

72. PROFILE ON COARSE/CRUSHED AGGREGATE

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I. SUMMARY

This profile envisages the establishment of a plant for the production of 170,000m³ crushed stones per annum.

The current demand for the envisage product is estimated at 55,400 m³ per annum and it is projected to reach 342,000 m³ by the year 2019.

The project will create employment opportunity for 43 persons.

The total investment cost of the project is estimated at Birr 16.32 million, out of which Birr 9.22 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 31% and a net present value (NPV) of Birr 20.18 million, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Coarse/Crushed aggregates are stones with low wear-tear and water absorbing capacity characteristics which are mined, crushed and asserted by size. Crushed stones are used in road making, construction of building, dams, runways, etc.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past supply and Present Demand

The demand for coarse aggregates is derived from building and road construction activities. Since transporting and selling coarse aggregates over a long distance is not a profitable operation, the relevant market in this case is the local or regional market. As far as the supply is concerned, the standard practice to date in Benishangul Gumuz as

well as most other remote and emerging regions is for construction firms to meet their need by producing own aggregates which is carried out on-site.

Since the demand for coarse aggregates in Benishangul-Gumuz Region is assumed to be mainly dependent on the amount of public sector construction activity in the short and medium run, the Three Year Development plan of the region which catalogues individual projects is used to identify the relevant construction projects. The plan has separate sections covering Education, Health, Housing and Road Construction, among others. The private sector's demand is also taken account of, and is expected to emanate mainly from commercial buildings for hotels, restaurants, gas stations and the like.

According to the Three Year Development Plan of the Benishangul-Gumuz Region, a total of 10 Health Posts, 6 Health centers, 2 Hospitals, 48 Primary Schools, 4 Scondary School and 250 Residential Houses are envisaged to be built in different woredas. In addition, 210 kms of rural road with RR 50 grade will be constructed during the plan period. Apart from these public investments, as a consequence of increased economic activity in the region, the private sector is bound to invest in the construction of low rising (ground plus one and two) commercial and office buildings.

Table 3.1 details out the anticipated realization of the plan with implementation of projects spread over a three years period of time.

Table 3.1**PROJECTED IMPLEMENTATION OF CONSTRUCTION PROJECTS****BENISHANGU - GUMUZ (Number)**

Sr. No.	Item	Year			Total
		2005	2006	2007	
1.	Heath post	2	3	5	10
2.	Health	1	2	3	6
3.	Hospital	1	1	-	2
4.	Primary Village School (PVS)	8	10	15	33
5.	Complete Primary School (CPS)	4	5	6	15
6.	Secondary School	1	1	2	4
7.	Residential House, (G+0)	70	80	100	250
8.	Commercial & Office Buildings				
	- G+0	30	35	40	105
	- G+1	1	3	5	9
	- G+2	-	1	2	3
9.	Rural Road (RR50)	50 Kms	60 Kms	100 Km	210 Km

Note: Rural road Construction is given in Linear Km, while all other figures refer to number of projects.

In order to establish the coarse aggregate requirement for various types of Health and Educational buildings, the standard design and bill of quantity (BoQ) of the respective sectors was scrutinized. For commercial and residential buildings a sample of BoQ of various buildings was assessed to establish the average requirement. Furthermore, it was learnt from knowledgeable source that rural roads of the RR50 category require about 2000m³ of coarse aggregate per linear kilometer. However, since some of the construction enterprises are likely to have their own crusher machines, it is assumed that only about 50 per cent of the anticipated road construction would create a market for the envisaged plant.

The coarse aggregate requirement calculated by type of building on the basis of the above data is provided in Table 3. 2.

Table 3.2
COARSE AGGREGATE REQUIREMENT BY TYPE OF BUILDING

Item	Consumption per, 1m ² of Floor Area (m ³)	Floor Area (m ²)	Total consumption per one building (m ³)
Health Post	0.2	75.6	15.5
Health Center	0.12	867.5	108
Hospital	0.15	2400	360
Primary Village School (PVS)	0.11	364.6	42
Complete Primary School (CPS)	0.07	904	66
Secondary School	0.09	1270	110
Residential House (G+0)	0.17	63	11
Commercial & office Building	0.35	300	105
- G+0	0.45	600	270
- G+1	0.36	900	324
- G+2			

After applying the requirements shown in Table 3.2 on the data given in Table 3.1, the total present demand for coarse aggregate is estimated to be 55,400 m³. Out of this amount, 50,000 m³ or 90% emanates from road construction, while the balance, i.e. 5,400 m³ or 10% of the demand originates from building construction.

