COST-BENEFIT ANALYSIS - METHOD OF ASSESSING PUBLIC INVESTMENT

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Abstract

Decision "to invest or not" in the public interest is based on cost-benefit analysis (CBA). Cost-benefit analysis is a method of substantiation for investment decision. On this line, the paper aims to answer the following questions: Which are the stages of cost-benefit analysis? Which are the indicators used in determining the efficiency of investment? Which are the limits of economic efficiency indicators?. The answer to these questions was based on the analysis and evaluation of investment projects in energy, calculating the following indicators: the total investment, payback period, net actualized value, annual benefits, annual cost, cost / benefit ratio, internal return. The analysis calculated of indicators highlights the advantages and disadvantages of using CBA in the theory of public investment decisions.

Keywords: investment, cost benefit analysis, indicator

Cost-benefit analysis is an analytical tool used to estimate (in terms of benefits and costs) socio-economic impacts caused by the implementation of certain investments. The impact must be assessed against predetermined objectives. The analysis considers all social and economic variables affected by direct or indirect action.

The results provide evidence about the investment opportunity.

The analysis is based on a case study for an investment in Iasi, Brăeşti village. Investing involves creating a system of solar public illumination

MATERIAL AND METHOD

For detailing and interpreting indicators in the cost-benefit analysis were used the following research methods: economic analysis (analysis of accounting records), comparison, decomposition and generalization of the results, direct observation and statistical analysis. Base of information on the case study was the statistical and accounting records of the Village Hall Brăeşti, Iasi County.

RESULTS AND DISCUSSIONS

Cost-benefit analysis is done usually when we want to make an investment in the public domain. Cost-benefit analysis involves the next steps:

- definition of objectives;
- options analysis and feasibility;
- financial analysis;
- economic analysis;
- risk analysis and sensitivity.

Defining objectives

Defining objectives is essential to identify investment (A. Boardman et al., 2004).

Objectives have a number of characteristics:

- be clearly defined in terms of socio-economic variables;
- to highlight the general welfare that occurs due to the project;
- be linked to investment activities;
- be quantifiable;
- indicate the performance to be achieved.

Options analysis and feasibility

At the start, the idea of making an investment leaves more options. By making "explore options" investor will choose the best option of all feasible alternatives. In some cases, the investment can be seen better from the point of view of the cost - benefit analysis but, lower than other options.

For each investment could be considered at least three alternatives (P. Masse, 1964):

- The alternative of doing nothing;
- Alternative to a minimum;
- Option to do something (or reasonable alternative).

The financial analysis

The main purpose of financial analysis is to demonstrate the sustainability of the investment,

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using cash flows. Was calculated: financial net present value (FNPV) and internal rate of return on equity (RIRF) and in terms of return on investment costs, FNPV (C) and RIRF (C), and return on national capital FNPV (K) and FRR (K).

The methodology used in financial analysis to determine the financial return is the discounted net cash flow approach (DCF). Assumptions were considered:

1. were considered only cash inflows and outflows (depreciation, reserves and other accounts that do not correspond to actual flows are ignored);

2. determined the investment cash flow scenarios mentioned above;

3. have updated all flows.

The economic analysis

Objective economic analysis is to demonstrate that the investment has a positive net contribution to society.

Economic indicators and thresholds used are: economic net present value (VENA) positive, a Benefit / Cost (B / C) greater than 1, the economic internal rate of return (RIRE) that exceed the discount rate used to calculate VENA . According to the Working Document. 4. proposed by the European Commission recommends using a social discount rate of 5.5%.

Economic analysis can be summarized in five steps:

1. conversion of market price in accounting prices;
2. monetization of non-tradable effects;
3. inclusion of additional indirect effects (if relevant);
4. updating the estimated costs and benefits;
5. calculation of economic performance indicators (Economic Net Present Value, Internal Rate of Return Economic and benefit / cost).

