

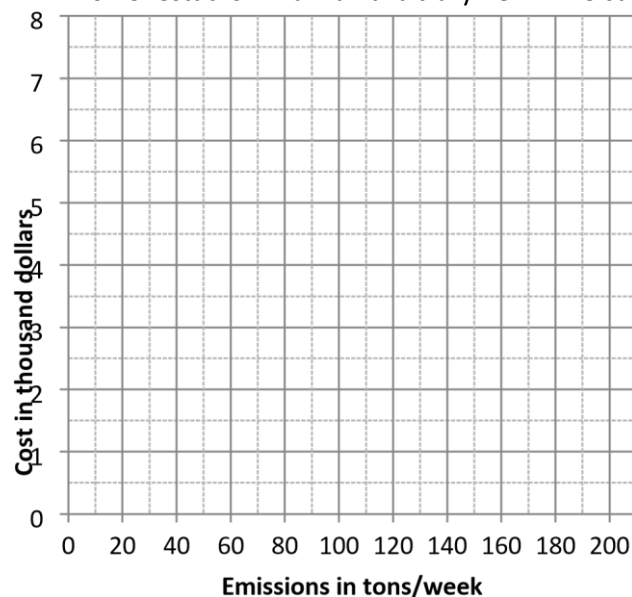
DIS Environmental Economics: In-class exercise on damage and abatement costs

1. Single firm MAC

Today's exercise takes place in the Upper Peninsula of Michigan, a sparsely populated region that is nevertheless home to a number of large coal-fired power plants whose sulfur dioxide emissions make an outsize contribution to acid rain falling on the Northeast. The Upper Peninsula's low population density can perhaps be blamed for its relatively lax regulatory environment, which has led to unusually high rates of damage from sulfur dioxide emissions (among other pollutants). Today you'll be working with the fictional Marquette Power Plant located in Marquette, MI (we'll just call it "Marquette"), which emits 140 tons of SO_2 per week under business-as-usual (BAU) conditions. That's horrible. Let's now assume that Marquette has a linear MAC curve, and that if Marquette abates to 40 tons of SO_2 , the marginal cost of abating one more unit would be \$6,000. This gives you enough information to graph Marquette's MAC curve.

Scenario: Michigan's House of Representatives passes a statewide Acid Rain Law that forces Marquette to abate 70 tons of SO_2 per week.

- Draw Marquette's MAC to the graph; assume infinite cost for abating the final tons.
- When the Acid Rain Law is introduced, how much is Marquette emitting? What would be the marginal cost of abating one more unit from that point?
- What is the total cost to Marquette of abating these 70 tons of SO_2 per week?
- Suppose a new type of scrubber is introduced to the market, and Marquette would like to know how much it can expect to save if it adds scrubbers to its smokestacks. Draw an arbitrary new MAC curve and highlight the savings area on the graph.

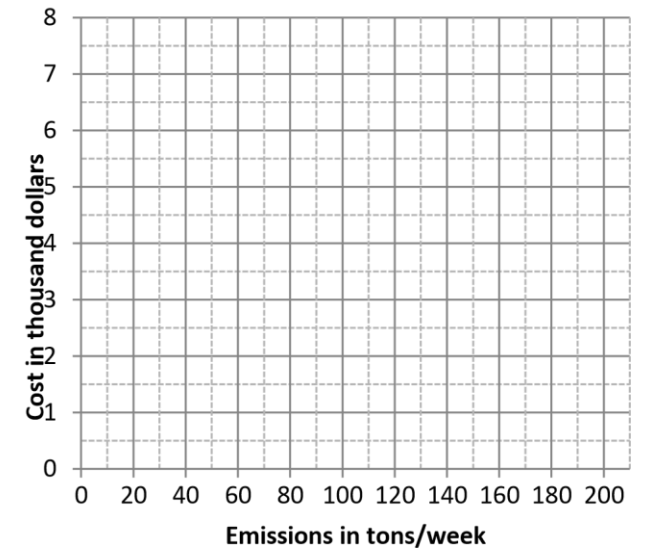
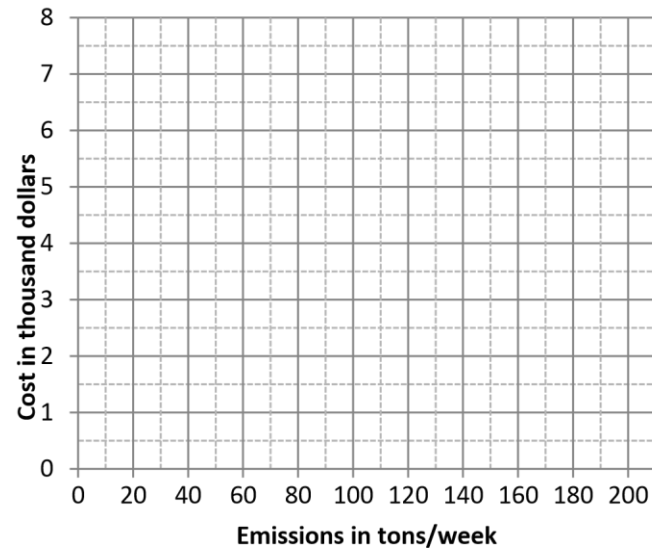
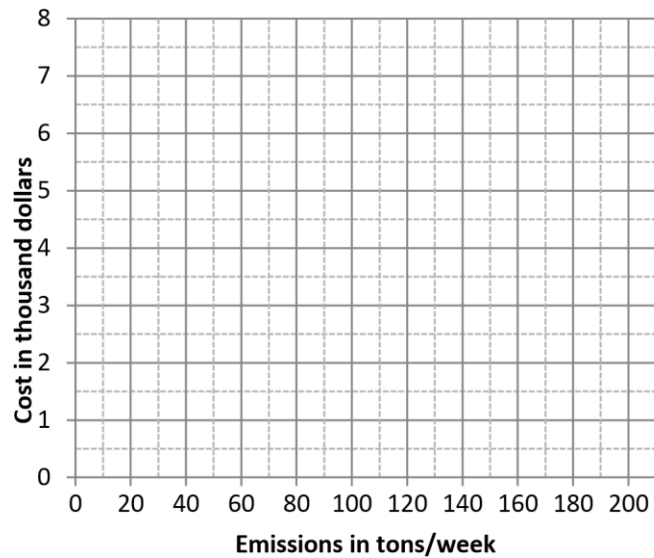


2. Aggregating MAC curves

Now suppose that the Upper Peninsula energy industry consists of exactly **two** coal-fired power plants—we'll call them Marquette and Escanaba:

Industry	BAU	If they abate to a level of 40 tons SO ₂ /week, the marginal cost of abating one more unit would cost:
Marquette Power Plant	80 t SO ₂ / week	\$6000
Escanaba Power Plant	60 t SO ₂ / week	\$5000

Draw the graphs, aggregate to find the MAC curve for the whole Upper Peninsula energy industry!



3. Marginal damage cost function

Researchers have estimated the damage cost function for a specific source pollutant. They assume the existence of a threshold. Please draw an arbitrary MD function, taking the assumption into consideration.

Give a few examples of MD curve shifts. Please keep the same starting point.

