



ENVIRONMENTAL ECONOMICS IN ACTION 5.1 An Illustrative CBA

Consider a project to support the construction of a new renewable energy source.

A plan is proposed to build a small-scale wind farm in a scenic area. The initial construction costs are estimated to be £750,000. Following start-up, annual maintenance costs of £5,000 are expected throughout the fifteen-year lifespan of the plant. At the end of this fifteen-year period, the wind farm will need to be dismantled, and the site restored, at an expected cost of £35,000. Every year after the initial construction year, the site will produce electricity with a market value of £150,000, which for

now we take to be a constant flow in real terms (we will ignore the effects of inflation here). Objectors have protested about the visual impact of the windmills, and so the government has commissioned a contingent valuation study of local residents. The results suggest that the mean annual compensation demanded by locals is £25/household: there are 2,000 households thought to be affected (this mean is calculated across both those against the project and those in favour).

It is straightforward to set up a basic CBA of this project. The initial ('year zero') construction costs are not discounted, as they occur at the start of the project. Maintenance costs are then discounted each year using the relevant discount factor, for a discount rate of 6% (not a declining discount rate, given the fairly short time horizon of the project).

Annual environmental costs of (£25 × 2,000) are also discounted over the fifteen years of the project; and are assumed to stop when the site is restored at a cost of £35,000 in year 15. This year-15 cost also needs to be discounted. Annual benefits of £150,000 get discounted each year; you can see how the present value of this fixed amount falls each year as we move forwards in time. The table below shows all workings.

As we can see, the total present value of costs is £1,275,779 million, whilst the total present value of benefits is £1,394,130 million. This means the net present value of the project is positive at £118,351, which passes the CBA test at the 6% discount rate. Notice how little the site renovation cost of £35,000 amounts to in present-value terms: less than half its future value.

Year	Discount factor at 6% discount rate $(1.06)^{-t}$	Benefits (£)	Present value of benefits (£)	Costs (£)	Present value of costs (£)
0	1		0	750,000	750,000
1	0.9434	150,000	141,495	55,000	51,881
2	0.89	150,000	133,485	55,000	48,944
3	0.8396	150,000	125,940	55,000	46,178
4	0.7921	150,000	118,815	55,000	43,565
5	0.7473	150,000	112,080	55,000	41,096
6	0.705	150,000	105,735	55,000	38,769
7	0.6651	150,000	99,750	55,000	36,575
8	0.6274	150,000	94,110	55,000	34,507
9	0.5919	150,000	88,770	55,000	32,549
10	0.5584	150,000	83,745	55,000	30,706
11	0.5268	150,000	79,005	55,000	28,968
12	0.497	150,000	74,535	55,000	27,329
13	0.4688	150,000	70,320	55,000	25,784
14	0.4423	150,000	66,345	55,000	24,326
15	0.4173			35,000	14,602
Total discounted benefits/costs			1,394,130		1,275,779

Net Present Value = 1,394,130 - 1,275,779 = +118,351.