Risk analysis

A risk assessment consist in studying probability that an investment is performant. Probability should be understood here as an indicator that takes the value 1 for absolute certainty, zero for certain that the forecast will be confirmed and intermediate values which lie between the two extremes.

The sensitivity analysis

Sensitivity analysis allows the determination of variables "critical". These variables are those whose changes, positive or negative, have the greatest impact on the financial performance and / or economic of an investment. The analysis is performed by modifying an element at a time and determine the effect of this change on the internal rate of return and net present value.

For the best results highlight case studies still only relevant aspects of the economic and financial analysis.

Analysis financially - case study

Calculation of income and costs.

By mounting the 1375 panel sized pillars with about 130W power produced will result in over a year:

1375 columns x 130W x 3.5 h / day x 365 days = 228.35 MWh / year.

The average price for 1 kWh is 0.6 lei. => The value of the electricity bill that will save = 0.6 * 228.35 * 1000 = 137010 lei / year. Correct gross average revenue growth of 4.4% per year resulting economic value of the electricity bill of 2826418.46 lei for the duration of the investment.

The calculation was made an average annual panel load of 3.5 hrs / day.

The financial analysis aimed at verifying the financial viability of the project. The initial investment is lei 27968211 lei is realized in the first year.

Maintenance cost of the system is identified by the cost of personnel for system maintenance and 1 employee. Considering the minimum wage for a skilled worker is 720 lei per month and rate of 1.044 h / month / worker to obtain an annual cost of lei 751.68. It takes into account the average gross revenue growth of 4.4% per year (lower forecasted growth experts IMF and World Bank).

It is noted that cash flow (the calculation of which had regard to investment costs, all funds used for the implementation and operation of investment and net benefits) is positive for the entire duration of the payback. Not considered residual.

Formula:

The payback period was calculated using the formula:

$$I_{total} = \sum_{i=PIF+1}^{PIF+TR} (V_i - C_i)$$

where Itot = total investment made during the implementation Vi = annual earned income during operation, Ci = annual expenditures made during operation, PIF = year commissioning of the plant, TR = recovery period;

Recovery period (TR) result is 15 years.

The net present value was calculated using the formula:

$$VAN = \sum_{i=1}^{n} \frac{V_i - C_i - I_i}{(1+r)^i} + \frac{VR}{(1+r)^i}$$

where r = discount rate (5%), Io = investment made for more than one year, Vi =

operating income in year i, Ci = operating cost in year i; VR = residual value N = life investment.

Obtain a net present value of the investment -25,430,672.07 lei *(tab. 1)*.

As VANF is negative, it is a first sign that the project can not be achieved without financial aid grant, although it is an investment that, in terms of socio-economic parameters, it should be done.

Table 1

Indicators of financial analysis

Nr. crt	Year	The initial investment	Revenues from energy saving	Personnel costs	Annual benefits	The present value
1	1	-20976158.25	137010.00	751.68	-20976158.25	-20976158.25
2	2	-6992052.75	143038.44	784.75	-6855794.43	-6529328.03
3	3	0.00	149332.13	819.28	142253.69	129028.29
4	4	0.00	155902.75	855.33	148512.85	128290.98
5	5	0.00	162762.47	892.97	155047.41	127557.89
6	6	0.00	169924.01	932.26	161869.50	126828.99
7	7	0.00	177400.67	973.28	168991.76	126104.25
8	8	0.00	185206.30	1016.10	176427.40	125383.66
9	9	0.00	193355.38	1060.81	184190.20	124667.18
10	10	0.00	201863.01	1107.48	192294.57	123954.79
11	11	0.00	210744.99	1156.21	200755.53	123246.48
12	12	0.00	220017.77	1207.09	209588.77	122542.22
13	13	0.00	229698.55	1260.20	218810.68	121841.97
14	14	0.00	239805.28	1315.65	228438.35	121145.73
15	15	0.00	250356.72	1373.54	238489.64	120453.47
16	TOTAL	-27968211.00	2826418.46	15506.62	-25157299.16	-25430672.07