2. Projected Demand

The Benishangul-Gumuz Region's demand for coarse aggregate in the next three years is forecasted on the basis of the projected implementation of construction projects as depicted in Table 3.1 and the consumption coefficients established in Table 3.2.

For the part of the forecast period extending beyond the coming three years, an annual average growth rate of 10% is used to execute the demand projection; the underlying assumption being that as observed in many countries, both developed and undeveloped, the rate of growth of the construction sector has been consistently higher than that of the economy as a whole. Since the Ethiopian economy has been growing at an average rate of 7% in the recent past, a 10% growth rate in the construction sector is not an unlikely scenario in the future. Table 3.3 shows the demand projection made on the basis of these assumptions.

Table 3.3
PROJECTED DEMAND FOR COARSE AGGREGATE

Year	Projected Demand (m³)
2005	55400
2006	67,200
2007	109,000
2008	120,000
2009	132,000
2010	145,000
2011	160,000
2012	175,000
2013	193,000
2014	212,000
2015	234,000
2016	257,000
2017	283,000
2018	311,000
2019	342,000

3. Pricing and Distribution

The current price of coarse aggregate around Addis Ababa, at quarrying site is between Birr 100-125 /m³. However, the envisaged plant as a new entrant should set a price of its product lower. Considering lower lease rate & royalty as well as cheap laboring in BGRS a factory-gate price of Birr 60/ m³ is adopted for the purpose of financial analysis. As regards to distribution, it is the retailers that effect the purchase from production site using their own means of transportation.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Based on the demand projection indicated earlier, the proposed plant will have a capacity to produce 170,000 m³ of crushed stones of various sizes per annum.

2. Production Programme

The plant will produce 80% of its capacity during the first year, 90% in the second year and full capacity in the third year and thereafter. The plant will operate 300 days in a year and one shift of 8 hours per day.

IV. RAW MATERIALS AND UTILITIES

A. RAW MATERIALS

The raw material used to produce aggregate is basalt rock which is available in the region. The annual raw material requirement at full operation capacity of the plant and the corresponding cost estimates are shown in Table 4.1.

Table 4.1**ANNUAL CONSUMPTION OF RAW MATERIALS AND COST**

Sr. No.	Description	Qty	Cost '000 Birr		
			FC	LC	Total
1	Royalty (3% of gross sales)		-	204.00	204.00
2	Explosives	lup-sum	100	-	100
	Total		100	204.00	304.00

B. UTILITIES

The total cost of utilities is estimated at Birr 10,000, out of which fuel consumption accounts for Birr 9,000 and water consumption accounts for Birr 1,000.

V. TECHNOLOGY AND ENGINEERING**A. TECHNOLOGY****1. Production Process**

The quarry for the stone deposit is prepared by open cut mining. The rock is dug or blasted using explosives and the blasted rock is transported for crushing. Then, the crushed stone is sized and those crushed stones which do not pass through sieve are again crushed and sized. The sized crushed stones are stored in open air for use.

2. Source of Technology

The machinery required for the envisaged plant could be obtained from an Indian Company.

Safal Engineering & Fabrication

F-35, MIDC Shiroli (p.), Kolhapur-416 122, India

Tele: (+91) - (230) - 2628410/2469401

Website: <http://www.indiawart.co>.

