**Cost-effectiveness problem**

Cost-effectiveness is a convenient framework for prioritizing competing potential air pollution control options. Table 1 provides a few typical air pollution control options, including how much they cost to implement, how much and what kind of emissions are reduced. Table 2 provides marginal social impacts for different pollutants.

1. For each control option, compute the cost-effectiveness.
2. Compare the cost-effectiveness of the options. Which might be the first options to prioritze based on this metric?

**Table 1**. Air pollution control options, implementation costs, and emissions reductions.

| Option | Baseline | Unit | Implementation Cost ($/yr)1 | Emissions reduced (tonnes/yr) |
| --- | --- | --- | --- | --- |
| Catalytic converter on automobile | No controls | 1 automobile | $50 | PM2.5: 5 x 10-3 |
| Sulfur scrubber on coal plant | No controls | 1 power plant | $1 billion | SO2: 7,000,000 |
| Gas reburning used with low NOx burner on power plant | No controls | 1 power plant | $5 million | NOx: 4,000 |
| Reduce coal activity by 25 % due to improved coal stove | No controls | 1 household | $35 | PM2.5: 0.043  NOx: 0.014 |
| Replace coal stove with LPG stove | No controls | 1 household | $55 | PM2.5: 0.175 |

Note 1: Most air pollution control options will have one-time capital costs to implement paid up front as well as annual operating and maintenance costs. They will also typically last for many years. To account for these factors, the implementation cost should be an “annual equivalent cost”.

**Table 2**. Typical marginal social impacts for various emissions.

| Pollutant | Marginal social impact2 (mortality/tonne) |
| --- | --- |
| PM2.5 | 9.0 x 10-3 |
| SO2 | 4.5 x 10-3 |
| NOx | Ground: 4.0 x 10-4  Elevated: 2.6 x 10-4 |

Note 2: In general, marginal social impacts will depend on where the emissions occur, especially how densely populated the surrounding area is. The values listed here are representative emission-weighted damages taken from REACH Southern Africa.