Table 2

Indicators of economic analysis

Nr. crt	Year	The initial investment	Revenues from energy saving	Benefits of reducing the cost of maintenance	Other benefits	Total annual net benefits	The present value
1	1	-20976158.25	137010.00	727780.63	1162324.00	-20976158.25	-20976158.25
2	2	-6992052.75	143038.44	759802.98	1213466.26	-4951796.75	-4693646.21
3	3	0.00	149332.13	793234.31	12266858.77	1416190.90	1912004.78
4	4	0.00	155902.75	828136.62	1322600.56	1478503.30	1890386.67
5	5	0.00	162762.47	864574.63	1380794.98	1543557.45	1869033.83
6	6	0.00	169924.01	902615.91	1442549.96	1611473.98	1847942.55
7	7	0.00	177400.67	942331.01	1504978.16	1682378.83	1827109.18
8	8	0.00	185206.30	983793.58	1571197.20	1756403.50	1806530.13
9	9	0.00	193355.38	1027080.50	1640329.87	1833685.25	1786201.88
10	10	0.00	201863.01	1072272.04	1712504.39	1914367.40	1766120.94
11	11	0.00	210744.99	1119452.01	1787854.58	1998599.57	1746283.90
12	12	0.00	220017.77	1168707.90	1866520.18	2086537.95	1726687.41
13	13	0.00	229698.55	1220131.04	1948647.07	2178345.62	1707328.15
14	14	0.00	239805.28	1273816.81	2034387.54	2274192.83	1688202.87
15	15	0.00	250356.72	1329864.75	2123900.60	2374257.31	1669308.36
16	TOTAL	-27968211.00	2826418.46	15013594.70	21854013.53	-1779461.11	

The economic analysis - case study

Economic analysis proves the contribution of investment to economic development planning. Economic indicators positive performance (VANE = 509,969.58 lei and RIRE = 5.7827%), results based on data below *(tab.2)* justifies the investment, as the social utility and its socio-economic impact is a decisive component. B/C ratio is positive. (B/C = 1,50).

Quantified monetary benefits are:

1. In social terms:

- New public lighting creates a pleasant and comfortable environment;

- Reduce emissions into the atmosphere (SO2, NOx impact on population health, crops, global warming) is a major positive impact on the environment.

2. From the point of view of environmental protection:
- Greenhouse gas emissions are reduced by 358.73 kg/year/luminaire, eg for lamp 1375 is approximately 493.25 tons/year;
- Use LEDs produce no environmental pollution with mercury, which was containing sodium vapor lamps. Power solar lighting system leads to the realization of an organic product that does not affect the environment.

CONCLUSIONS

The results obtained from the study are:
ACB - is the main method of analysis used in the theory of the decision to invest or not in the public domain. Investment decision making involves the following steps: defining the objectives, options and feasibility analysis, financial analysis, economic analysis and sensitivity and risk analysis.

The main indicators used in ACB steps are: the total investment, payback period, net actualized value, annual benefits, annual cost, cost/benefit ratio, internal rate of return.

Globally it is estimated that an investment is justified if the analyzed indicators within the following values:
- Positive net present value;
- Cost/benefit ratio greater than one;
- Internal rate of return exceeds the discount rate used to calculate the net present value of the positive.

REFERENCES

Boardman A. şi colab., 2004 – *Analiza Cost-Beneficiu*, Editura ARC, Bucureşti.
Isfrănescu A. şi colab., 2006 - *Analiza economico-finaciară*, Editura Cartea Universală Bucureşti.
Masse P., 1964 – *Les choix des investissement*, Editura Dunod, Paris.
Ştefan G. şi colab., 2006 - *Economie şi politici agroalimentare*, Editura ALFA, Iaşi.