B. ENGINEERING

1. Machinery and Equipment

The required plant machinery and equipment and the corresponding cost are indicated in Table 5.1.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT AND COST

Sr. No.	Item	Qty. (No.)	Total Cost '000 Birr		
			FC	LC	Total
1.	Bull Dozer	1	2,100		2,000
2.	Excavator	1	1,400		1,400
3.	Loader	1	1,500		1,500
4.	Dump truck	2	700		1,400
5.	Compressor and power tools	1	1,000		1,000
6.	Crushing plant	1	1,500		1,500
	F.O.B		8,800		8,800
7.	Bank Insurance & communication			425	425
	Grand Total		8,800	425	9,225

2. Land, Building and Civil Works

The total area required for the envisaged plant including provision for open space is estimated to be 25,000m², out of which 200 m² is a built-up area. The total cost of land, building and civil works is estimated at Birr 450,000. The total cost of land lease for a period of 70 years land holding is estimated to be 4.375 million. Thus, the total investment cost for land, building and civil works assuming that the total land lease cost will be paid in advance is estimated at 4.82 million.

3. Proposed Location

Based on the availability of infrastructure, utilities and labour, Assosa & Pawe town are proposed to be the location of the envisaged plant.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The total manpower requirement for the envisaged project will be 43 persons. Details of labour source & annual salary requirement are as indicated in Table 6.1.

Table 6.1
MANPOWER REQUIREMENT AND ANNUAL LABOUR COST

Sr. No.	Description	Req. No.	Salary per Month (Birr)	Annual Salary (Birr)
1	Manger	1	2,200	26,400
2	Engineer	1	1,800	21,600
3	Commercial staff	3	750	27,000
4	Administration and finance staff	6	850	5,100
5	Technical staff	2	500	12,000
6	Skilled workers	10	500	60,000
7	Unskilled workers	20	250	60,000
	Sub-Total	43		212,100
	Benefits (25%)			53,025
	Grand Total	43		265,125

B. TRAINING REQUIREMENT

Training by the machinery supplier should be given for two technical staff for two months during erection & commissioning, such training is estimated to cost Birr 10,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the coarse/crushed aggregate project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 years
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	10.5%
Discounted cash flow	10.5%
Repair and maintenance	5 % of the total plant and machinery
Accounts receivable	30 days
Raw material, import	90 days
Work in progress	1 day
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at Birr 16.33 million, of which about 54 % will be required in foreign currency. The major breakdown of the total initial investment cost is shown in Table 7.1

Table 7.1
INITIAL INVESTMENT COST ('000 BIRR)

Sr. No.	Cost Items	Foreign Currency	Local Currency	Total
1	Land	-	4,375.00	4,375.00
2.	Building and Civil Work	-	450.00	450.00
3.	Plant Machinery and Equipment	8,800.00	425.00	9,225.00
4.	Office Furniture and Equipment	-	100.00	100.00
5.	Vehicle	-	500.00	500.00
6.	Pre-production Expenditure*	-	2,641.89	2,641.89
	Total Investment cost	8,800.00	7,377.65	16,177.65
7	Working Capital	37.77	112.96	150.74
	Grade Total	8837.77	7490.62	16,328.39

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 3.24 million (see Table 7.2). The material and utility cost accounts for 8.73 per cent while repair and maintenance take 14 per cent of the production cost.

* *Pre-production expenditure include interest during construction (Birr 1.11 million), training (Birr 10,000), and costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

Table 7.2
ANNUAL PRODUCTION COST ('000 BIRR)

Items	Year			
	3	4	7	10
Raw Material and Inputs	243.20	273.60	304.00	304.00
Labour direct	101.81	114.53	127.26	127.26
Utilities	8.00	9.00	10.00	10.00
Maintenance and repair	369.00	415.12	461.25	461.25
Labour overheads	42.42	47.72	53.02	53.02
Administration cost	67.87	76.36	84.84	84.84
Total Operating Costs	832.30	936.33	1040.38	1040.38
Depreciation	1151.50	1151.50	1067.50	1067.50
Cost of Finance	1223.95	1148.97	761.64	350.81
Total Production Cost	3207.75	3236.81	2869.51	2458.68

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the life-time of the project. The income statement and the other indicators of profitability show that the project is viable.

2. Break-even Analysis

The break-even point of the project is estimated by using income statement projection.

$$\text{Be} = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 20 \%$$

3. Pay-back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 3 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 31 % and the net present value at 10.5% discount rate is Birr 20.18 million.

D. ECONOMIC BENEFITS

The project can create employment for 43 persons. In addition to supply of the domestic needs, the project will generate Birr 17 million in terms of tax revenue. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.