Lecture # 26 – Case #3: Benefit-Cost Analysis for a Composting Facility

Today we discussed the final case study, which asked for cost-benefit analysis of a proposed composting facility. The question is whether the county should build a municipal composting facility to reduce its landfill usage. Thus, we want to find the net present value of the composting facility. If the net present value (NPV) is positive, investing in the facility is worthwhile. Below I highlight some key points of the analysis.

- To begin, we defined the benefits of the composting facility.
    - The main benefit is that less trash goes into the landfill. Thus, the county will save landfill costs.
        - Note: alternatively, you could calculate the total costs of remaining landfill use + composting and compare to the costs of landfilling only. You get exactly the same results, but considering the landfill savings as a benefit is simpler, as it only requires one calculation.
            - Essentially, if you calculate both, you are doing a cost effectiveness analysis: asking which method is the most cost effective way to dispose of trash.
        - To calculate this value, first note that only 58% of the trash collected can be composted.
            - The total trash saved is this percentage times the trash collected.
        - Since the cost of landfilling is $100 per ton, that is the savings for trash that is composted rather than put in landfills.
        - These savings occur over a 20-year period. Thus, we need the PV of 20 years' worth of savings. I assume that the savings begin next year, since the plant first needs to be built.
            - These savings are in real dollars – that is, they are all measured in today's dollars.
            - Thus, inflation has been considered. We need a real discount rate.
            - Real rate = nominal rate – inflation = 6% - 3% = 3%
        - The NPV of savings ranges from $157,046,624 to $201,917,088, depending on the amount of trash collected.
    - An additional benefit comes from the sale of mulch. Each ton of trash composted creates 0.5 tons of mulch that can be sold for $10/ton.
        - The NPV of these sales range from $7,852,331 to $10,095,854, depending on the amount of trash collected.

- Next we need to calculate the costs.
    - The composting facility includes both a fixed cost to be paid now to set up the plant, and variable costs of operation.
        - The fixed cost is $45 million.
    - One variable cost is the cost of sorting trash. This is $10/ton.
        - The NPV of sorting trash ranges from $27,077,004 to $34,813,291, depending on the amount of trash collected.
    - A second variable cost is the cost of operating the plant. These range between $50 and $80 per ton composted. Thus, it is important to calculate a range of values, as I did in class.
    - Note that we ignore collection costs, because the trash must be collected for landfilling or composting. It is not a cost specific to the composting facility.
    - Total costs are the sum of the variable costs and the fixed costs. These are summarized below.

Total PV of costs at:	**700 tons trash/day**	**800 tons trash/day**	**900 tons trash/day**
Operating cost of $50/ton	$150,600,317	$165,686,076	$180,771,836
Operating cost of $65/ton	$174,157,310	$192,608,355	$211,059,399
Operating cost of $80/ton	$197,714,304	$219,530,633	$241,346,962

- Finally, we calculate the net present value by subtracting the present value of costs from the present value of benefits.
    - The composting facility is a good investment if the NPV is positive.

Net Present Value at:	**700 tons trash/day**	**800 tons trash/day**	**900 tons trash/day**
Operating cost of $50/ton	$14,298,639	$22,769,873	$31,241,108
Operating cost of $65/ton	-$9,258,354	-$4,152,405	$953,544
Operating cost of $80/ton	-$32,815,348	-$31,074,684	-$29,334,019

    - As we discussed in class, note that changes in the amount of trash collected per day do not change the results much. However, the NPV is only positive for the lower values of the operating cost.
        - It is important to note that the composting is not desirable if the sorting costs will be high. The city should look into these costs further before reaching a final decision.
    - Finally, we should consider whether there other areas of uncertainty, or whether some benefits and costs have been left out.
        - There may be environmental benefits to less landfill use. These could be stated, even if dollar values are not available.
        - Also, note that the project becomes less desirable as the discount rate increases.