

U-6016: Cost-benefit Analysis

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Assignment #2

Scenario: A cost-benefit analysis of Bulawayo Industries cement plant

Introduction: Bulawayo Industries, Ltd., a private industrial concern, proposes to construct a cement plant on the outskirts of Bulawayo, Zimbabwe, adjacent to limestone deposits on government-owned land. The company has submitted a proposal, seeking approval for this investment as well as permission to mine the limestone, which is currently lying unutilized.

Basic technical specifications: The plant is to be constructed on the outskirts of Bulawayo, near limestone deposits located on government-owned land. Limestone is an essential ingredient in the production of cement. The proposal calls for a plant with an annual capacity of 100,000 tons of cement. At this capacity, the limestone deposits are expected to last about 5 years.

Bulawayo Industries has obtained bids from several construction firms for the construction of the plant and development of the site. The lowest of these bids comes to \$25,000,000 for all the machinery, equipment, and vehicles necessary for operations. Construction and site development is expected to take a year. Bulawayo Industries intends to claim depreciation allowances of \$5,000,000 in each of the five years that the plant is in operation. These claims will be used to reduce the profit-taxes payable on the project. The current profit-tax rate is 20% of operating income, net of depreciation allowances. The machinery and equipment are not expected to have any scrap value at the end of the project.

The annual operating data for the proposed plant are shown in Exhibit A. Details are given below:

- (a) The cement will be sold domestically. Bulawayo Industries commissioned a survey of the demand and supply parameters in this market. The market survey indicates that a \$1 decrease in the price per ton of cement is likely to raise the quantity that is demanded by 3000 tons while the supply forthcoming from other producers is likely to decrease by 2000 tons. The current price per ton of cement is \$200 and the quantity being traded is 300,000 tons.
- (b) Limestone will be available at no cost, once the mining site has been developed and the equipment put into place.
- (c) Fuel will have to be imported from abroad. The world price of fuel, translated into Zimbabwean dollars is \$0.50 per litre.
- (d) Water, supplied by the domestic public water authority, is available at a constant price equal to its marginal supply cost of \$0.01 per litre.
- (e) Power, supplied domestically by the state electricity agency, is available at a constant price equal to its marginal supply cost of \$1,000 per kilowatt.
- (f) Hemp-bags will also be purchased from domestic producers. Again, a survey of market conditions indicates that a \$1 decrease in the price per 1000 bags is likely to raise the quantity demanded by other firms and industries that use hemp-bags by 40,000 bags, and is likely to reduce the quantity supplied by 40,000 bags. The current price for 1000 bags is \$500, and the quantity being traded is 8,000,000 bags.

- (g) The cement that is produced will have to be transported an average of 100 kilometers. For this, Bulawayo Industries plans to rely on the domestic trucking industry. The costs of trucking are about \$1 per truck per 10 kilometers. Each truck holds 20 tons. Of the \$1 charge per truck, \$0.50 can be attributed to the cost of the fuel, 1 litre, that is used up every 10 kilometers. Any changes in the price of fuel are directly transmitted by the trucking companies to their clients through increases in the trucking charges.
- (h) Workers will be recruited from Bulawayo and surrounding areas. These workers, who will mostly be engaged in manual (unskilled) labor will have to be paid the going market wage, \$5,000 per year per worker. The demand for labor from the plant is not expected to influence the market wage.
- (i) The supervisors and technicians for the project will be drawn from the existing technical and managerial staff of Bulawayo Industries. Each of the 25 supervisors and technicians will be paid a salary of \$30,000 per year.

Financing: Bulawayo Industries, Ltd. has applied to the Bank for Industrial Development for a loan of \$20,000,000 to cover the initial outlay on machinery and equipment. If approved, the loan would be provided at an interest rate of 10% per annum, with a one-year grace period,¹ and subsequent repayment of principal and interest in equal annual installments over the next five years. Interest payments are not deductible for tax purposes. The balance of the finance that is necessary would be in the form of an equity investment by Bulawayo Industries.

¹A one-year grace period implies that during the first year of the loan, no interest would accumulate.

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A. Base scenario: Assuming that the data in Exhibit A are complete and accurate (i.e. capture all the relevant aspects of the project), and *assuming that there are no distortions (i.e., no taxes, subsidies or quantity restraints) in any of the markets affected by the project:*

- (a) what is the net present value of the *cashflows* generated by this project?
- (b) what is the net present value of the *cashflows accruing to Bulawayo Industries*?
- (c) what impact will this project have on the government's tax revenues?²
- (d) what is the present value of the net economic benefits (from a societal perspective) of this project?³
- (e) should the government approve the project?

B. Distortions and secondary market effects: Suppose now that within the next year (i.e., before the plant begins operation) the government plans to introduce a whole series of taxes, tariffs, and subsidies. Thus, instead of the base scenario assumed in part (A), many of the markets affected by the project will be subject to distortions, and these distortions have to be taken into account in doing both the financial appraisal as well as the cost-benefit analysis. The specific policies that the government plans to introduce are:

- (i) an unit tax of \$50 per ton of cement
- (ii) an ad-valorem subsidy of 25% for the production of hemp-bags
- (iii) an ad-valorem tariff of 20% on fuel imports

Assuming that these policies will be put into place before the plant begins operations:

- (a) what is the net present value of the cashflows generated by the project?
- (b) if Bulawayo Industries anticipates that these policies will be introduced, will it be willing to undertake the project?
- (c) what is the net present value of the economic costs and benefits of this project?
- (d) what will be the annual net impact of the project on the government budget during the years that the plant is in operation?

²Assume that there are no secondary market effects of any kind.

³Assume that the government's discount rate is 10%.

C. Incentives and concessions: Under the scenario presented in part (B), it appears that if Bulawayo Industries correctly anticipates the imposition of the proposed taxes, tariffs and subsidies in the specified markets, it will no longer be willing to undertake the project. However, a cost-benefit analysis of the project indicates that from the perspective of the national economy, the project ought to be undertaken. In order to ensure this, however, the Ministry of Industries will need to offer some concessions or incentives to Bulawayo Industries. Four such incentives/concessions have been proposed and are under consideration:

- (i) a profit-tax holiday for the length of the project
- (ii) exemption from tariff-payments for fuel directly purchased by Bulawayo Industries
- (iii) subsidy/payment of \$25 for each ton of cement produced by Bulawayo Industries
- (iv) provision of an interest subsidy equivalent to offering Bulawayo Industries a loan at 0%

The criteria to be used in selecting one of these proposals are: first, that the provision of the incentive persuade Bulawayo Industries to proceed with the project; and second, that it achieve this objective at the lowest possible budgetary cost.

- (a) which one, or more, of these proposals satisfy the first criterion?
- (b) what are the budgetary costs associated with each of these proposals?
- (c) which is the preferred proposal given the two selection criteria?

Exhibit A
Annual operating data: Bulawayo Industries cement plant

Output	<i>Quantity</i>	<i>Units</i>
Cement	100,000	tons
Input		
Limestone	1000	tons
Fuel	5,000,000	liters
Water	50,000,000	liters
Power	500	kilowatts
Hemp-bags	4,000,000	bags
Trucking	10,000,000	ton-kilometers
Workers	500	person-years
Supervisors	25	person-years