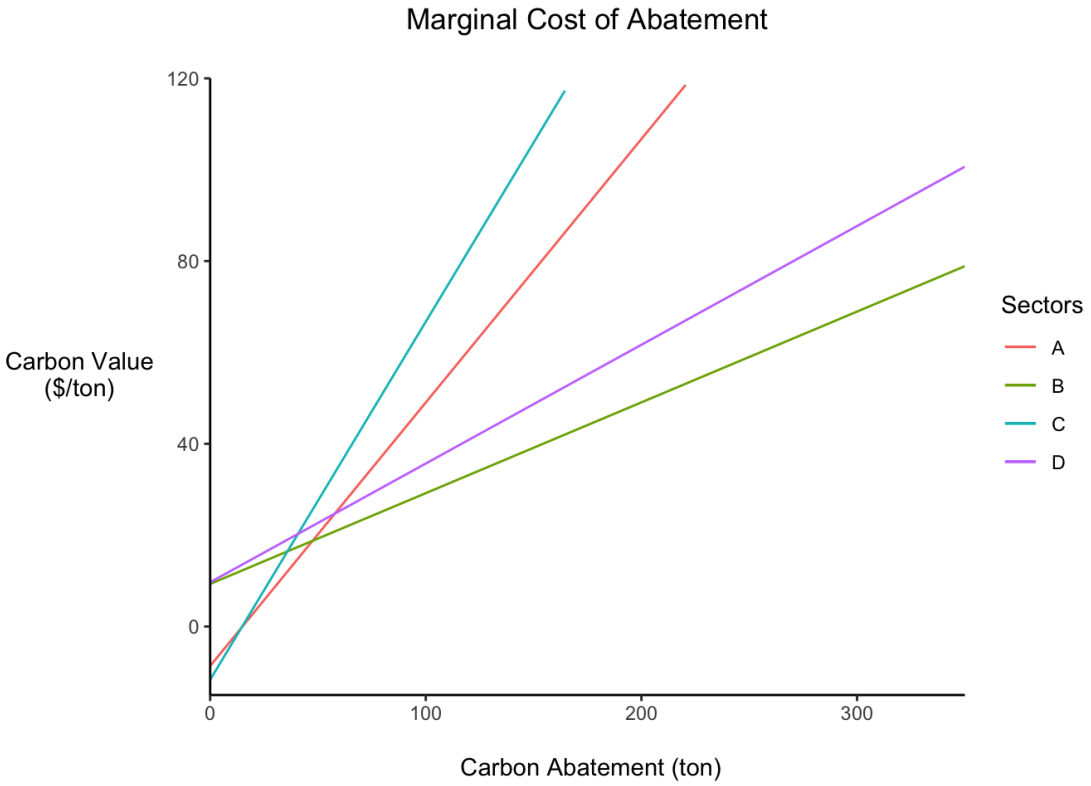
Table 1. The above table illustrates the slope and intercepts for each sectors Marginal Cost of Abatement curves. It also includes r-squred values, to indicate how well the functions fit their data. Sectors B and D do not have appropriately fitting functions, and would potentially benefit from piecewise or quadratic equations, rather than a linear one.

$$Sector\ A = 0.58x - 8.64$$

$$Sector\ B = 0.2x + 9.32$$

$$Sector\ C = 0.78x - 11.66$$

$$Sector\ D = 0.26x + 9.69$$



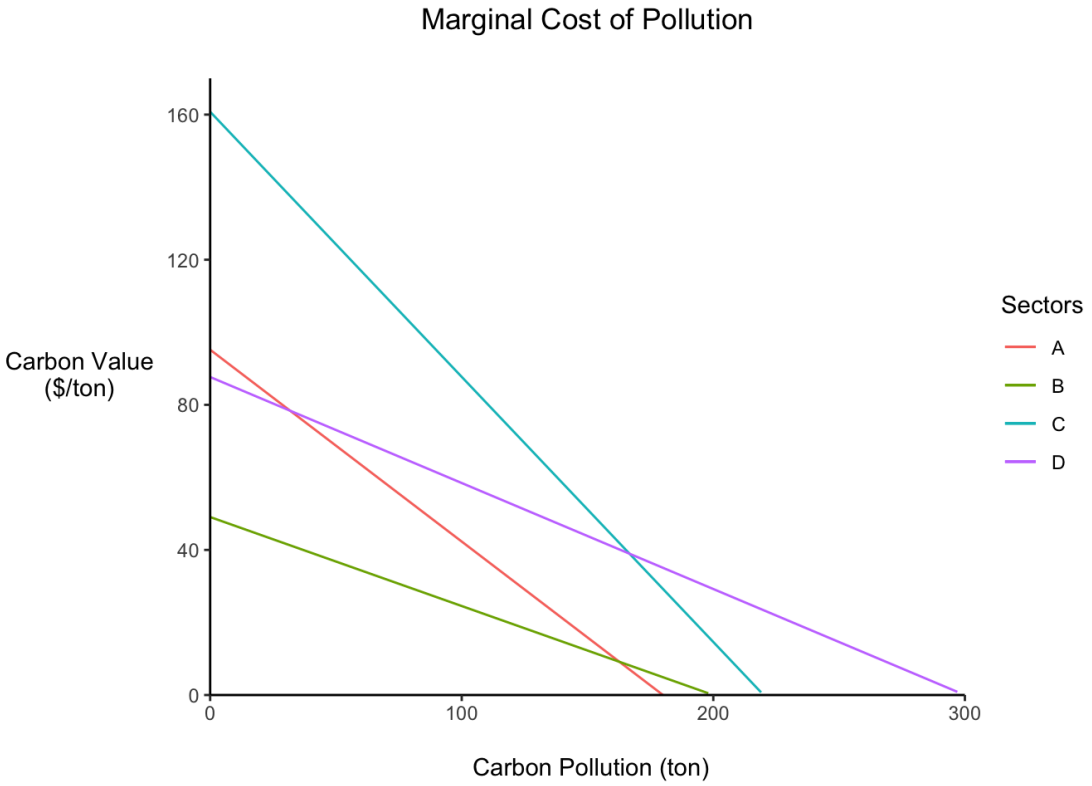
Problem 2

$$Sector\ A = -0.53x - 95.19$$

$$Sector\ B = -0.25x + 49.07$$

$$Sector\ C = -0.73x - 160.79$$

$$Sector\ D = -0.29x + 87.67$$



Problem 3

Sectors	Policy A: Cap on Carbon	Policy B: Carbon Tax	Policy C: Cap and Trade
A	1154.34	1282.61	1939.66
B	1925.49	3692.27	1661.98
C	4244.95	904.93	2278.18
Total	7324.77	5879.81	5879.81
Tax Revenue	0.00	11827.97	0.00

Table 2. The above kable table indicates the outcomes of three different policy options. An important thing to note, there is no tax revenue generated when there is a cap on carbon, or in a cap and trade situation. However, a carbon tax does provide tax revenue. Additionally, the total cost of abating carbon emissions is the same regardless of whether you impose a carbon tax, or if you implement a cap and trade program. The main difference is that a cap and trade program satisfies the *Equal Marginal Principle*, and therefor is the (theoretically) more equitable solution.

Problem 4

The new aggregate demand curve is as follows:

$$Cost\ of\ Abating = 11.89x - 54.3$$

The new price associated with the optimal carbon emissions (77.38 tons, sector D) is \$29.80. If Sector D were to enter the market, it would see a net benefit of \$778.13. The net benefit was calculated in the following way by finding the area under Sector D's "supply" curve from 0 to 77.38, and then subtracting

the product of 77.38 and 29.80.